

**ANNAMALAI UNIVERSITY  
FACULTY OF ENGINEERING AND TECHNOLOGY  
DEPARTMENT OF INFORMATION TECHNOLOGY**

**B.E. Information Technology  
(Four-Year Full Time) DEGREE PROGRAMME  
Choice Based Credit System**

**Regulations - 2022**

**Curriculum for Students Admitted in the Academic Year 2022-2023**



**HAND BOOK  
2022**



**ANNAMALAI UNIVERSITY**  
**FACULTY OF ENGINEERING AND TECHNOLOGY**  
**DEPARTMENT OF INFORMATION TECHNOLOGY**

**B. E. Information Technology**  
**(Four-Year) Degree Programme (FULL-TIME)**  
**Choice Based Credit System (CBCS)**

**REGULATIONS 2022**

**1. Condition for Admission**

Candidates for admission to the first year of the four year B.E. Degree programmes shall be required to have passed the final examination of the plus 2 Higher Secondary Course with Mathematics, Physics and Chemistry as courses of study and candidates who have passed the Higher Secondary Examination through vocational stream under Engineering, conducted by the Board of Secondary Education, Government of Tamil Nadu or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

Candidates who have passed the Diploma programme in Engineering of the State Board of Technical Education, Tamil Nadu will be eligible for admission to the second year of the four year degree programme in B.E. under the lateral entry scheme provided they satisfy other conditions.

**2. Branches of Study in B.E.**

BRANCH I	-	Civil Engineering
BRANCH II	-	Civil and Structural Engineering
BRANCH III	-	Mechanical Engineering
BRANCH IV	-	Mechanical Engineering (Manufacturing)
BRANCH V	-	Electrical and Electronics Engineering
BRANCH VI	-	Electronics and Instrumentation Engineering
BRANCH VII	-	Chemical Engineering
BRANCH VIII	-	Computer Science and Engineering
BRANCH IX	-	Information Technology
BRANCH X	-	Electronics and Communication Engineering
BRANCH XI	-	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
BRANCH XII	-	Computer Science and Engineering (Data Science)

**3. Courses of Study and Scheme of Examinations**

The courses of study with respective syllabi and the scheme of Examinations are given separately.

**4. Choice Based Credit System (CBCS)**

The curriculum includes six components namely Humanities / Social Sciences /Management, Basic Sciences, Engineering Sciences, Professional Core, Professional/Programme Electives and Open Electives in addition to Seminar & Industrial Training and Project. Each semester curriculum shall normally have a blend of theory, practical and theory cum practical courses. The total credits for the entire degree Programme is **173 (132 for lateral entry students)**.

## **5. Eligibility for the Degree**

A candidate shall be eligible for the degree of Bachelor of Engineering if the candidate has satisfactorily undergone the prescribed courses of study for a period of four academic years and has passed the prescribed examinations in all the four academic years. For the award of the degree, a student has to earn a minimum of 173 credits (132 for lateral entry students).

Serve in any one of the Co-curricular activities such as

- National Cadet Corps (NCC)
- National Service Scheme (NSS)
- National Sports Organization (NSO) and
- Youth Red Cross (YRC)

For at least one year. The students enrolled in any one of the co-curricular activities (NCC / NSS / NSO / YRC) will undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid. While the training activities will normally be during weekends, the camp will normally be during vacation period.

(or)

Enrol as a student member of a recognized professional society such as

- Student Chapters of Institution of Engineers (India)
- Student Chapters of other Professional bodies like ICI, ISA, IICChE, IEEE, SAE, ASHRAE, CSI and IWS

### **5.1 B.E (Honours) Degree**

A student shall be eligible to get Under Graduate degree with Honours, if he/she completes an additional 20 credits. Thus the total credits are 193. Out of 193 credits (152 credits for lateral entry students), 20 credits must be earned by studying additional course offered by the same or allied Departments (listed in Annexure) in the sixth, seventh and eighth semesters.

### **5.2 B.E Degree with Minor Engineering**

A student shall be eligible to get Under Graduate degree with additional Minor Engineering, if he/she completes an additional 20 credits. Out of the 193 credits, 20 credits must be earned from the courses offered by any one of the Departments (listed in Annexure) in the Faculty of Engineering and Technology in sixth, seventh and eighth semesters.

## **6. Assignment of Credits for Courses**

Each course is normally assigned one credit per hour of lecture/tutorial per week and half credit for one hour for laboratory or practical or drawing course per week.

## **7. Duration of the Programme**

A student is normally expected to complete the B.E. programme in four years but in any case not more than seven years from the time of admission.

## **8. Registration for Courses**

A newly admitted student will automatically be registered for all the courses prescribed for the first, second and third semesters without any option.

Every other student shall enrol for the courses intended to be credited in the succeeding semester in the current semester itself by completing the registration form indicating the list of courses. This registration will be done a week before the last working day of the current semester.

A student is required to earn 173 (132 for lateral entry students) credits in order to be eligible for obtaining the degree. However the student is entitled to enjoy an option to earn either more or less than the total number of credits prescribed in the curriculum of a particular semester on the following guidelines:

### **8.1 Slow Learners**

The **slow learners** may be allowed to withdraw certain courses with the approval by the Head of the Department and those courses may be completed by them in the fifth year of study and still they are eligible to be awarded with I Class. A student can withdraw a maximum of 2 courses per semester from IV semester to VII semester and take up those courses in the fifth year of study. However, courses withdrawn during odd semesters (V and VII) must be registered in the odd semester of fifth year and courses withdrawn during even semesters (IV and VI) must be registered in the even semester of fifth year.

### **8.2 Advanced Learners**

The **advanced learners** may be allowed to take up the open elective courses of eighth semester in sixth and seventh semesters one in each to enable them to pursue industrial training/project work in the entire eighth semester period provided they should register those courses in the fifth semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

### **9. Project Work**

The student typically registers for project at the end of seventh semester and completes it at the end of the eighth semester along with the courses prescribed for study in the eighth semester. However a student who has registered and successfully completed the courses of eighth semester by acquiring additional credits in the earlier semesters can attempt to spend his/her period of study in an industry and complete his/her project work, submit the project report and appear for viva-voce examination at the end of eighth semester.

### **10. Mandatory Induction program**

A 3-week long induction program for the UG students entering the institution, right at the start is proposed. Normal classes start only after the induction program is over. The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

- Physical Activity
- Creative Arts
- Imparting Universal Human Values
- Literary Activities
- Conduct of crash courses on soft skills
- Lectures by Eminent People
- Visits to Local Area
- Familiarization to Dept./Branch & Innovative practices

### **11. Electives**

The elective courses fall under two basic categories:

- Professional Electives
- Open Electives

#### **11.1 Professional Elective Courses**

The Professional Elective courses are offered in the concerned branch of specialization and a student can choose the Professional Elective courses with the approval of the Head of the Department concerned.

## **11.2 Open Elective Courses**

Apart from the various Professional elective courses, a student must study **five** open elective courses of which the student may opt to study either that offered by the Department concerned or from the open elective courses offered by any other Department in the Faculty of Engineering & Technology, with the approval of the Head of the concerned Department and the Head of the Department offering the course. In case the student opts to study an open elective offered by a neighbouring Department in the Faculty, it shall be handled by the faculty of that Department offering the chosen open elective.

A student may be required to choose Intellectual Property Rights (IPR) and Cyber Security as open electives anywhere between fifth and eighth semesters as part of the requirements of the study.

## **11.3 MOOC (SWAYAM) Courses**

The student can be permitted to earn not more than 40% of his/her total credits (that is 69 credits) by studying Massive Open Online Courses (MOOCs) offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned and the Dean of the Faculty. The courses will be considered as equivalent to elective courses from the fifth to the eighth semesters and the credits earned through MOOC courses may be transferred and considered for awarding Degree to the student concerned.

A student who earns 3 or more credits from a 12 week MOOC course through SWAYAM portal (Syndicate Resolution No.:14 dated 10.05.2019) shall be exempted from studying the elective course and permitted to transfer the credits. Besides the student may be permitted to claim for the conversion to the next higher grade in accordance with the Syndicate Resolution No.: 31 dated 09.09.2020

## **11.4 Value Added Courses**

A student can study one or more value added courses being offered by the other Departments of Study either within the Faculty or any other Faculty in the University in any semester of the B.E degree programme except First Year, with the restriction that only one Value added Course can be registered at a time.

## **11.5 Extra One Credit Courses**

One credit courses shall be offered by a Department with the prior approval from the Dean of the Faculty.

For one credit courses, a relevant potential topic may be selected by a committee consisting of the Head of the Department concerned and the Board of Studies member from the Department and a senior faculty member from the Department concerned. An expert from industry familiar with the topic chosen may be accordingly invited to handle classes for the students. The details of the syllabus, time table and the name of the industrial expert may be sent by the above committee to the Dean for approval. The credits earned through the extra one credit courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. Students can take a maximum of two extra one credit courses (one each in VI and VII semesters). They shall be allowed to take extra one credit courses offered in other Departments with the permission of Head of the Department offering the courses. A separate mark sheet shall be issued for extra one credit courses.

## **11.6 Skill Related /NaanMudhalvan**

A student is required to study **Three** open elective courses One each in the fifth, sixth and seventh semester of study as part of acquiring skills in the specified field. The student shall pursue the open electives listed in the NaanMudhalvan portal against the respective semesters. However alternatively the student shall choose the open electives from the list tabled relating to the respective programmes with the approval of the Head of the Department concerned and Dean of the Faculty.

## **12. Assessment**

### **12.1. Theory Courses**

The break-up of Continuous Assessment for the theory courses relates to evaluating the performance under the five Course Outcomes uniformly with 5 Marks for each outcome spread over Two Mid-Semester tests and One Assignment, totalling to 25 Marks. Similarly the break-up mark for University End Semester exams involves evaluating the performance under the five Course Outcomes with 15 Marks for each Outcome, totalling to 75 Marks.

The break-up of continuous assessment and examination marks for theory courses is as follows:

First assessment (Mid-Semester Test-I Covering Units I & II)	: 8 marks
Second assessment (Mid-Semester Test-II Covering Units III, IV & V)	: 12 marks
Third Assessment (Assignment Covering Units I, II, III, IV & V)	: 5 marks
End Semester Examination	: 75 marks

The break-up of Continuous Assessment for the theory course titled Basic Engineering in the II semester that involves two disciplines requires evaluating the performance under the five Course Outcomes, with 3 for one discipline and two for the other, uniformly with 5 Marks for each outcome spread over Two Mid-Semester tests and One Assignment, totalling to 25 Marks. Similarly the break-up mark for University End Semester exams involves evaluating the performance under the five Course Outcomes with 15 Marks for each Outcome, totalling to 75 Marks.

## **12.2 Practical Courses**

The break-up of Continuous Assessment for the practical courses involves evaluating the performance under the five Course Outcomes uniformly with 8 Marks for each outcome spread over Two tests and Record work, totalling to 40 Marks. Similarly the break-up mark for University End Semester exams relates to evaluating the performance under the five Course Outcomes with 12 Marks for each Outcome, totalling to 60 Marks

The break-up of continuous assessment and examination marks for Practical courses is as follows:

First Assessment (Test-I Relating to Cycle I)	: 15 marks
Second Assessment (Test-II Relating to Cycle II)	: 15 marks
Maintenance of Record book	: 10 marks
End Semester Examination	: 60 marks

## **12.3 Theory cum Practical Course**

The break-up of Continuous Assessment for the theory cum practical courses necessitates to evaluating the performance as being followed for the theory and practical courses individually and requires the students to clear each component separately. The average of the marks secured by the student in the theory and practical courses and the appropriate grade relating to the average shall be assigned to the student.

## **12.4 Project Work**

The continuous assessment marks for the project work will be 40 and to be assessed by a review committee consisting of the project guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the Chairman by the Head of the Department. The Head of the Department may be a member or the Chairman. At least two reviews should be conducted during the semester by the review committee. The student shall make presentation on the progress made before the committee. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

### **12.5 Industrial Internship**

After attending the internship during the semester vacation of II / III year for a period of 4 weeks duration in each year, the student has to submit a report and appear for the viva-voce exam along with the V/VII semester end semester examinations.

### **13. Substitute Assessment**

A student, who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the final examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Dean / Head of the Department within a week from the date of the missed assessment.

### **14. Student Counsellors (Mentors)**

To help the students in planning their course of study and for general advice on the academic programme, the Dean / Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counsellor for those students throughout their period of study. Such student counsellors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Dean / Head of the Department.

### **15. Class Committee**

For all the branches of study during the first two semesters, a common class committee will be constituted by the Dean of the faculty. From among the various teachers teaching the same common course to different classes during each semester of the first year, the Dean shall appoint one of them as course coordinator.

The composition of the class committee during first and second semesters will be as follows:

- Course coordinators of all courses.
- All the Heads of the Sections, among whom one may be nominated as Chairman by the Dean.
- The Dean may opt to be a member or the Chairman.

For each of the higher semesters, separate class committees will be constituted by the respective Head of the Departments.

The composition of the class committees from third to eighth semester will be as follows:

- Teachers of the individual courses.
- A seminar coordinator (for seventh semester only) shall be appointed by the Head of the Department
- A project coordinator (for eighth semester only) shall be appointed by the Head of the Department from among the project supervisors.
- One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory/40 marks for seminar/ industrial training, practical and project work will be finalized for every student and tabulated and submitted to the Head of the Department (to the Dean in the case of I & II Semester) for approval and transmission to the Controller of Examinations.

#### **16. Attendance Requirements**

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

#### **17. Temporary Break of Study**

A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

If a student wishes to apply for break of study, the student shall apply to the Dean in advance, in any case, not later than the last date of the first assessment period. The application duly filled by the student shall be submitted through the Head of the Department. In the case of short term employment/ training/ internship, the application for break of study shall be approved and forwarded by the Head of the Department concerned to the Dean.

However, the student must complete the entire programme within the maximum period of seven years.

#### **18. Procedure for Withdrawing from the Examinations**

A student can withdraw from all the examinations of the semester only once during the entire programme on valid grounds accepted by the University. Such withdrawal from the examinations of a semester will be permitted only if the candidate applies for withdrawal at least 24 hours before the commencement of the last examination. The letter grade 'W' will appear in the mark sheet for such candidates.

#### **19. Passing and Declaration of Examination Results**

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the Grade Point Average (GPA) and Cumulative Grade Point Average (CGPA), and prepare the mark sheets.

90 to 100 marks	:	Grade 'S'
80 to 89 marks	:	Grade 'A'
70 to 79 marks	:	Grade 'B'
60 to 69 marks	:	Grade 'C'
55 to 59 marks	:	Grade 'D'
50 to 54 marks	:	Grade 'E'
Less than 50 marks	:	Grade 'RA'
Withdrawn from the examination	:	Grade 'W'

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S, A, B, C, D or E for a course, is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who is detained for lack of attendance must re-register for and repeat the courses in the respective semester.



A student who obtains letter grade RA in the mark sheet must reappear for the examination of the courses except for Honours courses.

A student who obtains letter grade W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

**S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0**

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-evaluation of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

OGPA/CGPA is similarly calculated considering all the courses taken from the time of admission.

## **20. Awarding Degree**

After successful completion of the programme, the degree will be awarded based on OGPA/CGPA.

The conversion of OGPA/CGPA (from I semester to VIII Semester) to the corresponding Percentage of marks may be calculated as per the following formula:

$$\text{Percentage of marks} = (\text{OGPA/CGPA} - 0.25) \times 10$$

$$\text{Where } \text{OGPA/CGPA} = \frac{\sum C_i GP_i}{\sum C_i}$$

$C_i$  - Credit hours of a course

$GP_i$  - Grade Point of that course

### **20.1 Honours Degree**

The student requires to earn a minimum of 193 credits within four years (152 credits within three years for lateral entry students) from the time of admission, pass all the courses in the first attempt from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students) and obtain a OGPA/CGPA of 8.25 or above to obtain the Honours Degree.

The Student is required to complete 6 elective courses, 2 each in the V, VI and VII semesters with a stipulation that 2 of the 6 courses need to be of 4 credits each, while the remaining 4 has to be of 3 credits each, thus totalling to 20 credits, the choice being approved by the Head of the Department concerned and the Dean of the Faculty.

However, if the student either does not clear the extra course(s) relating to become eligible for the Honours Degree or discontinues it in any of the semesters, then the student may revert to the category of the First Class with Distinction or First class, provided the student is eligible for that respective category. The student may claim for revised mark sheet, paying the stipulated fee in order that the unsuccessful appearance or discontinuity of the course(s) is not reflected in the new mark sheet.

### **20.2 First Class with Distinction**

To obtain B.E Degree First Class with Distinction, a student must earn a minimum of 173 Credits within four years (132 credits within three years for lateral entry students) from the time of admission, by passing all the courses in the first attempt from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students) and obtain a CGPA of 8.25 or above.

### **20.3 First Class**

To obtain B.E Degree First Class, a student must earn a minimum of 173 credits within *five* years (132 credits within *four* years for lateral entry students) from the time of admission and obtain a OGPA/CGPA of 6.75 or above for all the courses from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

### **20.4 Second Class**

For Second Class, the student must earn a minimum of 173 credits within *seven* years (132 credits within *six* years for lateral entry students) from the time of admission.

### **20.5 B.E Degree with Minor Engineering**

The student shall be given an option to earn a Minor Engineering Degree in another discipline of Engineering not related to his/her branch of study at the end of the first year provided the student clears all the subjects in the first year in the first attempt and secures a OGPA/CGPA of not less than 7.5

The student is required to earn an additional 20 credits starting from the third semester in the sense he/she requires to complete 6 elective courses, 2 each in the V, VI and VII semesters with a stipulation that 2 of the 6 courses need to be of 4 credits each, while the remaining 4 has to be of 3 credits each, thus totalling to 20 credits, the choice being approved by the Head of the Department concerned and the Dean of the Faculty.

The rules for awarding the B.E degree in First Class with Distinction or in First Class or in Second Class apply in the same manner for B.E Degree with Minor Engineering.

However the student who opts for Honours Degree is not entitled to pursue B.E Degree with Minor Engineering and vice-versa

## **21. Ranking of Candidates**

The candidates who are eligible to get the B.E. degree with Honours will be ranked together on the basis of OGPA/CGPA for all the courses of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The candidates who are eligible to get the B.E. degree in First Class with Distinction will be ranked next after those with Honours on the basis of OGPA/CGPA for all the courses of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The candidates passing with First Class will be ranked next after those with distinction on the basis of OGPA/CGPA for all the courses of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The ranking of candidates will be done separately for each branch of study.

## **22. Transitory Regulations**

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

Wherever there had been change of syllabi, examinations based on the existing syllabi will be conducted for three consecutive times after implementation of the new syllabi in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent courses, as per the new syllabi, on the recommendations of the Head of the Department concerned.

**ANNEXURE**

<b>S.No .</b>	<b>Branch of Study in B.E</b>	<b>Honours Elective Courses from Same and Allied Departments of</b>	<b>Minor Engineering Courses from Other Departments of</b>
1.	Chemical Engineering	<ol style="list-style-type: none"> <li>1. Chemical Engineering</li> <li>2. Pharmacy</li> <li>3. Electronics and Instrumentation Engineering</li> </ol>	<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Mechanical Engineering</li> <li>3. Electronics and Instrumentation Engg.</li> <li>4. Information Technology</li> <li>5. Civil and Structural Engg.</li> <li>6. Electrical Engineering</li> <li>7. Electronics and Communication Engg.</li> <li>8. Mechanical (Manufacturing) Engg.</li> <li>9. Computer Science and Engineering</li> <li>10. Computer Science and Engineering (Artificial Intelligence and Machine Learning)</li> <li>11. Computer Science and Engineering(Data Science)</li> </ol>
2.	Civil Engineering		<ol style="list-style-type: none"> <li>1. Mechanical Engineering</li> <li>2. Electrical Engineering</li> <li>3. Chemical Engineering</li> <li>4. Computer Science and Engineering</li> </ol>
3.	Civil and Structural Engineering	<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Civil and Structural Engg.</li> </ol>	<ol style="list-style-type: none"> <li>5. Computer Science and Engineering (Artificial Intelligence and Machine Learning)</li> <li>6. Computer Science and Engineering(Data Science)</li> <li>7. Mechanical (Manufacturing) Engg</li> <li>8. Electronics and Instrumentation Engg</li> <li>9. Information Technology</li> <li>10. Electronics and Communication Engg.</li> </ol>

4.	Computer Science and Engineering	<ol style="list-style-type: none"> <li>1. Computer Science and Engg.</li> <li>2. Information Technology</li> <li>3. Electronics and Communication Engineering</li> <li>4. Computer Science and Engineering(Artificial Intelligence and Machine Learning)</li> <li>5. Computer Science and Engineering(Data Science)</li> </ol>	<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Mechanical Engineering</li> <li>3. Mechanical (Manufacturing) Engg.</li> <li>4. Civil and Structural Engg.</li> <li>5. Chemical Engineering</li> </ol>
5.	Computer Science and Engineering (Artificial Intelligence and Machine Learning)		
6.	Computer Science and Engineering (Data Science)		
7.	Electrical and Electronics Engineering	<ol style="list-style-type: none"> <li>1. Electrical Engineering</li> <li>2. Electronics and Instrumentation Engineering</li> <li>3. Electronics and Communication Engineering</li> </ol>	<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Civil and Structural Engg.</li> <li>3. Mechanical Engineering</li> <li>4. Chemical Engineering</li> <li>5. Mechanical (Manufacturing) Engg.</li> </ol>
8.	Electronics and Communication Engg.		
9.	Electronics and Instrumentation Engg.		
10.	Information Technology	<ol style="list-style-type: none"> <li>1. Computer Science and Engg.</li> <li>2. InformationTechnology</li> <li>3. Electronics and Communication Engineering</li> <li>4. Computer Science and Engineering (Artificial Intelligence and Machine Learning)</li> <li>5. Computer Science and Engineering (Data Science)</li> </ol>	<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Mechanical Engineering</li> <li>3. Mechanical (Manufacturing) Engg.</li> <li>4. Civil and Structural Engg.</li> <li>5. Chemical Engineering</li> </ol>

11.	Mechanical Engineering		<ol style="list-style-type: none"> <li>1. Civil Engineering</li> <li>2. Civil and Structural Engg.</li> <li>3. Electrical Engineering</li> <li>4. Chemical Engineering</li> <li>5. Computer Science and Engineering</li> <li>6. Computer Science and Engineering (Artificial Intelligence and Machine Learning)</li> <li>7. Computer Science and Engineering (Data Science)</li> <li>8. Electronics and Instrumentation Engg.</li> <li>9. Information Technology</li> <li>10. Electronics and Communication Engg.</li> </ol>
12.	Mechanical (Manufacturing) Engg.	<ol style="list-style-type: none"> <li>1. Mechanical Engineering</li> <li>2. Mechanical (Manufacturing) Engg.</li> </ol>	



# ANNAMALAI UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY  
B.E./B.Tech. (Four Year) Degree Program (FULL-TIME)

Choice Based Credit System (CBCS)

Curriculum for First Year B.E. (2022-23 onwards)

COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATIONS 2022)

SEMESTER - I									
Course Code	Category	Course	L	T	P/D	CA	FE	Total	Credits
22ETBS101	BS-I	Mathematics-I	3	1	-	25	75	100	4
22ETBS102	BS-II	Physics	3	1	-	25	75	100	4
22ETBS103	BS-III	Chemistry	3	1	-	25	75	100	4
22ETES104	ES-I	Programming for Problem Solving	2	1	-	25	75	100	3
22ETHS105	HS-I	Heritage of Tamils தமிழர் மரபு	1	-	-	25	75	100	1
22ETHP106	HSP-I	Communication Skills and Language Laboratory	-	-	3	40	60	100	1.5
22ETSP107	ESP-I	Engineering Workshop Practice	-	-	3	40	60	100	1.5
22ETSP108	ESP-II	Electrical Wiring and Earthing Practice Laboratory	-	-	3	40	60	100	1.5
<b>Total Credits</b>									<b>20.5</b>

SEMESTER - II									
Course Code	Category	Course	L	T	P/D	CA	FE	Total	Credits
22ETHS201	HS-II	English	3	1	-	25	75	100	4
22ETBS202	BS-IV	Mathematics-II	3	1	-	25	75	100	4
22ETES203	ES-II	Basic Engineering*	4	-	-	25	75	100	4
22ETHS204	HS-III	Tamils And Technology தமிழரும் தொழில்நுட்பமும்	1	-	-	25	75	100	1
22ETBP205	BSP-I	Physics Laboratory	-	-	3	40	60	100	1.5
22ETBP206	BSP-II	Chemistry Laboratory	-	-	3	40	60	100	1.5
22ETSP207	ESP-III	Computer Programming Laboratory	-	-	3	40	60	100	1.5
22ETSP208	ESP-IV	Engineering Graphics	2	-	3	40	60	100	3
<b>Total Credits</b>									<b>20.5</b>

\* Civil (3 Units) & Mechanical (2 Units) for Circuit Branches

\* Mechanical (2 Units) & Electrical and Electronics (3 Units) for Civil, C&S and Chemical Engineering Branches

\* Civil (2 Units) & Electrical and Electronics (3 Units) for Mechanical & Mechanical (Manufacturing) Engineering Branches

**ANNAMALAI UNIVERSITY**

**FACULTY OF ENGINEERING AND TECHNOLOGY**

**B.E.(FourYear)DegreeProgramme (FULL-TIME)**

**ChoiceBasedCreditSystem(CBCS)**

**BRANCH : INFORMATION TECHNOLOGY**

**COURSES OF STUDY AND SCHEME OF EXAMINATIONS (REGULATION 2022)**

<b>SEMESTER – III</b>									
<b>Course Code</b>	<b>Category</b>	<b>Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CA</b>	<b>FE</b>	<b>Total</b>	<b>Credits</b>
22ETBS301	BS-V	Engineering Mathematics - III	3	1	-	25	75	100	4
22ETES302	ES-III	Environmental Studies	3	-	-	25	75	100	3
22ITES303	ES-IV	Digital Logic and Microprocessors	3	-	-	25	75	100	3
22ITPC304	PC-I	Data Structures and Algorithms	3	-	-	25	75	100	3
22ITPC305	PC-II	Database Management System	3	-	-	25	75	100	3
22ITPC306	PC-III	Object Oriented Programming using JAVA	3	1	-	25	75	100	3
22ITSP307	ESP-IV	Digital Logic and Microprocessors Lab	-	-	3	40	60	100	1.5
22ITCP308	PCP-I	OOPs & Data Structures and Algorithms Lab	-	-	3	40	60	100	2
22ITCP309	PCP-II	Database Management System Lab	-	-	3	40	60	100	1.5
								<b>Total Credits</b>	<b>24</b>

<b>SEMESTER– IV</b>									
<b>Course Code</b>	<b>Category</b>	<b>Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>CA</b>	<b>FE</b>	<b>Total</b>	<b>Credits</b>
22ITBS401	BS-VI	Discrete Mathematics	3	-	-	25	75	100	3
22ITPC402	PC-IV	Computer Architecture and Organization	2	-	-	25	75	100	3
22ITPC403	PC-V	Operating System	3	-	-	25	75	100	3
22ITPC404	PC-VI	Computer Graphics and Multimedia	3	-	-	25	75	100	3
22ITPC405	PC-VII	Computer Networks	3	-	-	25	75	100	3
22ITPC406	PC-VIII	Python Programming	3	-	-	25	75	100	3
22ETHS407	HS-II	Universal Human Values	2	1	-	25	75	100	3
22ITCP408	PCP-III	Operating System Lab	-	-	3	40	60	100	1.5
22ITCP409	PCP-IV	Computer Graphics and Multimedia Lab	-	-	3	40	60	100	2
22ITCP410	PCP-V	Computer Networks Lab	-	-	3	40	60	100	1.5
								<b>Total Credits</b>	<b>26</b>
<p><b>Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming V Semester.</b></p>									

SEMESTER- V									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
22ITPC501	PC-VIII	Theory of Computation	3	-	-	25	75	100	3
22ITPC502	PC-IX	System Software and Compiler Design	3	-	-	25	75	100	3
22ITPC503	PC-X	Web Essentials	3	-	-	25	75	100	3
22ITPC504	PC-XI	Software Engineering	3	-	-	25	75	100	3
22ITPE505	PE-I	Professional Elective-I	3	-	-	25	75	100	3
22ITPE506	PE-II	Professional Elective-II	3	-	-	25	75	100	3
22ITOE507	OE-I	<b>Open Elective-I (Naan Mudhalvan)</b>	3	-	-	25	75	100	3
22ITCP508	PCP-VI	System Software and Compiler Design Lab	-	-	3	40	60	100	1.5
22ITCP509	PCP-VII	Web Essentials Lab	-	-	3	40	60	100	1.5
22ITEP510	PEP-I	Professional Elective Practical - I	-	-	3	40	60	100	1.5
22ETIT511	IT-I	Industrial Training / Rural Internship/Innovation / Entrepreneurship	<i>Four weeks during the summer vacation at the end of IV Semester</i>				100	100	<b>4.0</b>
								<b>Total Credits</b>	<b>29.5</b>

SEMESTER- VI									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
22ITPC601	PC-XII	Data Warehousing and Data Mining	3	-	-	25	75	100	3
22ITPC602	PC-XIII	Mobile Computing	3	-	-	25	75	100	3
22ITPE603	PE-III	Professional Elective-III	3	-	-	25	75	100	3
22ITPE604	PE-IV	Professional Elective-IV	3	-	-	25	75	100	3
22ITPE605	PE-V	Professional Elective-V	3	-	-	25	75	100	3
22ITOE606	OE-II	<b>Open Elective-II (Naan Mudhalvan)</b>	3	-	-	25	75	100	3
22ITCP607	PCP-VIII	Data Mining Lab	-	-	3	40	60	100	1.5
22ITCP608	PCP-IX	Network Security Lab	-	-	3	40	60	100	1.5
								<b>Total Credits</b>	<b>21.0</b>
<b>Students must undergo Internship for 4 weeks during summer vacation which will be assessed in the forthcoming VII Semester.</b>									



SEMESTER– VII										
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits	
22ETHS701	HS-III	Engineering Ethics	2	-	-	25	75	100	2	
22ITPC702	PC-XIV	Software Project Management	3	-	-	25	75	100	3	
22ITPE703	PE-VI	Professional Elective-VI	3	-	-	25	75	100	3	
22ITPE704	PE-VII	Professional Elective-VII	3	-	-	25	75	100	3	
22ITOE705	OE-III	Open Elective-III (Naan Mudhalvan)	3	-	-	25	75	100	3	
22ITEP706	PEP-II	Professional Elective Practical - II	-		3	40	60	100	1.5	
22ETIT707	IT-II	Industrial Training / Rural Internship/Innovation / Entrepreneurship	<i>Four weeks during the summer vacation at the end of VI Semester</i>					100	100	4.0
<b>Total Credits</b>									<b>19.5</b>	

SEMESTER– VIII									
Course Code	Category	Course	L	T	P	CA	FE	Total	Credits
22ITOE801	OE-IV	Open Elective-IV (from the same dept)	3	-	-	25	75	100	3
22ITOE802	OE-V	Open Elective-V (from the same dept)	3	-	-	25	75	100	3
22ITPV803	PV-I	Project Work and Viva-voce	-	PR 10	S 2	40	60	100	6
<b>Total Credits</b>									<b>12</b>

<b>L</b>	No. of Lecture Hours	<b>TR</b>	No. of Hours for Discussion on Industrial Training
<b>T</b>	No. of Tutorial Hours	<b>S</b>	No. of Seminar Hours on Industrial Training / Project
<b>P</b>	No. of Practical Hours	<b>PR</b>	No. of Hours for Discussion on Project work
<b>CA</b>	Continuous Assessment Marks	<b>FE</b>	Final Examination Marks
<b>Credits</b>	Credit points allotted to that course	<b>Total</b>	Total Marks

<b>HS</b>	Humanities and Social Sciences including Management courses
<b>BS</b>	Basic Science courses
<b>ES</b>	Engineering Science Courses
<b>CA</b>	Continuous Assessment Marks
<b>FE</b>	Final Exam Marks

**PROFESSIONAL ELECTIVE COURSES: VERTICALS**

<b>Vertical-I</b>	<b>Vertical-II</b>	<b>Vertical-III</b>	<b>Vertical-IV</b>	<b>Vertical-V</b>	<b>Vertical-VI</b>	<b>Vertical-VII</b>
<b>Data Science</b>	<b>Wireless Networking</b>	<b>Computing Technologies</b>	<b>Artificial Intelligence</b>	<b>Cyber Security and Data Privacy</b>	<b>Emerging Technologies</b>	<b>General Electives</b>
Artificial Intelligence	Principles and Practices of Communication System	Virtualization	Principles and Practices of Communication System	Ethical Hacking	Fundamentals of VR / AR / MR	E - Business
Big Data Analytics	Wireless communication	Parallel and distributed computing	Signals and Systems	Digital and Mobile Forensics	Robotic Process Automation	Information Retrieval
Business Analytics	Mobile Adhoc and Wireless Sensor Networks	Analysis and Design of Service Oriented Architecture	Digital signal processing	Social Network Security	IoT and its Applications	Free and Open Source Software
Social Network Information Analysis	Cyber Physical Systems	Cloud Services Management	Digital Image Processing	Modern Cryptography	Cyber Forensics and Information Security	Software Testing and Quality Assurance
Exploratory Data Analysis	Optical Communication	Security and Privacy in Cloud	Information Coding Theory	Engineering Secure software systems	Fundamentals of Reversible and Quantum computing	Object Oriented Analysis and Design
Neural Networks and Deep Learning	Satellite Communication	Storage Technologies	Pattern Recognition & Visual Recognition	Cryptocurrency and Blockchain Technologies	Cryptocurrency and Blockchain Technologies	Bio Informatics
Text and Speech Analysis	5G Wireless Networks	UI and UX Design	Artificial Intelligence	Cyber Law and Ethics	Game Development	Human Computer Interaction
Recommender Systems	Next Generation Networks	Quantum Computing	Text and Speech Analysis	Security and Privacy in Cloud	3D Printing and Design	Game Theory
Computer Vision	Software Defined Networks	Cryptocurrency and Blockchain Technologies	Image and video analytics	Penetration Testing Methodologies	Drone Technology	E-Learning Techniques
Cognitive Science	Network Management Systems	Dev-Ops	Soft Computing	Edge And Mobility Network Security Solutions	GIS and Remote Sensing	Software Metrics

## LIST OF PROFESSIONAL ELECTIVES

### PROFESSIONAL ELECTIVES – I

S. No	CODE	COURSE
1.	22ITPE505	Artificial Intelligence
2.	22ITPE505	Cognitive Science
3.	22ITPE505	Wireless Communication
4.	22ITPE505	Principles and Practices of Communication System
5.	22ITPE505	Virtualization
6.	22ITPE505	Signals and Systems
7.	22ITPE505	Ethical Hacking
8.	22ITPE505	Robotic Process Automation
9.	22ITPE505	Free and Open Source Software

### PROFESSIONAL ELECTIVES – II

S. No	CODE	COURSE
10.	22ITPE506	Cyber Physical Systems
11.	22ITPE506	UI and UX Design
12.	22ITPE506	Digital Signal Processing
13.	22ITPE506	Digital Image Processing
14.	22ITPE506	3D Printing and Design
15.	22ITPE506	Information Retrieval
16.	22ITPE506	Soft Computing

### PROFESSIONAL ELECTIVE PRACTICAL – I

S. No	CODE	COURSE
I.	22ITEP510	Artificial Intelligence Lab
II.	22ITEP510	Virtualization Lab
III.	22ITEP510	UI and UX Design Lab
IV.	22ITEP510	Signals and Systems Lab
V.	22ITEP510	Digital Signal Processing Lab
VI.	22ITEP510	Digital Image Processing Lab
VII.	22ITEP510	Ethical Hacking Lab
VIII.	22ITEP510	Robotic Process Automation Lab
IX.	22ITEP510	3D Printing and Design Lab
X.	22ITEP510	Soft Computing Lab

### PROFESSIONAL ELECTIVES – III

S. No	CODE	COURSE
17.	22ITPE603	Social Network Information Analysis
18.	22ITPE603	Mobile Adhoc and Wireless Sensor Networks
19.	22ITPE603	Software Defined Networks
20.	22ITPE603	Parallel and distributed computing
21.	22ITPE603	Information Coding Theory
22.	22ITPE603	Cyber Law and Ethics
23.	22ITPE603	GIS and Remote Sensing
24.	22ITPE603	Software Testing and Quality Assurance
25.	22ITPE603	Object Oriented Analysis and Design

### PROFESSIONAL ELECTIVES – IV

S. No	CODE	COURSE
26.	22ITPE604	Computer Vision
27.	22ITPE604	Network Management Systems
28.	22ITPE604	Analysis and Design of Service Oriented Architecture
29.	22ITPE604	Quantum Computing
30.	22ITPE604	Cyber Physical Systems
31.	22ITPE604	Text and Speech Analysis
32.	22ITPE604	Modern Cryptography
33.	22ITPE604	Cryptocurrency and Blockchain Technologies
34.	22ITPE604	Bio Informatics

### PROFESSIONAL ELECTIVES – V

S. No	CODE	COURSE
35.	22ITPE605	Business Analytics
36.	22ITPE605	Digital and Mobile Forensics
37.	22ITPE605	Social Network Security
38.	22ITPE605	Human Computer Interaction
39.	22ITPE605	5G Wireless Networks
40.	22ITPE605	Drone Technology
41.	22ITPE605	Image and video analytics
42.	22ITPE605	Software Metrics
43.	22ITPE605	Game Theory
44.	22ITPE605	Engineering Secure software systems

**PROFESSIONAL ELECTIVES – VI**

<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
45.	22ITPE703	IoT and its Applications
46.	22ITPE703	Exploratory Data Analysis
47.	22ITPE703	Neural Networks and Deep Learning
48.	22ITPE703	Next Generation Networks
49.	22ITPE703	Game Development
50.	22ITPE703	Security and Privacy in Cloud
51.	22ITPE703	E-Learning Techniques
52.	22ITPE703	Optical Communication
53.	22ITPE703	Edge And Mobility Network Security Solutions

**PROFESSIONAL ELECTIVES – VII**

<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
54.	22ITPE704	e - Business
55.	22ITPE704	Fundamentals of VR/AR/MR
56.	22ITPE704	Cloud Services Management
57.	22ITPE704	Cyber Forensics and Information Security
58.	22ITPE704	Satellite Communication
59.	22ITPE704	Fundamentals of Reversible and Quantum computing
60.	22ITPE704	Storage Technologies
61.	22ITPE704	Pattern Recognition & Visual Recognition
62.	22ITPE704	Recommender Systems
63.	22ITPE704	Penetration Testing Methodologies

**PROFESSIONAL ELECTIVE PRACTICAL – II**

<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
XI.	22ITEP706	IoT and its Applications Lab
XII.	22ITEP706	Augmented Reality / Virtual Reality Lab
XIII.	22ITEP706	Dev-Ops Lab
XIV.	22ITEP706	5G Wireless Networks Lab
XV.	22ITEP706	Game Development Lab
XVI.	22ITEP706	Pattern Recognition & Visual Recognition Lab
XVII.	22ITEP706	Penetration Testing Methodologies Lab
XVIII.	22ITEP706	Exploratory Data Analysis Lab
XIX.	22ITEP706	Deep Learning Lab
XX.	22ITEP706	Storage Technologies Lab

## LIST OF OPEN ELECTIVES

<b>OPEN ELECTIVES – I</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOESCN	Machine Learning
2.	22ITOESCN	Big Data
3.	22ITOESCN	Big Data Analytics
4.	22ITOESCN	Data Science for Engineers
5.	22ITOESCN	Data Engineering

<b>OPEN ELECTIVES – II</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOESCN	Cyber Security
2.	22ITOESCN	Industry 4.0
3.	22ITOESCN	Robotics simulation for Manufacturing
4.	22ITOESCN	Smart Energy Grid
5.	22ITOESCN	Augmented & Virtual Reality Development

<b>OPEN ELECTIVES – III</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOESCN	Cloud Essentials
2.	22ITOESCN	Cloud Computing
3.	22ITOESCN	DevOps
4.	22ITOESCN	Full Stack
5.	22ITOESCN	Block Chain

Open Elective – I, Open Elective – II, Open Elective – III applies to Naan Mudalvan Scheme

<b>OPEN ELECTIVES – IV</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOESCN	Data Analytics
2.	22ITOESCN	Data Analytics in Bioinformatics
3.	22ITOESCN	System Modeling and Simulation
4.	22ITOESCN	Supply Chain Management
5.	22ITOESCN	Knowledge Management for E-Learning
6.	22ITOESCN	Project Management
7.	22ITOESCN	Product Design
8.	22ITOESCN	Organizational Behaviour and Management
9.	22ITOESCN	Mobile Application Development

<b>OPEN ELECTIVES – V</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOESCN	Enterprise Resource Planning
2.	22ITOESCN	E-Commerce
3.	22ITOESCN	Information Technology Essentials
4.	22ITOESCN	Unix Internals
5.	22ITOESCN	Computer Forensics
6.	22ITOESCN	User Interface Design
7.	22ITOESCN	Entrepreneurship and Startups
8.	22ITOESCN	AI for everyone
9.	22ITOESCN	ICT in Education
10.	22ITOESCN	Intellectual Property Rights

### **LIST OF HONOURS ELECTIVES**

<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>	<b>Credits</b>
1.	22ITHESCN	Information System Audit	<b>4</b>
2.	22ITHESCN	Design Thinking	<b>4</b>
3.	22ITHESCN	Predictive Analytics	<b>3</b>
4.	22ITHESCN	Heterogeneous Computing	<b>3</b>
5.	22ITHESCN	Agile Software Development	<b>3</b>
6.	22ITHESCN	IoT based Smart Systems	<b>3</b>

### **LIST OF MINOR ENGINEERING ELECTIVES**

<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>	<b>Credits</b>
1.	22ITMISCN	Introduction to Information Technology	<b>3</b>
2.	22ITMISCN	Fundamentals of Object Oriented Programming	<b>3</b>
3.	22ITMISCN	Data Communication and Computer Networks	<b>4</b>
4.	22ITMISCN	Basics of Computer Graphics and Multimedia	<b>3</b>
5.	22ITMISCN	Information Security	<b>3</b>
6.	22ITMISCN	Fundamentals of Data Mining	<b>4</b>

<b>ONE CREDIT COURSES</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22ITOCSCN	Office Automation Tools Lab
2.	22ITOCSCN	Socially Relevant Project Lab
3.	22ITOCSCN	Professional Communication
4.	22ITOCSCN	Web and Social Media Analytics Lab
5.	22ITOCSCN	Hardware and Trouble Shooting Lab
6.	22ITOCSCN	Adobe Experience Manager Lab
7.	22ITOCSCN	Mobile Application Development Lab

<b>VALUE ADDED COURSES</b>		
<b>S. No</b>	<b>CODE</b>	<b>COURSE</b>
1.	22EINTVAC01	Web Development
2.	22EINTVAC02	Mobile Application Development
3.	22EINTVAC03	Big Data Technologies
4.	22EINTVAC04	Foundation of Data Science
5.	22EINTVAC05	Introduction to Cyber Security



## FIRST SEMESTER

22ETBS101	MATHEMATICS – I	L	T	P/D	C
		3	1	0	4

### Course Objectives:

- To familiarize definite integrals and its application in finding area and volume.
- To introduce the fundamentals of functions of several variables.
- To make the student to learn infinite series and its nature.
- To impart knowledge about Vector calculus.
- To provide the concept of eigen values and eigen vectors of a real matrix and its properties of great utility in many branches of engineering.

### Unit – I: Integral Calculus

Evaluation of definite integrals and their properties-Applications of definite integrals to evaluate surface areas and volumes of revolutions.Improper integral-Beta and Gamma functions and their properties.

### Unit – II: Functions of several Variables

Rolle's theorem-Mean value theorem. Indeterminate forms-L'Hospital's rule, Functions of two variables: Taylor's and Maclaurin's series expansions-Maxima and minima for functions of two variables.

### Unit – III: Sequences and Series

Convergence of sequence and series- tests for convergence: Comparison test(only for series with positive terms)-D'Alembert's ratio test-Cauchy's root test-Integral test-Leibnitz's test(Alternating series).

### Unit – IV: Vector Calculus (Differentiation)

Gradient, divergence and curl- Directional derivative-unit normal vector-Irrotational and solenoidal vectors- Expansion formulae for operators involving.

### Unit – V: Matrices

Rank of a matrix- Symmetric, skew- Symmetric and orthogonal matrices-Characteristic equation- Eigen values and Eigen vectors –Cayley-Hamilton Theorem-Diagonalization of symmetric matrices by Orthogonal transformation.

### Text Books:

1. Veerarajan T., "Engineering Mathematics for First Year", Tata McGraw-Hill, New Delhi, 2008.
2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 36<sup>th</sup> Edition, 2010

### Reference Books:

1. G.B. Thomas and R.L. Finney, "Calculus and Analytic geometry", 9<sup>th</sup> publishers, Reprint,2002.
2. Erwin kreyszig,"Advanced Engineering Mathematics", 9<sup>th</sup> Edition, John Wiley & Sons,2006.
3. Ramana B.V., "Higher Engineering Mathematics", Tata McGraw Hill New Delhi,11<sup>th</sup> Reprint, 2010.
4. N.P. Bali and Manish Goyal, "A text book of Engineering Mathematics", Laxmi Publications, Reprint,2008.

## Course Outcomes:

At the end of this course, students will be able to

1. Solve improper integrals using Beta and Gamma functions.
2. Evaluate the extreme values for functions of two variables.
3. Analyze the convergence of infinite series.
4. Understand vector differentiation and Recognize solenoidal and irrotational fields.
5. Solve eigen values and eigen vectors of a real matrix and Orthogonal transformation of a matrix.

Mapping of Course Outcomes with Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	-	-	-	-	-	-	-	-	-
CO2	3	3	2	2	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	2	-	-	-	-	-	-	-

<b>22ETBS102</b>	<b>PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

## Course Objectives:

- To understand the ray of light to undergo the phenomenon of interference diffraction and polarization.
- To understand the principle and various application of laser.
- To develop knowledge in crystal structure and its properties.
- To understand the energy quantization of subatomic particles like electron.
- Rationalize the law of conservation of energy in solar water heater and solar cells.

## Unit – I: Wave Optics

Huygens' Principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer and Mach-Zehnder interferometer. Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; diffraction gratings and their resolving power.

## Unit – II: Lasers

Introduction – Principles of Laser – Stimulated emission, Properties of laser beams: monochromaticity, coherence, directionality and brightness Einstein's theory of, stimulated emission A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO<sub>2</sub>), solid-State lasers (ruby, Neodymium), dye lasers, laser speckles, applications of lasers in science, engineering and medicine.

## Unit – III: Crystal Physics

Introduction to solid Materials – Crystal structure – Geometry of lattice unit cell – Bravais' lattice – crystal systems, Crystal structures of Materials –(Coordination number, Atomic radius, packing factor and packing density) – Types of crystal Lattice (Simple Cubic, Body Centered Cubic, Face Centered Cubic and Hexagonal Closed Packed) Miller Indices and their calculations - Finding Miller indices of crystal planes.

## Unit – IV: Quantum Mechanics

Heisenberg uncertainty Principle – Dual nature of Matter and radiation – De Broglie's Wave length – Wave Velocity and group velocity. The wave Equation, Schrödinger's time dependent and independent wave equations - The Wave function and its physical significance - The particle in a box Problem (one dimensional box) - Energy quantization – Eigen values and Eigen functions.

## Unit – V: Energy Physics

Introduction to energy sources - Energy sources and their availability (Conventional and Non- conventional energy sources) solar energy – Methods of Harvesting solar energy – Solar heat collector, solar water heater and solar cells. Wind energy – Basic principle and components of wind energy Conversion system (WECS) – Application of wind energy. Biomass - Biogas Generation - Classification of Biogas plants – Properties and application of Biogas.

### Text Books:

1. Arumugam.M. "Engineering Physics", Anuradha agencies, 2<sup>nd</sup> Edition, 1997.
2. John Twidell & Tony Weir, "Renewable Energy Resources", Taylor & Francis, 2005.
3. Avadhanulu. M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand & Company Ltd., 7<sup>th</sup> Enlarged Revised Ed., 2005
4. Gaur R.K. and Gupta S.L., "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2003.
5. Rai.G.D, "Solar Energy Utilization" Volume-1 & 2 by - Khanna Publishers, New Delhi
6. Pajput. R. K. Non – Conventional energy sources and Utilization - S. Chand Publication – 2013.

### Reference Books:

1. Rajendran.V , "Engineering Physics", Tata McGraw Hill publishers, 2009.
2. Rai G.D., "Non-conventional Energy sources", Khauna Publications, 1993.
3. Mani. P. "Engineering Physics", Dhanam Publication, Chennai, 2011.
4. Agarwal.M.P, "Solar Energy", S.Chand & Co., 1<sup>st</sup> Edn, New Delhi, 1983.

### Course Outcomes:

At the end of the course the student will be able to

1. Gain knowledge on the construction of different types of interferometer.
2. Description on different types of laser and its application.
3. Analyze the importance of packing factor in different crystal system.
4. Evaluate the quantum mechanical concept of wave velocity and group velocity.
5. Compared the different energy resource and their availability.

Mapping of Course Outcomes with Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	3	2	-	-	-	-	-	1
CO2	3	2	-	-	2	1	1	-	-	-	-	-
CO3	3	1	1	-	-	1	-	-	-	-	-	-
CO4	2	1	2	2	1	1	-	-	-	-	-	-
CO5	3	2	-	-	1	2	1	-	-	1	-	1

<b>22ETBS103</b>	<b>CHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **Course Objectives:**

1. To understand water treatment techniques and basic knowledge on surface chemistry.
2. To provide knowledge on electrochemical cells and chemistry involved in corrosion.
3. To learn various processes involved in fuel refining and mechanism involved in energy storage devices.
4. To develop knowledge about synthesis of various types of polymers and nano materials.
5. To get basic knowledge on refractories, lubricants and spectroscopical techniques.

### **Unit – I: Water Chemistry and Surface Chemistry**

Hardness of water – Softening of hard water by ion exchange method – Boiler feed water – boiler troubles – Internal treatment methods – Estimation of hardness by EDTA method – Desalination of brackish water – Reverse Osmosis. Disinfection of water – Break point chlorination – Adsorption – Types of Adsorption – Freundlich and Langmuir adsorption isotherms – Applications of adsorption.

### **Unit – II: Electrochemistry and Corrosion**

Electrode potential – Electrochemical cell – Measurement of EMF – Nernst equation for cell EMF – Concentration cells – Electrochemical series – Conductometry – Conductance, Cell constant – Types of conductometric titrations. Potentiometry – Principle of acid base titration. Corrosion – Dry and wet corrosion – Galvanic, concentration cell and pitting corrosion – Control of corrosion by Cathodic protection method.

### **Unit – III: Fuels and Storage Devices**

Fuels – Classification – Calorific values – HCV and LCV – Analysis of coal – Proximate and ultimate analysis – Refining of petroleum. Cracking – Fixed bed – Synthetic petrol – Fischer – Tropsch process – Flue gas analysis by Orsat apparatus. Batteries – Primary and secondary – Dry cell – Lead acid storage battery – Ni-Cd battery – Lithium battery – H<sub>2</sub>-O<sub>2</sub> fuel cell.

### **Unit – IV: Polymers and Nano Materials**

Polymers – Types of polymerization – Addition, condensation and copolymerisation – Mechanism of addition polymerization (Free radical).Plastics – Thermoplastics and thermosetting plastics – Preparation, properties and uses of polyethylene, polyvinyl chloride, polystyrene, Nylon and bakelite.Nanochemistry – Introduction to nano materials. Synthesis – Precipitation, sol- Gel process, electrodeposition and chemical vapour deposition methods. Carbon nano tubes, fullerenes, nano wires and nano rods.

### **Unit – V: Engineering Materials and Spectroscopic Techniques**

Refractories – Classification, characteristics (Refractoriness, RUL, Thermal spalling, porosity) and uses, Lubricants – Classification, properties (cloud and pour point, flash and fire point, viscosity index) and applications. Principles of spectroscopy – Beer – Lambert’s Law – UV – Visible and IR spectroscopy – Basic principles and instrumentation (block diagram) – Fluorescence and its applications in medicine.

### **Text Books:**

1. Jain, P.C. and Monica Jain (2010) “Engineering Chemistry” DhanpatRai& Sons, New Delhi.

- Dara, S.S. and Umare, S.S. (2014) "Text Book of Engineering Chemistry" S. Chand & Co. Ltd., New Delhi.
- Gopalan, R., Venkappaya, D. and Nagarajan, S. (2008) "Engineering Chemistry" Tata McGraw Publications Ltd., New Delhi.
- Puri, B.R., Sharma, L.R. and Pathania, M.S. (2013) "Principles of Physical Chemistry" Vishal Publication Company, New Delhi.
- Sharma, Y.R. (2010) "Elementary Organic Spectroscopy, Principle and Chemical Applications", S. Chand Publishers, New Delhi.
- Asim K Das and Mahua Das (2017) "An Introduction to Nanomaterials and Nanoscience" CBS Publishers & Distributors Pvt. Ltd., New Delhi.

### Course Outcomes:

At the end of the course the student will be able to

- Develop innovative methods in soft water production for industrial uses and about adsorption analysis.
- Describe the concept of electrochemistry and its applications; corrosion and its controlling methods.
- Understand the properties of fuels and applications of energy storage devices.
- Synthesis various polymers and understand about nanomaterials.
- Gain knowledge on refractories, lubricants and understand the concepts of certain spectroscopical techniques

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	2	-	-	-
CO2	-	-	-	2	1	-	-	-	-	-	-	-
CO3	3	-	3	-	-	-	-	-	-	-	-	-
CO4	3	-	-	-	1	-	-	-	-	-	-	-
CO5	-	2	3	2	-	-	-	-	2	-	-	-

22ETES104	PROGRAMMING FOR PROBLEM SOLVING	L	T	P/D	C
		2	1	0	3

### Course Objectives:

- To understand the fundamentals of C programming
- To provide students with understanding of code organization and functional hierarchical decomposition using complex data types.
- To understand how to break a large problem into smaller parts, writing each part as a module or function
- To effectively utilize structures and pointers in problem solving
- To enable students to take up Systems programming or Advanced C programming course.

### Unit – I: Fundamentals of Programming

Introduction to Programming, Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.), Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudocode with examples. From algorithms to programs; source



22ETHS105	HERITAGE OF TAMILS தமிழர் மரபு	L	T	P/D	C
		1	0	0	1

**அலகு I: மொழி மற்றும் இலக்கியம்: 3**  
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமணப் பெளத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.

**அலகு II: மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை: 3**  
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.

**அலகு III: நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்: 3**  
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.

**அலகு IV: தமிழர்களின் திணைக் கோட்பாடுகள்: 3**  
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.

**அலகு V: இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு: 3**  
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப்படிக்கள் - தமிழ்ப் புத்தகங்களின் அச்ச வரலாறு.

1. Language and Literature: Language Families in India - Dravidian Languages - Tamil as a Classical Language - Classical Literature in Tamil - Secular Nature of Sangam Literature - Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars. - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.
2. Heritage - Rock art paintings to modern art - Sculpture: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple carmaking - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.
3. Folk and Martial arts - Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.
4. Thinaï concept of Tamils - Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.
5. Contribution of Tamils to Indian National Movement and Indian Culture: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India - Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine - Inscriptions & Manuscripts - Print History of Tamil Books.

## TEXT-CUM-REFERENCE BOOKS

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணினித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of TamilStudies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of TamilStudies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of TamilStudies.)
9. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, TamilNadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, TamilNadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

22ETHP106	COMMUNICATION SKILLS AND LANGUAGE LABORATORY	L	T	P/D	C
		0	0	3	1.5

### Course Objectives:

- To facilitate computer assisted multimedia instruction enabling individualized and independent language learning.
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in student pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency of students in spoken English
- To train students to use Language appropriately for public speaking, group discussion and interviews.

### List of Topics

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

Suggested Software Package: Globarena Package for communicative English The Globarena Package consists of the following exercises

1. Reading comprehension
2. Listening comprehension



3. Vocabulary exercises
4. Phonetics
5. Role Play in dialogues
6. Auto Speak

**Text Books:**

1. Daniel Jones Current, "English Pronouncing Dictionary", Edition with CD.
2. R. K. Bansal and J. B. Harrison, "Spoken English ",Orient Longman 2006 Edn.
3. J. Sethi, KamleshSadanand& D.V. Jindal, "A Practical course in English Pronunciation, (with two Audio cassettes)", Prentice-Hall of India Pvt. Ltd., New Delhi.
4. T.Balasubramanian," A text book of English Phonetics for Indian Students", (Macmillan).
5. "English Skills for Technical Students", WBSCTE with British Council, OL.

**Course Outcomes:**

At the end of the course, the students will be able to

1. Student will heighten their awareness of correct usage of English Grammar in writing and speaking.
2. Acquire speaking ability in English both in terms of fluency and comprehensibility.
3. Enhance competence in the four modes of literacy; Writing, Speaking, Reading and Listening.
4. Ensure student to improve their accuracy and fluency in producing and understanding spoken and written English
5. Exposure of the grammatical forms of English and the use of these forms in specific communicative contexts.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	-	-	-	-	-	-	3	-	3
CO2	-	3	-	-	-	-	-	-	-	3	-	3
CO3	-	-	2	-	-	-	-	-	-	3	-	3
CO4	-	2	-	-	-	-	-	-	-	3	-	3
CO5	-	-	3	-	-	-	-	-	-	3	-	3

<b>22ETSP107</b>	<b>ENGINEERING WORKSHOP PRACTICE</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

- To provide the students simple hands-on-experience in the basic aspects of production engineering in fitting, carpentry and sheet metal.
- To familiarize the students in the various hand forging operations

**Carpentry:** Use of hand tools - exercises in planning and making joints namely, Lap joint, Lenthhening joint, half lap joint, dovetail joint, mortising and tenoning etc.

**Fitting:** Use of bench tools, vice, hammers, chisels, files, hacksaw, centre punch, twist drill, taps and dies - Simple exercises in making T, V joint and dovetail joints.

**Sheet Metal Work:** Use of hand tools - Simple exercises in making objects like cone, funnel, tray, cylinder.

**Smithy:** Demonstration of hand forging and drop forging.

**Course Outcomes:**

Upon completion of this course, students will be able to

1. Use basic tools of fitting, carpentry and sheet metal fabrication.
2. Fabricate simple carpentry joints.
3. Develop skill to make simple fitting joints.
4. Create simple shapes of sheet material.
5. Distinguish hand forging and drop forging operation.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		2		2		3					3
CO2	3		2		2		3					3
CO3	3		2		2		3					3
CO4	3		2		2		3					3
CO5	3		2		2		3					3

<b>22ETSP108</b>	<b>ELECTRICAL WIRING AND EARTHING PRACTICE LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

**Course Objectives:**

- To create an awareness on the electrical safety in industrial and commercial environment.
- To enable the understanding on the principles of different types of electrical wiring.
- To offer exposure on the need for earthing and earthing practices.
- To provide practical knowledge on the various types of lighting circuits.
- To introduce methods for measuring the variables in electric circuits.

**List of experiments:**

1. Residential Wiring
2. Fluorescent lamp wiring
3. Stair case Wiring
4. Go down Wiring
5. Ceiling fan wiring
6. Industrial Wiring
7. Series and Parallel Lamp Circuits
8. Measurement of Earth Resistance
9. Measurement of Parameters in a Single-Phase AC Circuit
10. Measurement of Voltage, Current, Power and Power factor in a Resistive Circuit
11. Soldering Practice – Components devices and circuits – using general purpose PCB

12. Corridor Wiring
13. Test the operation and control circuit for LED Flourescent Lamp (18W)
14. Study of various categories of Fuses and Insulators
15. Study and test the operation of Automatic Iron Box
16. Testing the buck/boost functions of the domestic stabilizer

**Course Outcomes:**

At the end of the course, the students will be able to

1. Familiarize with the electrical safety measures.
2. Identify the different types of electrical wiring.
3. Know the necessity of Earthing.
4. Gain knowledge on the different types of lighting circuits.
5. Understand the methods for measuring electrical variables.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	2	-	-	2	-	-	-	-	3
CO2	3	-	-	2	-	-	2	-	2	-	-	3
CO3	3	-	-	2	-	-	2	-	2	-	-	3
CO4	3	-	-	2	-	-	2	-	2	-	-	3
CO5	3	-	-	2	-	-	2	-	2	-	-	3

## SECOND SEMESTER

22ETHS201	ENGLISH	L	T	P/D	C
		3	1	0	4

### Course Objectives:

- To ensure the students with good vocabulary
- To make the students participate actively in writing activities
- To practice the unique qualities of professional writing style
- To develop the students the proficiency in communicative skills
- To ensure the students to face the demand of their profession

### Unit- I: Vocabulary Building

The concept of Word Formation

Root words from foreign languages and their use in English

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, Count and uncount nouns.

Synonyms, antonyms, and standard abbreviations.

Language development - Wh questions asking and answering yes or no questions.

### Unit –II: Basic Writing Skills

Sentence Structures

Use of phrases and clauses in sentences

Importance of proper punctuation

Creating coherence and Techniques for writing precisely

Organizing principles of paragraphs in writing

### Unit – III: Nature and Style of sensible Writing

Describing and Defining

Classifying and Providing examples or evidence

Writing introduction and conclusion

Comprehension

Precis Writing

### Unit – IV: Writing Practices & Oral Communication

Listening to lectures and making notes

Mechanics of presentation, asking and giving instruction

Essay Writing – Writing analytical essays and issue based essays

Dialogue writing and conversation

Letter writing – Formal and informal

### Unit – V: Group Discussion and Job Application

Characteristics and practices of group discussion

Job application

Resume preparation

Writing reports – minutes of a meeting, accident, survey E-mail – etiquette

### Text /Reference Books:

1. Michael Swan, "Practical English Usage", OUP, 1995.
2. F.T. Wood, "Remedial English Grammar", Macmillan, 2007.
3. William Zinsser, "On Writing Well", Harper Resource Book, 2001,
4. Liz Hamp - Lyons and Ben Heasley, "Study Writing", Cambridge University Press, 2006.
5. Sanjay Kumar and PushpLata, "Communication Skills" Oxford University Press, 2011.
6. "Exercises in Spoken English. Parts. I-III", CIEFL, Hyderabad, Oxford University Press.
7. Raman, Meenakshi and Shama, Sangeetha, "Technical Communication Principles and Practice", Oxford University Press, New Delhi, 2014.

**Course Outcomes:**

At the end of this course, students will be able to

1. Comprehension, writing and speaking skills. Get an exposure of vocabulary and gain a good glossary.
2. Get knowledge regarding use of Grammar in speech and writing.
3. Acquire a knowledge of remembering, understanding, applying, analyzing, evaluating & creating.
4. Determine how to articulate their ideas effectively to a variety of listeners.
5. Acquire ability to speak and write effectively in English.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	-	2	-	-	-	-	-	3	-	3
CO2	-	2	-	2	-	-	-	-	-	3	-	3
CO3	-	-	3	-	-	-	-	-	-	3	-	3
CO4	-	-	2	3	-	-	-	-	-	3	-	3
CO5	-	-	3	2	-	-	-	-	-	3	-	3

22ETBS202	MATHEMATICS – II	L	T	P/D	C
		3	1	0	4

**Course Objectives:**

1. To familiarize multiple integrals and its application in finding area and volume.
2. To make the student to learn line, surface and volume integrals.
3. To solve Second order linear differential equations with constant coefficients.
4. To acquaint the student with the techniques in the theory of analytic functions.
5. To introduce the fundamentals of complex integrations.

**Unit – I: Multivariable Calculus (Integration)**

Double integrals (Cartesian) - change of order of integration in double integrals - Change of variables (Cartesian to polar) - Applications: Area as a double integral. Triple integrals (Cartesian) - Applications: Volume as a triple integral.

**Unit – II: Vector Calculus (Integration)**

Line, Surface and Volume integrals - Gauss divergence theorem (without proof) - Green's theorem in the plane (without proof) – Stokes theorem (without proof). Verification of the above theorems and evaluation of integrals using them.

**Unit – III: Ordinary differential equations**

First order ordinary differential equations (Linear and Bernoulli's differential equations, exact differential equations). Solution of Second order ordinary linear differential equations with constant co-efficient (method of variation of parameters only). Solution of Second order ordinary linear differential equations with variable co-efficient (Euler and Legendre's linear equations).

**Unit – IV: Complex Variable (Differentiation)**

Analytic functions and their properties-Cauchy-Riemann equations- Harmonic functions – harmonic conjugate of elementary analytic functions– Construction of an analytic function. Mobius transformations.

**Unit – V: Complex Variable (Integration)**

Cauchy theorem (without proof) –Cauchy Integral formula (without proof) – Cauchy Integral formula for higher derivatives (without proof) – zeros and poles of an analytic functions –

singularities. Residues - Cauchy Residue theorem (without proof) –Evaluation of definite integral using them. Taylor’s series and Laurent’s series.

**Text Books:**

1. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
2. Erwin kreyszig, “Advanced Engineering Mathematics”, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.

**Reference Books:**

1. G.B. Thomas and R.L. Finney, “Calculus and Analytic geometry”, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. W. E. Boyce and R. C. DiPrima, “Elementary Differential Equations and Boundary Value Problems”, 9<sup>th</sup> Edn., Wiley India, 2009.
3. S. L. Ross, “Differential Equations”, 3<sup>rd</sup> Ed., Wiley India, 1984.
4. J. W. Brown and R. V. Churchill, “Complex Variables and Applications”, 7<sup>th</sup> Ed., McGraw Hill, 2004.
5. N.P. Bali and Manish Goyal, “A text book of Engineering Mathematics”, Laxmi Publications, Reprint, 2008.

**Course Outcomes:**

At the end of this course, students will be able to

1. Solve double and triple integrals in finding area and volumes.
2. Apply line, surface and volume integrals in Gauss, Greens and Stoke’s theorems.
3. Solve Second order linear differential equations with constant coefficients.
4. Construct analytic function and analyze conformal mappings.
5. Evaluate the complex integrals and contour integration.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-

22ETES203	<b>BASIC ENGINEERING {Mechanical (2Units), Electrical and Electronics (3 Units), Civil (2 Units) and Civil (3 Units)}</b>	L	T	P/D	C
		4	0	0	4

**BASIC MECHANICAL ENGINEERING (2 Units)**

**COURSE OBJECTIVES:**

- To familiarize the students the functioning of boilers, turbines and internal combustion engines.
- To provide knowledge about the use of various machine tools and manufacturing processes

**UNIT I**

Energy Conversion Devices: Boilers - Classification – Description and working of Cochran boiler - Babcock and Wilcox boiler. Steam turbines: Principles and working of Impulse and Reaction turbines. Gas turbines: Principles and working of Open cycle and Closed cycle gas turbines. Internal Combustion Engines: Classification – principal parts –

two stroke and four stroke cycle engines – working principle of petrol and diesel engines – Concept of CRDI and MPFI fuel injection systems – Hybrid engines. Battery electric vehicles (BEV) – key components

## **UNIT II**

Formative Manufacturing Processes: Forging – Principle and operations; Rolling – Principle, rolling mill configurations; Extrusion – Direct versus indirect extrusion. Metal Casting: Principle – Green sand moulding – Injection moulding.

Subtractive Manufacturing: Description of parts and operations performed: Lathe, Shaper, Universal Drilling machine, Universal Milling Machine - CNC Machining Centers.

Additive Manufacturing Processes: 3 D Printing: Classification – Steps – Advantages – Disadvantages - Stereolithography process - Gas welding – principle, Oxy-acetylene welding – equipment, Arc welding – principle - equipment – Brazing: Types - Soldering – Comparison of brazing and soldering.

### **TEXT BOOKS:**

1. Prabhu T J, Jaiganesh V and Jebaraj S, Basic Mechanical Engineering, Scitech Publications Pvt. Ltd., Chennai, 2016.
2. Venugopal and Prabhuraj T J, Basic Mechanical Engineering, ARS publishers, Sirkali, 1996.

### **REFERENCE BOOKS:**

1. HajraChoudhury S. K., Nirjhar Roy, HajraChoudhury A. K., Elements of Workshop Technology,(Vol 1 and Vol II,) , Media Promoters, Pvt Ltd. (2008)
2. Rao P. N., Manufacturing Technology : Foundry, Forming and Welding - Vol 1,Mc Graw Hill Education, (2013)
3. Steven R. Schmid, SeropeKalpakjian, Manufacturing Processes for Engineering Materials (English) 5th Edition, Pearson India, (2009)

### **COURSE OUTCOMES**

Upon completion of this course, the students will be able to

1. Demonstrate the working of various energy conversion devices such as boilers, turbines and internal combustion engines
2. Appraise the fundamental concepts of manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

## **BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (3 UNITS)**

### **COURSE OBJECTIVES:**

- To understand the basics of Electrical circuit laws and fundamentals of AC circuits
- To understand the working of DC Machines, transformers and AC machines
- To learn the basics of electronic devices and Communication Systems

### **UNIT-I BASIC CIRCUITS**

Definition of current and voltage - Electrical circuit elements (R, L and C) - Ohm's Law- Kirchhoff's laws - solution for currents and voltages - AC circuits - RMS -Average values - Introduction to 3 phase systems - Advantages

### **UNIT-II ELECTRICAL MACHINES**

Laws of Electromagnetism - Construction of DC Machines - DC Generator - EMF Equation - DC Motor - Principle of operation - Types – Characteristics

Single-phase Transformer: Construction and Working principle - EMF equation - Three-phase transformer - Working principle.

Three-phase induction motor – Construction and working principle - Single-phase induction motor - Alternators - Working principle

### UNIT-III BASIC ELECTRONICS

P-N junction - VI Characteristics of PN junction diode, Zener diode - Rectifier circuits- Voltage Regulator using Zener diode - Elements of Communication Systems - Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

#### TEXTBOOKS:

1. Kothari DP and I.J Nagrath, “Basic Electrical and Electronics Engineering”, McGraw Hill Education, 2014.
2. A K Theraja&B L Theraja, A Textbook of Electrical Technology, Vol.2, S. Chand Publishing, 2014.

#### REFERENCE BOOKS:

1. Del Toro, “Electrical Engineering Fundamentals”, Second edition, Pearson Education, New Delhi, 1989.
2. V.K. Mehta, Rohit Mehta, “Basic Electrical Engineering”, S.Chand Publications, 2012.

#### COURSE OUTCOMES:

At the end of the course, the students will be able to

- Understand the concepts related with electrical circuits and AC fundamentals.
  - Acquire knowledge on the concepts of DC machines, Transformers and AC machines
  - Enhance the knowledge about the basic electronic devices and their applications.
- Gain insight on the various elements of Communication systems.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	2
CO2	3	2	1	-	-	-	-	-	-	-	-	2
CO3	3	2	1	-	-	-	-	-	-	-	-	2
CO4	3	-	1	-	-	-	-	-	-	-	-	2
CO5	3	-	1	-	-	-	-	-	-	-	-	2

### BASIC CIVIL ENGINEERING (2 Units)

#### COURSE OBJECTIVES:

- To inculcate a knowledge on essentials of Civil Engineering and to expose on the role of significance and contributions
- To satisfying societal needs and illustrate the concepts of various construction techniques



## UNIT I

Introduction to Civil Engineering - Various disciplines of Civil Engineering - Introduction to various building materials Stone, Bricks, Steel, Cement, Concrete – its characteristics, types and uses. Surveying - Principles and objectives of surveying; Types, Classifications of surveying, measurement of areas and distances – chain – compass: Introduction to Leveling, Total station, Remote sensing.

## UNIT II

Building construction – foundations; Bearing capacity of soil, functions of foundations, Types - Shallow and Deep. Brick masonry – Header, Stretcher, Flemish and English Bond. Columns, Lintels, Roofs – functions, types, roofing materials. Bridges – necessity - selection of site – components of a bridge: Dams – types – selection site - forces acting on a dam – Roads – uses - classification of roads – components of a road.

### TEXT BOOKS:

1. Ramesh babu. V, A text book of Basic Civil Engineering, Anuradha Agencies, Kumbakonam, 1995.
2. Palanichamy M.S., Basic Civil Engineering, Tata McGraw Hill Publishing Company Ltd, 2000.

### REFERENCE BOOKS:

1. Ramamrutham V, Basic Civil Engineering, DhanpatRai Publishing Co. (P) Ltd., 1999.
2. Natarajan K V, Basic Civil Engineering, Dhanalakshmi Publications, Chennai, 2005.
3. SatheeshGopi, Basic Civil Engineering, Pearson Publications, 2010.

### COURSE OUTCOMES:

1. Understand the basic knowledge on civil engineering materials
2. Develops the skill to satisfy the social needs and suitable method of construction technique

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	-	-	-	2
CO2	3	2	2	-	-	-	-	-	-	-	-	2
CO3	-	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-

## BASIC CIVIL ENGINEERING (3 Units)

### COURSE OBJECTIVES:

- To inculcate a knowledge on essentials of Civil Engineering
- To expose the students on the role, significance and contributions of Civil Engineering in satisfying societal needs
- To illustrate the concepts of various construction techniques

## UNIT I

Introduction to Civil Engineering - Relevance of Civil Engineering in the overall infrastructural development of the country. Introduction to various building materials – Stone,



22ETHS204	TAMILS AND TECHNOLOGY தமிழரும் தொழில்நுட்பமும்	L	T	P/D	C
		1	0	0	1

அலகு I: நெசவு மற்றும் பாணைத் தொழில்நுட்பம்: 3  
சங்க காலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு II: வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: 3  
சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோயில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ-சாரோசெனிக் கட்டிடக் கலை.

அலகு III: உற்பத்தித் தொழில் நுட்பம்: 3  
கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத்துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.

அலகு IV: வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்: 3  
அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குழுவித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.

அலகு V: அறிவியல் தமிழ் மற்றும் கணித்தமிழ்: 3  
அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.

TOTAL : 15 PERIODS

- Weaving and Ceramic Technology:**Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.
- Design and Construction Technology:**Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram- GreatTemplesofCholasandotherworshipplaces – TemplesofNayakaPeriod- Type study (Madurai Meenakshi Temple)-ThirumalaiNayakarMahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.
- ManufacturingTechnology:**ArtofShipBuilding –Metallurgicalstudies –Ironindustry- Iron smelting,steel-Copperand gold-Coinsassourceofhistory-Mintingof Coins– Beadsmaking-industriesStonebeads-Glassbeads-Terracottabeads- Shellbeads/bonebeats-Archeological evidences - Gem stone types described in Silappathikaram.
- AgricultureandIrrigationTechnology:**Dam,Tank,ponds,Sluice,SignificanceofKumi zhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and AgroProcessing-KnowledgeofSea-Fisheries–Pearl-Conchediving-

5. **Scientific Tamil& Tamil Computing**:DevelopmentofScientificTamil -Tamil computing –DigitalizationofTamilBooks–DevelopmentofTamilSoftware–TamilVirtualAcademy–Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

**TEXT-CUM-REFERENCEBOOKS:**

1. தமிழக வரலாறு – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2. கணிணித் தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3. கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4. பொருநை – ஆற்றங்கரை நாகரிகம். (தொல்லியல் துறை வெளியீடு)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB& ESC and RMRL – (in print)
6. SocialLifeoftheTamils- TheClassicalPeriod(Dr.S.Singaravelu)(Publishedby:InternationalInstitute of Tamil Studies).
7. HistoricalHeritageoftheTamils(Dr.S.V.Subatamanian,Dr.K.D. Thirunavukkarasu) (Publishedby: International Institute of Tamil Studies).
8. TheContributionsoftheTamilstoIndianCulture(Dr.M.Valarmathi)(Publishedby: International Institute of Tamil Studies.)
9. Keeladi - ‘SangamCityCivilizationonthebanksofriverVaigai’(JointlyPublishedby:DepartmentofArchaeology&TamilNaduTextBookandEducationalServiceCorporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) Publishedby: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)
12. Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) –Reference Book.

22ETBP205	PHYSICS LABORATORY	L	T	P/D	C
		0	0	3	1.5

**Course Objectives:**

- To access the Rigidity modulus of wire.
- To assess the various properties of light.
- To asses the characterization of Metals.
- To analyses the thickness of microsized objects.

**LIST OF EXPERIMENTS:**

1. AirWedge
2. Newtons’sRings
3. Simple Pendulum
4. Dispersive power of thePrism
5. DiffractionGrating
6. Acoustic diffraction Grating
7. Compound Pendulum
8. Kunt’stubeexperiment

9. Young's double slit experiment
10. Laser Grating
11. Torsional Pendulum
12. Young's Modulus – Non-uniform Bending
13. Young's Modulus – Uniform Bending.

**Course Outcomes:**

At the end of the course, the students will be able to

1. Acquired the knowledge of torsional properties of metals wire
2. Determine the radius of curvature of the plano-convex lens.
3. Determine the dispersion power of the prism.
4. Evaluate the important characteristics of simple and compound pendulum
5. Determine the Young's Modulus of uniform and non-uniform bending.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	-	-	-	2	-	2	3	-	3
CO2	3	-	-	-	-	-	2	-	2	3	-	3
CO3	3	-	-	-	-	-	2	-	2	3	-	3
CO4	3	-	-	-	-	-	2	-	2	3	-	3
CO5	3	-	-	-	-	-	2	-	2	3	-	3

22ETBP206	CHEMISTRY LABORATORY	L	T	P/D	C
		0	0	3	1.5

**Course Objectives:**

- To list the water quality standards.
- To assess the composition of an alloy.
- To appreciate the practical significance of acidimetry, alkalimetry, permanganometry, conductometry and potentiometry.
- To analyse quantitatively the amount of a substance present in a given sample.

**List of Experiments:**

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Determination of the rate constant of a reaction
6. Determination of cell constant and conductance of solutions
7. Potentiometry - determination of redox potentials and emfs
8. Saponification/acid value of an oil
9. Determination of the partition coefficient of a substance between two immiscible liquids
10. Adsorption of acetic acid by charcoal
11. Volumetric analysis

**Course Outcomes:**

At the end of the course the students will be able to

1. Determine the physical properties like surface tension and viscosity.

2. Determine rate of reactions and soapnification of oil.
3. Calculate the quantity of adsorbate adsorbed by charcoal.
4. Determine the impurity from Pharmacheutical products and hardness of water.
5. Determine exact concentration of acid and bases present in the industrial wastes.

Mapping of Course Outcomes with Program Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	1	-	-	1	-	-	-	-	-
CO2	2	1	-	-	-	1	-	-	-	-	-	-
CO3	3	2	-	1	-	-	2	-	-	-	-	-
CO4	3	-	1	-	-	-	-	-	-	-	-	-
CO5	2	2	-	-	-	-	-	-	-	-	-	-

<b>22ETSP207</b>	<b>COMPUTER PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P/D</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### Course Objectives:

- To enable students to code, compile and test C programs.
- To enable students to design algorithms using appropriate programming constructs for problem solving.
- Identify tasks in which the numerical techniques learned are applicable and apply them to write programs.
- To enable students to segregate large problems into functions using modular programming concepts.
- To enable students to apply pointer and structures in programs effectively.

**[The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given]**

Tutorial 1: Problem solving using computers:

Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:

Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:

Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:

Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:

Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings

Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:

Lab 7: Simple functions

Tutorial 8 & 9: Numerical methods (Root finding, numerical differentiation, numerical integration):

Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls

Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation

Lab 11: Pointers and structures

Tutorial 12: File handling:

Lab 12: File operations

### Course Outcomes:

At the end of this course, the students will be able to

1. Analyze program requirements and develop programs using conditional and looping statements.
2. Write programs for handling arrays and strings.
3. Create C programs with user defined functions and recursive function calls.
4. Utilize pointers and structures for dynamic memory allocation in C programming.
5. Develop C programs for handling files.

Mapping of Course Outcomes with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	2	-	-	-	-	-	-	-
CO2	2	1	1	-	2	-	-	-	-	-	-	-
CO3	2	1	1	-	2	-	-	-	-	-	-	-
CO4	1	1	1	-	2	-	-	-	-	-	-	-
CO5	1	1	1	-	2	-	-	-	-	-	-	-

22ETSP208	ENGINEERING GRAPHICS	L	T	P/D	C
		2	0	3	3

### Traditional Engineering Graphics:

Principles of Engineering Graphics; Orthographic Projection; Descriptive Geometry; Drawing Principles; Isometric Projection; Surface Development; Reading a Drawing; Sectional Views; Dimensioning, True Length, Angle.

### Computer Graphics:

Engineering Graphics Software; -Spatial Transformations; Orthographic Projections; Model Viewing; Co-ordinate Systems; Multi-view Projection; Exploded Assembly; Model Viewing; Animation; Spatial Manipulation; Surface Modeling; Solid Modeling; Introduction to Building Information Modeling (BIM). (Except the basic essential concepts, most of the teaching part can happen concurrently in the laboratory)

### Course Objectives:

- To develop the ability to produce simple engineering drawing and sketches based on current practice
- To develop the means for communication of ideas, thoughts and design of objects, related to engineering applications, to others through drawing
- To develop the skills to read manufacturing and construction drawings used in industry

- To develop a working knowledge of the layout of plant and equipment
- To develop skills in abstracting information from calculation sheets and schematic diagrams to produce working drawings for manufacturers, installers and fabricators

### **Unit- I: Introduction to Engineering Drawing,**

Introduction to Engineering Drawing: Lettering, Dimensioning and use of drawing instruments. Conic sections: Eccentricity method of/for drawing ellipse, parabola and hyperbola- Tangent and Normal from a point on the curve.

### **Unit- II: Orthographic Projections,**

Orthographic projections: Introduction – Projections of points Projections of Straight lines: Determination of true length and true angle of inclinations using half cone and trapezoidal methods – drawing the projections of straight lines using half cone method from true length and true angle of inclinations.

### **Unit -III: Projections of Regular Solids,**

Projections of solids in simple position: Projections of cube, Tetrahedron, prisms, Pyramids, cone and cylinder. Projections of solids: Auxiliary projections – projections of prisms, pyramids, cylinder and cone when the axis is inclined to only one plane.

### **Unit- IV: Sections and Sectional Views of Right Angular Solids,**

Sections of solids: Sections of prisms, pyramids, cylinder and cones – true shape of section. Developments of solids: Developments of lateral surfaces of solids using parallel and radial line methods.

### **Unit -V: Isometric Projections**

Isometric projections: Projections of simple solids. Conversion of pictorial view of simple objects into orthographic projections (only elevation and plan)

### **Overview of Computer Graphics Covering:**

Introduction to CAD software: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars). The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

### **Customization & CAD Drawing:**

Consisting of setup of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines and other basic geometric entities.

### **Annotations, layering & other functions:**

applying dimensions to objects and annotations to drawings; Setting up and use of Layers, Printing document stop a per using the print command; orthographic projection techniques Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation;

### **Text/Reference Books:**

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication.
4. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.



5. (Corresponding set of) CAD Software Theory and User Manuals.

**Course Outcomes:**

At the end of the course a student will be able to

1. Utilize drawing instruments effectively and able to present engineering drawings and sketches.
2. Describe the concept of orthographic, isometric projections of points, lines and regular solids.
3. Visualize the images and drawings in engineering perspective.
4. Practice sectioning of bodies like machines and equipment's.
5. Develop their technical communication skills and promote life-long learning.

Mapping of Course Outcomes with Programme Outcomes												
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	2	-	2	-	-	-	-	2	-	2
CO2	3	3	3	2	2	-	-	-	2	2	-	2
CO3	2	-	2	-	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	3	-	3

## DEPARTMENT OF INFORMATION TECHNOLOGY

### VISION

To produce globally competent, quality technocrats, to inculcate values of leadership and research qualities and to play a vital role in the socio – economic progress of the nation.

### MISSION

M1 : To partner with the University community to understand the information technology needs of faculty, staff and students.

M2 : To develop dynamic IT professionals with globally competitive learning experience by providing high class education.

M3 : To involve graduates in understanding need based Research activities and disseminate the knowledge to develop entrepreneur skills.

### PROGRAMME EDUCATIONAL OBJECTIVES

PEO1 : To offer students with **core competence** in mathematical, scientific and basic engineering rudiments necessary to prepare, analyze and solve hardware/software engineering problems and/or also to pursue advanced study or research.

PEO2 : To educate students with good **scope** of knowledge in core areas of IT and related engineering so as to comprehend engineering trade-offs, analyze, design, and synthesize data and technical concepts to create novel products and solutions for the real life problems.

PEO3 : To instil in students to maintain high **proficiency** and ethical standards, effective oral and written communication skills, to work as part of teams on multidisciplinary projects and diverse professional environments, and relate engineering issues to the society, global economy and to emerging technologies.

PEO4 : To deliver our graduates with **learning environment** awareness of the life-long learning needed for a successful professional career and to introduce them to written ethical codes and guidelines, perform excellence, leadership and demonstrate good citizenship.

### PROGRAMME OUTCOMES (POs)

After the successful completion of the B.E. Information Technology degree programme, the students will be able to:

**PO 1: Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO 2: Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO 3: Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO 4: Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the

information to provide valid conclusions.

**PO 5:Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

**PO 6:The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO 7:Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for, sustainable development.

**PO 8:Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO 9:Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO 10:Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO 11:Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO 12: Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **PROGRAM SPECIFIC OUTCOMES (PSOs)**

*At the time of graduation, the students will be able to :*

**PSO 1:** Apply the fundamental concepts of Information Technology to design, develop and test various real time applications in the areas of Computer Networking, Wireless Communication, and Information System and Security.

**PSO 2:** Solve complex engineering problems using the latest Information Technology tools and skills to arrive at cost effective and appropriate solutions.

**PSO 3:** Apply the knowledge of management principles and soft skills to carry out Information Technology projects with social and environmental awareness to have a successful career and as an entrepreneur.

<b>Mapping Programme Educational Objectives (PEOs) with Programme Outcomes (POs)</b>				
	PEO1	PEO2	PEO3	PEO4
PO1	✓	✓	✓	
PO2	✓	✓		✓
PO3	✓	✓		✓
PO4		✓	✓	✓
PO5	✓	✓	✓	
PO6			✓	✓
PO7		✓		✓
PO8			✓	✓
PO9	✓	✓	✓	✓
PO10			✓	✓
PO11	✓	✓	✓	✓
PO12	✓	✓	✓	✓

### THIRD SEMESTER

22ETBS301	MATHEMATICS – III	L	T	P	C
		3	1	0	4

#### COURSE OBJECTIVES

- To understand the basic concepts of partial differential equations which is helpful in solving Real world problems.
- Introduce Fourier series which is very useful in the study of electrostatics, acoustics and computing.
- Introduce Boundary value problems which is helpful in investigation of the important features of electromagnetic theory.
- The study of Fourier transform is useful in solving problems in frequency response of a filter and signal analysis.
- Provide a study of Z-transform which can played important role in the development of communication engineering.

#### Unit – I: Partial Differential Equations

Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions - Solution of standard type of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients.

#### Unit – II: Fourier series

Dirichlet's conditions - General Fourier series - Odd and Even functions - Half range sine series - Half range cosine series - Complex form of Fourier series – Parseval's identity.

#### Unit – III: Boundary Value Problems

Solutions of one-dimensional wave equation – One dimensional heat equation (without derivation) – Fourier series solutions in Cartesian co-ordinates.

#### Unit – IV: Fourier Transform

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem - Parseval's identity

#### Unit – V: Z – Transform and Difference Equations

Z – transform – Elementary properties – Inverse Z – transform - Convolution theorem – Solution of difference equations using Z – transform.

#### TEXT BOOKS

1. Kandasamy,P., Thilagavathy,K. and Gunavathy,K., Engineering Mathematics,6<sup>th</sup> ed., (Vol-I & II) S.Chand& Co Ltd. 2006, New Delhi.
2. Ventakataraman,M.K., 2003. Engineering Mathematics-The National Publishing Co., Chennai.

#### REFERENCES

1. Ramana B V., Higher Engineering Mathematics.,2007, Tata McGraw Hill Pub.
2. Veerarajan, T., Engineering Mathematics, 3<sup>rd</sup> edition, 2005, Tata McGraw Hill Pub.
3. Vairamanickam.k., Nirmala.p., Tamilselvan.S., Transforms and Partial Differential Equations., 2014,Scitech Publications(India) Pvt.Ltd
4. Singaravelu, A., Engineering Mathematics, Meenakshi Publications, Chennai,2004.

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Acquire basic understanding of the most common partial differential equations.
2. Understand the concepts of Fourier series.
3. Ability to solve boundary value problems.
4. Able to investigate signals problems using Fourier transform
5. Familiarize Z-transform that play important roles in many discrete engineering problems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-

22ETES302	ENVIRONMENTAL STUDIES				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To provide basic knowledge on natural resources.
- To describe the types, characteristic features, structure and function of an ecosystem.
- To expose information about biodiversity richness and the political angles to the species of plants, animals and microorganisms.
- To educate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To teach problem of over population, health and hygiene and also the role of technology in eliminating or minimizing above factors.

## UNIT – I Introduction

Multidisciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness. Natural resources - Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: Growing energy needs, renewable and non-renewable energy

sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources- Equitable use of resources for sustainable lifestyles.

### **UNIT – II Concept of an Ecosystem**

Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological - pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

### **UNIT – III Bio Diversity**

Definition: genetic, species and ecosystem diversity - Bio geographical classification of India - Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

### **UNIT – IV Types of Pollution**

Definition - Cause, effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution- Noise pollution - Thermal pollution - Nuclear hazards- Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution – Disaster management: floods, earthquake, cyclone and landslides. Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management - Resettlement and rehabilitation of people; its problems and concerns. - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation.

### **UNIT – V Environment and Human Health**

Population growth, variation among nations - Population explosion – Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health -Case Studies.

### **TEXT BOOKS**

1. Textbook of Environmental Studies, ErachBharucha, University Press,2005.
2. Environmental Studies, MP Poonia& SC Sharma, Khanna Publishing House,2017.

### **REFERENCES**

1. Environmental Studies, Rajagopalan, Oxford University Press, 2005.

2. Brunner R.C., Hazardous Waste Incineration, McGraw Hill Inc., 1989.
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T., Environmental Encyclopaedia, Jaico Publ. House, Mumbai, 2001.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd. New Age International Limited, 3rd Edition, 2003.
5. Jadhav, H &Bhosale, V.M. Environmental Protection and Laws. Himalaya Pub. House, Delhi, 1995 .
6. Wanger K.D., Environmental Management. W.B. Saunders Co. Philadelphia, USA, 1998.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand renewable and non-renewable resources of our ecosystem.
2. Compare ecological system, causes and their relationship.
3. Explain political angers to the species of plants, animals and microorganisms in the environment and the threats to biodiversity
4. Analyse the causes and consequences of natural and man induced disasters (flood, earthquake, landslides, cyclones) and measure pollutions and minimize their effects.
5. Design modes with the help of information technology for eliminating or minimizing the problems of Environment and human health.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	1	3	-	-	-	-	-	-	-	2
CO2	1	-	-	-	-	1	3	-	-	-	-	-	-	-	2
CO3	1	-	-	-	-	2	3	-	-	-	-	-	-	-	2
CO4	2	1	-	-	-	2	3	-	-	-	-	-	-	-	3
CO5	1	-	2	1	-	3	3	-	-	-	-	-	-	-	3

22ETES303	DIGITAL LOGIC AND MICROPROCESSORS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn combinational and sequential logic circuits
- To understand the components of a digital system
- To understand the microprocessor architecture and assembler instruction formats
- To study the architecture of microprocessors
- To design microprocessor-based systems

## UNIT - I

Introduction: Review of number systems - Logic gates: NAND, NOR gate as universal building blocks - Simplification of four-variable Boolean equations using Karnaugh maps  
 Combinational Logic circuits : Half adder, Full adder, Half subtractor, Full subtractor - 4-bit parallel adder and subtractor - 3-bit binary decoder – Decimal to BCD encoder – 8-to-1 multiplexer, 1-to-8 Demultiplexer



## UNIT - II

Sequential Logic Circuits: Flip-flops: SR flip-flop, Edge-triggered flip-flops (SR, D, JK and T), Master-slave JK flip-flop - 4bit binary asynchronous and synchronous counter - Decade counter (asynchronous and synchronous) - Shift registers (SISO, SIPO, PISO, PIPO) - Ring counter – Memories (RAM, ROM, EPROM, FLASH)

## UNIT - III

The 8085 Microprocessor Architecture: Pin diagram - CPU architecture – Flags-Interrupts – Instruction Set-Addressing mode

## UNIT - IV

The 8086 Microprocessor: Pin diagram, CPU architecture, addressing mode, Segmentation- Minimum mode maximum mode operations - Memory Interfacing- I/O interfacing  
Programming model of 8086: Programming model of 8086, Addressing modes, Instruction Formats, Instruction set, Assembler directives and Assembly language Programming of 8086.

## UNIT - V

Peripheral Chips: Block diagram – pin diagram, 8255 (PPI), 8254 (Timer), 8257 (DMA), 8259 (PIC), 8251 (USART), 8279 (Keyboard and Display Interfacing)

## TEXT BOOKS

1. Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Sixth Edition, Penram International Publishing, 2013.
2. Morris Mano, “Digital logic and Computer design”, 4th Edition, Pearson, 2008.

## REFERENCES

1. Yu-Cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design”, Second Edition, Pearson, 2015.
2. R.K. Gaur, “Digital Electronics and Microcomputers”, Dhanpat Rai Publications, 2012.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Get an ability to design and use the various combinational logic circuits.
2. Design and evaluate the various flip flops and counters for sequential logic circuits.
3. Analyse, design and implement the architecture of 8085.
4. Comprehend the design details of architecture of 8086 microprocessor.
5. Design and implement the various programming models of 8086 architecture.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	-	-	1	-	-
CO2	3	3	-	-	3	-	-	-	-	-	-	-	1	-	-
CO3	3	3	-	-	3	2	-	-	-	-	-	-	1	-	-
CO4	3	3	-	-	3	2	-	-	-	-	-	2	2	-	-
CO5	3	3	3	3	3	2	-	-	-	-	-	2	2	2	2

<b>22ITPC304</b>	<b>DATA STRUCTURES AND ALGORITHMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To assess how the choice of data structures and algorithms design methods impacts the performance of programs.
- To understand concepts about searching and sorting techniques
- To understand basic concepts about stacks, queues, lists, trees and graphs.
- To enable them to write algorithms for solving problems with the help of fundamental data structures.
- To employ the different data structures to find the solutions for specific problems.

### **UNIT-I**

Introduction:Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching:Linear Search and Binary Search Techniques and their complexity analysis.

### **UNIT-II**

Stacks and Queues: ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

### **UNIT-III**

Linked Lists:Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

### **UNIT-IV**

Trees:Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis.

### **UNIT-V**

Sorting and Hashing:Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

Graph:Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.

## **TEXT BOOKS**

1. Ellis Horowitz, Sartaj Sahni,“Fundamentals of Data Structures”, Illustrated Edition, Computer Science Press.

## REFERENCES

1. Mark Allen Weiss, "Algorithms, Data Structures, and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company
2. R. G. Dromey, "How to Solve it by Computer", 2nd Impression, Pearson Education.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Analyze the algorithms to determine the time and computation complexity and justify the correctness.
2. Implement the stack and queue ADT operations analyze the algorithms.
3. Analyze the linked list and analyze the same to determine the time and computation complexity.
4. Develop various applications and algorithms and complexity analysis of trees like AVL Tree and Binary Tree.
5. Discuss the various algorithms for sorting and searching techniques and search algorithms to determine the complexity analysis

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	1	2	-	1	1	3	2	1
CO2	3	3	3	2	2	-	-	1	2	-	1	1	3	2	1
CO3	3	3	3	2	2	-	-	1	2	-	1	1	3	2	1
CO4	3	3	3	3	2	-	-	1	2	-	1	1	3	2	1
CO5	3	2	3	3	2	-	-	1	2	-	1	1	3	2	1

<b>22ITPC305</b>	<b>DATABASE MANAGEMENT SYSTEM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical, and network models
- To understand and use data manipulation language to query, update, and manage database
- To develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency, distributed database, and intelligent database, Client/Server (Database Server), Data Warehousing.

## UNIT-I

Database system architecture: Data Abstraction, Data Independence, Data Definition Language (DDL), Data Manipulation Language (DML).

Data models: Entity-relationship model, network model, relational and object oriented data models, integrity constraints, data manipulation operations.

## **UNIT-II**

Relational query languages: Relational algebra, Tuple and domain relational calculus, SQL3, DDL and DML constructs, Open source and Commercial DBMS - MYSQL, ORACLE, DB2, SQL server.

Relational database design: Domain and data dependency, Armstrong's axioms, Normal forms, Dependency preservation, Lossless design.

Query processing and optimization: Evaluation of relational algebra expressions, Query equivalence, Join strategies, Query optimization algorithms.

## **UNIT-III**

Storage strategies: Indices, B-trees, hashing.

## **UNIT-IV**

Transaction processing: Concurrency control, ACID property, Serializability of scheduling, Locking and timestamp based schedulers, Multi-version and optimistic Concurrency Control schemes, Database recovery.

## **UNIT-V**

Database Security: Authentication, Authorization and access control, DAC, MAC and RBAC models, Intrusion detection, SQL injection.

Advanced topics: Object oriented and object relational databases, Logical databases, Web databases, Distributed databases, Data warehousing and data mining.

## **TEXT BOOKS**

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 6th Edition, McGraw-Hill.

## **REFERENCES**

1. J. D. Ullman, "Principles of Database and Knowledge – Base Systems", Vol 1, Computer Science Press.
2. R. Elmasri and S. Navathe, "Fundamentals of Database Systems", 5th Edition, Pearson Education
3. Serge Abiteboul, Richard Hull, Victor Vianu, "Foundations of Databases", Addison-Wesley

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Write relational algebra expressions for a given query and optimize the developed expressions
2. Design the databases using E\_R method and normalization, for a given specification of the requirement.
3. Construct the SQL queries for Open source and Commercial DBMS -MYSQL, ORACLE, and DB2 for a given specification.
4. Optimize its execution using Query optimization algorithms for a given query

5. Determine the transaction atomicity, consistency, isolation, and durability for a given transaction-processing system.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	3	2	2	-	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	-	3	3	2	1	-	-	-	-	-	-	-	-	-	2
<b>CO4</b>	3	-	2	1	-	-	-	-	-	-	-	-	1	-	-
<b>CO5</b>	-	2	-	3	3	1	-	1	-	-	-	-	-	-	2

<b>22ITPC306</b>	<b>OBJECT ORIENTED PROGRAMMING USING JAVA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- Understand the basic object oriented programming concepts and apply them in problem solving.
- Illustrate inheritance concepts for reusing the program.
- Demonstrate on the multi-tasking by using multiple threads.
- Develop data-centric applications using JDBC.
- Understand the basics of java console and GUI based programming.

### **UNIT-I**

OOP concepts: Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm. Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring string class.

### **UNIT II**

Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface;

Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.

### **UNIT III**

Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

### **UNIT IV**

Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC

### **UNIT V**

GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components. Containers: JFrame, JApplet, JDialog, JPanel, overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications. Layout management: Layout manager types, border, grid and flow. Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

### **TEXT BOOKS**

1. Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill, 1<sup>st</sup> Edition, 2013.
2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 7<sup>th</sup> Edition, 2011.
3. T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

### **REFERENCE BOOKS**

1. P.J.Dietel and H.M.Dietel, "Java How to program", Prentice Hall, 6<sup>th</sup> Edition, 2005.
2. P.Radha Krishna, "Object Oriented programming through Java", CRC Press, 1<sup>st</sup> Edition, 2007.
3. S.Malhotra and S. Choudhary, "Programming in Java", Oxford University Press, 2<sup>nd</sup> Edition, 2014

### **WEB REFERENCES:**

1. <http://java.sun.com>
2. <http://www.oracle.com/technetwork/java/index.html>
3. <http://java.sun.com/javase>
4. <http://www.oracle.com/technetwork/java/javase/overview/index.html>
5. <http://download.oracle.com/javase/7/docs/api/index.html>

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Explain the concept of class and objects with access control to represent real world entities.
2. Demonstrate the implementation of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.
3. Understand the impact of exception handling to avoid abnormal termination of program using checked and unchecked exceptions.
4. Develop java application to interact with database by using relevant software component (JDBC Driver).
5. Understand the process of graphical user interface design and implementation using AWT or swings.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2	1	1	-	-	-	-	-	-	2	3	2	1
<b>CO2</b>	3	2	2	1	2	-	-	-	-	-	-	2	3	3	1
<b>CO3</b>	3	2	2	1	1	-	-	-	-	-	-	2	3	2	1
<b>CO4</b>	3	2	2	1	1	-	-	-	-	-	-	2	2	2	1
<b>CO5</b>	3	2	2	1	1	-	-	-	-	-	-	2	2	2	1

<b>22ITSP307</b>	<b>DIGITAL LOGIC AND MICROPROCESSORS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## COURSE OBJECTIVES

- To get familiar with basic electronic components such as registers, capacitor, inductor, diodes, transmitters, etc
- To understand the function of various electronic components
- To understand the architecture of 8085 and 8086 microprocessor.
- To study and understand the assembly language programming using 8086 microprocessor.
- Equipped with microprocessor interfacing and its applications.

## LIST OF EXPERIMENTS

1. Basic Logic Gates
2. Combinational Circuits
3. Adders and Subtractors
4. Decoder and Encoder
5. Multiplexer and De-multiplexer

6. Registers and Counters
7. Study of 8085 and study of 8086 microprocessor.
8. 8-bit Arithmetic Operation.
9. 16-bit Arithmetic Operation.
10. Find the number of even and odd numbers in a block of data.
11. Fibonacci series
12. Sorting an array of numbers.
13. Searching a string
14. Square wave generation using 8255 IC
15. Data transfer using USART
16. Message display 8279 IC.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. design circuits for various mathematical operations using Op-Amps, various flip-flops, encoder/decoders, multiplexers, registers and counters.
2. explain the working and design of various A/D and D/A converters.
3. explain various components and working of the 8085 and 8086 microprocessor with their peripheral devices.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	1	2	2	2	2	-	2	3	3	3	3
CO2	3	3	3	3	-	2	3	2	2	2	2	3	3	3	3
CO3	3	3	3	2	1	2	2	2	2	-	2	3	2	2	2

22ITCP308	OOPs & DATA STRUCTURES AND ALGORITHMS LAB	L	T	P	C
		0	0	3	2

### COURSE OBJECTIVES

- To strengthen problem solving ability by using the characteristics of an object-oriented approach.
- To design applications using object oriented features
- To develop skills to design and analyze simple linear and non linear data structures.
- To Strengthen the ability to identify and apply the suitable data structure for the given real world problem.
- To Gain knowledge in practical applications of data structures.

### LIST OF EXERCISES (OOPS)

1. Programs Using Functions - Functions with default arguments
2. Implementation of Call by Value, Call by Address and Call by Reference
3. Simple Classes for understanding objects, member functions and Constructors and Destructor



4. Operator overloading
5. Friend Function
6. Data Type Conversion
7. Multiple Inheritances
8. Hierarchical Inheritance
9. Virtual Base Class
10. Virtual Functions

### **LIST OF EXERCISES (DATA STRUCTURES)**

1. Array implementation of List ADT, Stack ADT, Queue ADT.
2. Implementation of Singly linked list (addition, deletion, insertion in all positions).
3. Implementation of Doubly linked list (addition, deletion, insertion in all positions).
4. Implementation of Stack and Queues using linked list.
5. Implementation of binary search technique.
6. Program for tree traversal (inorder, postorder, preorder).
7. Implementation of Quick sort, Merge sort, Shell sort.
8. Implementation of Dijkstra's algorithm.
9. Implementation of Depth First Search.
10. Applications of Linked List, Stack and Queue in real world.

### **COURSE OUTCOMES**

At the end of this course, students will able to

1. Understand various oops concepts.
2. Implement operations like insertion, deletion and traversing mechanism on various data structures.
3. Understand and implement advance data structure using Non Linear data structure.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	3	3	1	2	-	-	2	3	1	1	1	3	2	1
<b>CO2</b>	3	3	3	2	2	-	-	1	2	1	1	1	3	2	1
<b>CO3</b>	3	3	3	3	2	-	-	1	2	1	1	1	3	2	3

<b>22ITCP309</b>	<b>DATABASE MANAGEMENT SYSTEM LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### **COURSE OBJECTIVES**

- To apply basic database concepts, including the structure and operation of the relational data model.
- To construct simple and moderately advanced database queries using Structured Query Language (SQL).
- To understand and successfully apply logical database design principles, including E-R diagrams and database normalization.
- To design and implement a small database project using Microsoft Access.

### **LIST OF EXERCISES**

1. Implementation of queries for student data base
2. Data Definition Language-with constraint and without constraint
3. Data Manipulation language-Insert, Delete, Update, Select and truncate
4. Transaction Control Statement – Commit, Save point, Roll back
5. Data Control Statement – Grant, Revoke
6. Data Projection Statement – Multi column, alias name, arithmetic operations, distinct records, concatenation, where clause
7. Data Selection Statement – Between, and, not in, like, relational operators and logical operators
8. Aggregate functions – count, maximum, minimum, sum, average, order by, group by, having
9. Joint queries – inner join, outer join, selfjoin, Cartesian join, or cross join
10. Sub queries – in, not in, some, any, all, exist, not exist
11. Set operations – union, union all, intersect, minus
12. Database objects – synonym, sequences, views and index
13. Cursor
14. Functions and procedures
15. Trigger
16. Exceptions
17. Packages
18. Factorial of a number
19. Checking whether a number is prime or not
20. Fibonacci series
21. Reverse the string
22. Swapping of numbers
23. Odd or even number
24. Duplication of records



## FOURTH SEMESTER

22ITBS401	DISCRETE MATHEMATICS	L	T	P	C
		3	1	0	3

### COURSE OBJECTIVES

- To introduce the basic concepts of Mathematical Logic that deals with the method of reasoning.
- To impart knowledge about sets and relations.
- To provide basic understanding of Boolean Algebra.
- To familiarize the basic properties and concepts of general algebraic systems.
- To illustrate graph theory and its application to Computer Science.

### UNIT - I Mathematical Logic

Propositions – Connectives – Tautology and contradiction – Equivalence of prepositions – Tautological Implication – Normal Forms – Theory of Inference – Rules of Inference.

### UNIT - II Set Theory and Relations

Set operations – Ordered pairs and Cartesian product – Relations – Type of relations – Operations or relations – Properties of relations – Equivalence classes – Partition of set – Matrix and Graphical representation of relation.

### UNIT - III Lattice and Boolean Algebra

Partial ordered set – Hasse diagram – Lattices – Properties of Lattices – Boolean Algebra – Karnaugh map method.

### UNIT - IV Group and Group code

Algebraic systems – Semi groups and Monoids – Groups – Permutation Group – Subgroups – Coding Theory – Group codes – Hamming codes – Procedure for Encoding and Decoding Group codes.

### UNIT - V Graph Theory

Graphs – Special simple graphs – Matrix representation of graphs – Path cycles and connectives – Eulerian and Hamiltonian graphs – Shortest path algorithms.

### TEXT BOOKS

1. Veerarajan T, “Discrete Mathematics with Graph Theory and Combinatorics”, Tata McGraw Hill Publishing Company Ltd,2014.
2. Discrete Mathematics and Its Applications, S. K. Chakraborty and B. K. Sarkar, Oxford, 2011.

### REFERENCES:

1. Venkataraman M K, “Discrete Mathematics”, TheNationalPublishing Company, 2008.
2. Kolman Busby Ross, “Discrete Mathematical Structures”,Pearson Education Pvt Ltd, 2000.
3. Trembley J P and Manohar R P, “Discrete Mathematical Structures with Applications to Computer Science”, Tata McGraw Hill Publishing Company Ltd,2005.

## COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Acquire the basic concepts in Mathematical Logic and theory of inferences.
2. Understand the concepts of Set theory, Relations and equivalence classes with matrix representation.
3. Implement Lattice theory and Boolean algebra in circuit design.
4. Design coding and encoding group codes.
5. Understand the basic concepts of Graph theory, Eulerian and Hamiltonian graphs.

Mapping of Course Outcomes with Programme Outcomes												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-

22ITPC402	COMPUTER ARCHITECTURE AND ORGANIZATION	L	T	P	C
		2	0	0	3

## COURSE OBJECTIVES

- To understand the basic structure and operation of a digital computer
- To learn the fundamentals of organizational and architectural aspects of control unit
- To acquire knowledge about processor and memory design of a digital computer
- To have a broad understanding of various system interfaces and Input output devices
- To obtain knowledge on recent processors.

### UNIT I BASIC COMPUTER ORGANIZATION AND DESIGN

Block Diagram of Computer-Instruction Codes – Computer Registers – Instruction Cycle – Memory reference Instructions – Input – Output and Interrupt Design of Basic Computer – ALU design.

### UNIT II BASIC PROCESSING UNIT

Fundamental concepts-Execution of a complete instruction – Multiple bus organization – Hardwired control –Micro programmed control – Pipelining: Basic concepts – Data hazards-Instruction hazards – Influence on Instruction sets – Data path and control consideration – Super Scalar Processors, VLIW, Parallel and Vector Processors.

### UNIT III MEMORY ORGANIZATION

Memory hierarchy – main memory – Memory chip Organization- auxiliary memory – Associate memory – Virtual memory – Cache memory – Cache algorithms, Cache Hierarchy, Cache coherence protocols, Performance, Interleaving, On chip Vs Off chip Memories/Caches.

## **UNIT IV INPUT-OUTPUT ORGANIZATION**

Input-output interface – asynchronous data transfer – modes of transfer – priority interrupt – DMA – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).

## **UNIT V ADVANCED PROCESSOR ARCHITECTURE**

Parallel processing and its challenges- Instruction level parallelism – Flynn's classification – Hardware multithreading: SISD, MIMD, SIMD, SPMD and Vector multithreading – Multicore processors: Shared memory multiprocessor and cluster multiprocessor.

### **TEXT BOOKS**

1. Carl Hamacher, Zvonko G. Vranesic, Safwat G. Zaky, “Computer Organization”, McGraw- Hill, 5th edition, 2014
2. David A. Patterson and John L. Henessey, “Computer Organisation and Design”, Morgan Kaufman / Elsevier, Fifth edition, 2014.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition, 2008.

### **REFERENCES**

1. William Stallings, “Computer Organization and Architecture”, Prentice-Hall of India, 7th Edition, 2016.
2. John P. Hayes, “Computer Architecture and Organisation”, McGraw Hill, 2012.
3. Morris Mano, "Computer System Architecture ", Prentice Hall of India, Third Edition, 2008.
4. Vincent P. Heuring, Harry F. Jordan, “Computer System Architecture”, Pearson Education, Second Edition, 2005.
5. Govindarajulu, “Computer Architecture and Organization, Design Principles and Applications”, Tata McGraw Hill, First edition, 2005.

### **WEB RESOURCES**

1. <http://www.inetdaemon.com/tutorials/computers/hardware/cpu/>
2. <https://inst.eecs.berkeley.edu/~cs152/sp18/>
3. [http://users.ece.cmu.edu/~jhoe/doku/doku.php?id=18447\\_introduction\\_to\\_computer\\_architecture](http://users.ece.cmu.edu/~jhoe/doku/doku.php?id=18447_introduction_to_computer_architecture)

### **COURSE OUTCOMES**

After completion of the course, the students will be able to

1. Identify and explain the basic structure of a computer and instruction sets with addressing modes and discuss the design of ALU.
2. Identify the mechanism in Hardwired control and micro programmed control unit along with concepts of pipelining and applications.
3. Illustrate the memory mapping procedure to enhance the performance of the system.
4. Discuss the standard I/O interfaces and peripheral devices.
5. Outline the advanced concepts of multi-core processors and modern Processors.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2	2	1	-	-	1	2	1	1	1	2	1	1
<b>CO2</b>	3	3	2	2	1	-	-	1	2	-	1	1	2	3	-
<b>CO3</b>	3	3	2	3	1	-	-	1	2	-	2	1	2	3	1
<b>CO4</b>	3	3	2	3	1	-	-	1	2	-	2	1	3	2	-
<b>CO5</b>	3	3	2	2	1	-	-	1	2	-	1	1	2	3	-

<b>22ITPC403</b>	<b>OPERATING SYSTEM</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To learn the basic concepts and functions of operating systems (OS).
- To learn the mechanisms of OS to handle processes and threads and their communication.
- To study the basic components of scheduling mechanism.
- To learn memory management strategies in contemporary OS.
- To appreciate the emerging trends in operating systems.

## **UNIT I INTRODUCTION TO OPERATING SYSTEMS AND PROCESSES**

Introduction to OS – Operating System Operations – Virtualization – Operating System Services – User and Operating System Interface – System Calls – Operating System Structures – Process Concept – Process Scheduling – Context Switch – Operations on Processes – Interprocess Communication – IPC in Shared-Memory Systems – IPC in Message-Passing Systems – Examples of IPC Systems.

## **UNIT II PROCESS SYNCHRONIZATION AND SCHEDULING**

Multicore Programming – Multithreading Models – Thread Libraries – Threading Issues – The Critical-Section Problem – Peterson’s Solution – Hardware Support for Synchronization – Mutex Locks – Semaphores – Monitors – Liveness – Basic Concepts of CPU Scheduling– Scheduling Criteria – Scheduling Algorithms: FCFS, SJF, RR, Priority, Multilevel Queue, Multilevel Feedback Queue – Thread Scheduling –Real-Time CPU Scheduling.

## **UNIT III FILE SYSTEM**

File Concept – Access Methods – Directory Structure – Protection – File-System Structure – File-System Operations – Directory Implementation – Allocation Methods – Free-Space Management – Recovery.

## **UNIT IV MEMORY MANAGEMENT**

Contiguous Memory Allocation – Paging – Structure of the Page Table – Swapping – Demand Paging – Copy-on-Write – Page Replacement – Allocation of Frames – Thrashing – Memory Mapped Files – Allocating Kernel Memory.

## **UNIT V I/O SYSTEMS AND STORAGE MANAGEMENT**

I/O Hardware – Application I/O Interface – Kernel I/O Subsystem – Transforming I/O Requests to Hardware Operations – STREAMS – I/O Performance – DISK Scheduling: FCFS, SSTF, SCAN, C-SCAN, LOOK – Disk Management: Disk formatting, Boot block, Bad Blocks.

### **TEXT BOOK**

1. Silberschatz Abraham, Greg Gagne, Peter B. Galvin. “Operating System Concepts”, Ninth Edition, Wiley, 2014.

### **REFERENCES**

1. Andrew S. Tanenbaum, “Modern Operating Systems”, Addison Wesley, 2009.
2. D. M. Dhamdhere, “Operating Systems: A Concept-based Approach”, Second Edition. Tata McGraw-Hill, 2006.
3. William Stallings, “Operating Systems: Internals and Design Principles”, Seventh Edition. Prentice Hall, 2011.

### **WEBLINKS**

1. <https://pdos.csail.mit.edu/6.828/2014/xv6/book-rev8.pdf>
2. The xv6 source code: `git clone git://pdos.csail.mit.edu/xv6/xv6.git`
3. <https://nptel.ac.in/courses/106108101/>
4. <http://www.tcyonline.com/tests/operating-system-concepts>
5. <http://www.galvin.info/history-of-operating-system-concepts-textbook>
6. [https://www.cse.iitb.ac.in/~mythili/teaching/cs347\\_autumn2016/index.html](https://www.cse.iitb.ac.in/~mythili/teaching/cs347_autumn2016/index.html)
7. <https://www.cse.iitk.ac.in/pages/CS330.html>

### **COURSE OUTCOMES**

At the end of this course, students will be able to

1. Articulate the main concepts, key ideas, strengths and limitations of operating systems.
2. Analyze the structure and basic architectural components of OS.
3. Design various scheduling algorithms.
4. Understand various file management systems.
5. Design and implement memory management schemes. Acquire a detailed understanding of various aspects of I/O management.



Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	1	1	1	1	-	1	1	-	1	1	2	1	2
<b>CO2</b>	1	2	1	2	2	1	1	1	2	-	2	2	2	1	2
<b>CO3</b>	2	2	2	2	2	-	-	-	2	-	2	2	2	1	2
<b>CO4</b>	2	3	1	3	3	-	-	-	3	-	3	3	2	1	2
<b>CO5</b>	3	3	3	3	3	-	-	-	3	-	3	3	2	1	2

<b>22ITPC404</b>	<b>COMPUTER GRAPHICS AND MULTIMEDIA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To develop, design and implement two dimensional and three dimensional graphical structures.
- To provide knowledge about transformations and clipping techniques.
- To acquire knowledge in OpenGL programming.
- To understand various aspects of multimedia and the concepts of audio, video, images and animation.

### **UNIT-I**

Introduction: Overview of Graphics System – Coordinate Representation – Graphics Output Primitives – Attributes of Graphics Primitives – Implementation Algorithms for Graphics Primitives – Introduction to OpenGL – OpenGL functions for Graphics Primitives.

### **UNIT-II**

2D Concepts: 2D Transformations – 2D Viewing – Window Viewport Transformation – Line, Polygon, Curve and Text Clipping Algorithms – OpenGL Functions for 2D Transformations and 2D Viewing.

### **UNIT-III**

3D Concepts: 3D Transformations – 3D Viewing – 3D Object Representations – Spline Representation – Visible Surface Detection Methods – Color Models – OpenGL Functions for 3D Transformations and 3D Viewing.

### **UNIT-IV**

Multimedia Systems Design: Multimedia Basics – Multimedia Applications – Multimedia System Architecture – Evolving Technologies for Multimedia – Defining Objects for Multimedia Systems – Multimedia Data Interface Standards – Multimedia Databases.

### **UNIT-V**

Multimedia File Handling and Hypermedia: Compression and Decompression – Data and File Format Standards – Multimedia I/O Technologies – Digital Voice and Audio – Video Image and Animation – Full Motion Video – Storage and Retrieval Technologies – Multimedia Authoring and User Interface – Hypermedia Messaging.

## TEXT BOOKS

1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, "Computer Graphics with OpenGL", Fourth Edition, Pearson Education, 2010.
2. Andleigh, P. K and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003.

## REFERENCES

1. Francis S. Hill Jr. and Stephen M Kelley, "Computer Graphics Using OpenGL", Third Edition, Prentice Hall, 2007.
2. Foley, Vandam, Feiner and Huges, "Computer Graphics: Principles and Practice", Second Edition, Pearson Education, 2003.
3. Ralf Steinmetz and Klara Steinmetz, "Multimedia Computing, Communications and Applications", Pearson Education, 2004.
4. Judith Jeffcoate, "Multimedia in practice: Technology and Applications", PHI, 1998.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Demonstrate knowledge on graphical system, 2D & 3D transformation and multimedia systems.
2. Analyze and apply suitable transformations for modeling 2D & 3D objects.
3. Investigate on different objects representation methods and identify visible surface in a 3D environment.
4. Design and develop multimedia system and construct multimedia databases.
5. Perform compression and decompression on the multimedia data using modern tools and techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	-	-	2	-	-	-	-	-	-	-	-	3	-
CO3	2	1	-	3	-	-	-	-	-	-	-	-	2	-	2
CO4	2	1	3	-	-	-	-	-	-	-	-	-	-	3	-
CO5	2	1	-	-	3	-	-	-	-	-	-	-	-	-	-

22ITPC405	COMPUTER NETWORKS				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To understand the major concepts involved in wide-area networks (WANs), local area networks (LANs) and Wireless LANs (WLANs).
- To understand modern network architectures from a design and performance perspective.
- To provide an opportunity to design and develop efficient network.
- To learn Quality of Service (QoS) in a network
- To Configure and use various application protocols and Firewalls.

## **UNIT-I**

Data communication Components: Representation of data and its flow in Networks, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media, LAN: Wired LAN, Wireless LANs, Connecting LAN and Virtual LAN, Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

## **UNIT-II**

Data Link Layer and Medium Access Sub Layer: Error Detection and Error Correction - Fundamentals, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go back – N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols -Pure ALOHA, Slotted ALOHA, CSMA/CD,CDMA/CA

## **UNIT-III**

Network Layer: Switching, Logical addressing – IPV4, IPV6 - Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

## **UNIT-IV**

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service, QoS improving techniques: Leaky Bucket and Token Bucket algorithm.

## **UNIT-V**

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls, Basic concepts of Cryptography

## **TEXT BOOKS**

1. Behrouz A. Forouzan, “Data Communications and Networking”, 4th Edition, McGraw- Hill.
2. William Stallings, “Data and Computer Communication”, 8th Edition, Pearson Prentice Hall India.

## **REFERENCES**

1. Andrew S. Tanenbaum, “Computer Networks”, 8th Edition, Pearson New International Edition.
2. Douglas Comer, “Internetworking with TCP/IP”, Volume 1, 6th Edition Prentice Hall of India.
3. W. Richard Stevens, “TCP/IP”, Illustrated, Volume 1, Addison-Wesley, United States of America.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Identify the components to create different types of Networks
2. Choose suitable error control and flow control mechanism
3. Apply proper routing techniques in a network
4. Provide Qos in a network for end to end connectivity
5. Configure and apply various application protocols like FTP, HTTP and Firewalls

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	3	-	-	-	-	1	-	3	-	-
CO3	2	2	2	2	2	-	-	-	-	-	-	-	3	2	-
CO4	3	2	2	2	2	-	-	-	-	2	-	1	3	2	-
CO5	3	2	2	2	2	-	-	-	-	-		1	3	2	-

22ITPC406	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the syntax and semantics of Python language and understand basic programming concepts using Python.
- To effectively use available built-in functions of Python and develop user defined functions for the requirements of the user.
- To implement object-oriented concepts and various network protocols using Python.
- To efficiently handle files, databases, and exceptions in Python.
- To create user interfaces with a wide range of features and develop simple real world applications using Python.

### UNIT-I

Elementary Programming, Selections and Loops: History of Python – Getting Started with Python – Programming Style-Writing a Simple Program – Reading Input from the Console-Identifiers – Variables, Assignment Statements, and Expressions – Simultaneous Assignments – Named Constants – Numeric Data Types and Operators – Type Conversions and Rounding-Introduction – Boolean Types, Values, and Expressions –if Statements – Two-Way if-else Statements – Nested if and Multi-Way if-elif-else Statements – Logical Operators – Conditional Expressions – Operator Precedence and Associativity – Detecting the Location of an Object Case Study: Computing Body Mass Index – The while Loop – The for Loop –Nested Loops – Keywords break and continue-Case Studies: Displaying Prime Numbers and Random Walk.

### UNIT-II

Mathematical Functions, Strings and User Defined Functions: Simple and Mathematical Python Built-in Functions – Strings and Characters –Introduction to Objects and Methods – Formatting Numbers and Strings– Drawing Various Shapes – Drawing with Colors and Fonts – Defining a Function – Calling a Function –Functions with/without Return Values –

Positional and Keyword Arguments –Passing Arguments by Reference Values – Modularizing Code-The Scope of Variables – Default Arguments – Returning Multiple Values –Function Abstraction and Stepwise Refinement – Case Study: Generating Random ASCII Characters.

### **UNIT-III**

Classes and Objects: Introduction to Object – Oriented Programming – Basic principles of Object – Oriented Programming in Python – Class definition, Inheritance, Composition, Operator Overloading and Object creation – Python special modules – Python Object System – Object representation, Attribute binding, Memory Management, and Special properties of classes including properties, Slots and Private attributes.

### **UNIT-IV**

Files, Exception Handling and Network Programming: Introduction –Text Input and Output – File Dialogs Exception Handling – Raising Exceptions – Processing Exceptions Using Exception Objects – Defining Custom Exception Classes – Binary IO Using Pickling – Case Studies: Counting Each Letter in a File and Retrieving Data from the Web–Client Server Architecture-sockets – Creating and executing TCP and UDP Client Server.

### **UNIT-V**

Database and GUI Programming: DBM database-SQL database-GUI Programming using Tkinter: Introduction – Getting Started with Tkinter – Processing Events – The Widget Classes – Canvas – The Geometry Managers –Displaying Images – Menus – Popup Menus – Mouse, Key Events, and Bindings –List boxes – Animations – Scrollbars – Standard Dialog Boxes–Grids.

### **TEXT BOOKS**

1. Guttag, John, “Introduction to Computation and Programming Using Python”, MIT Press, 2013.
2. Wesley J Chun “Core Python Applications Programming”, Prentice Hall, 2012.

### **REFERENCE BOOKS**

1. Mark Lutz, “Learning Python, Powerful OOPs”, O’Reilly, 2011.
2. Jennifer Campbell, Paul Gries, Jason Montajo, Greg Wilson, “Practical Programming An Introduction To Computer Science Using Python” The Pragmatic Bookshelf, 2009
3. Mark Summerfield “Programming in python 3: A Complete Introduction to Python Language”, Addison Wesley, Pearson Education, 2010.
4. Zelle, John M. “Python Programming: An Introduction to Computer Science”, 1st ed. Franklin Beedle and Associates, 2003.
5. Budd, Timothy, “Exploring Python”, McGraw–Hill Science, 2009.
6. Seema Thareja, “Python Programming”, Pearson.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Represent and manipulate basic data types such as Numbers, Strings, List, Tuples, Set and Dictionaries in Python. Become fluent in the use of control flow and looping statements.

2. Express proficiency in the handling of built-in functions, and developing user defined and lambda functions. Able to generate random data as per the requirements.
3. Develop applications in Python using object-oriented programming concepts.
4. Handle various file operations and exceptions using Python. Design and develop Client Server network applications using Python
5. Manage various databases and perform different database operations using Python. Design and develop GUI Applications in Python.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	3	-	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	2	-	-	3	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	2	3	2	3	1	-	-	-	-	-	-	-	-	3
<b>CO4</b>	3	3	3	3	3	2	-	-	-	-	-	-	-	-	3
<b>CO5</b>	1	3	3	3	3	3	-	-	-	-	-	-	-	-	3

<b>22ETHS407</b>	<b>UNIVERSAL HUMAN VALUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES:**

- Development of a holistic perspective based on self-exploration about themselves (humanbeing), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

### **UNIT-I Course Introduction - Need, Basic Guidelines, Content and Process for Value Education**

- 1.1 Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- 1.2 Self-Exploration—what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration.
- 1.3 Continuous Happiness and Prosperity- A look at basic Human Aspirations.
- 1.4 Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- 1.5 Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
- 1.6 Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than arbitrariness in choice based on liking-disliking

## **UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!**

- 2.1 Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.
- 2.2 Understanding the needs of Self ('I') and 'Body' - happiness and physical facility.
- 2.3 Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer).
- 2.4 Understanding the characteristics and activities of 'I' and harmony in 'I'.
- 2.5 Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- 2.6 Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs. dealing with disease

## **UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship**

- 3.1 Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship.
- 3.2 Understanding the meaning of Trust; Difference between intention and competence.
- 3.3 Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship.
- 3.4 Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals.
- 3.5 Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives

## **UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence**

- 4.1 Understanding the harmony in the Nature.
- 4.2 Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature.
- 4.3 Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- 4.4 Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

## **UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics**

- 5.1 Natural acceptance of human values.
- 5.2 Definitiveness of Ethical Human Conduct.
- 5.3 Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order.
- 5.4 Competence in professional ethics: a. Ability to utilize the professional competence for

augmenting universal human order b. Ability to identify the scope and characteristics of people- friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above productionsystems.

5.5 Case studies of typical holistic technologies, management models and productionsystems.

5.6 Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

5.7 Sumup.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial)

Sessions eg.to discuss the conduct as an engineer or scientist etc.

## **TEXTBOOK**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, ExcelBooks, New Delhi,2010

## **REFERENCEBOOKS**

- 1 Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
- 2 Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi,2004.
- 3 The Story of Stuff(Book).
- 4 TheStoryofMyExperiments withTruth- byMohandas KaramchandGandhi
- 5 Small is Beautiful - E. F.Schumacher.
- 6 Slow is Beautiful - CecileAndrews
- 7 Economy of Permanence - JCKumarappa
- 8 Bharat Mein Angreji Raj -PanditSunderlal
- 9 Rediscovering India - byDharampal
- 10 Hind Swaraj or Indian Home Rule - by Mohandas K.Gandhi
- 11 India Wins Freedom - Maulana Abdul KalamAzad
- 12 Vivekananda - Romain Rolland(English)
- 13 Gandhi - Romain Rolland(English)

## **COURSE OUTCOMES**

At the end of this course, students will able to

1. Become more aware of themselves, and their surroundings (family, society, nature);
2. Become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
3. Havebettercriticalability.
4. Becomesensitivetotheircommitmenttowards what they have understood (human values, human relationship and human society).
5. Apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in thisdirection.
6. This is only an introductory foundational input. It would be desirable to follow it up by
  - a) faculty-student or mentor-mentee programs throughout their time with theinstitution
  - b) Higher level courses on human values in every aspect of living. E.g. as aprofessional



Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	-
CO2	-	3	3	-	-	-	-	-	-	-	-	-	-	3	3
CO3	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	3	-	-	2		-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	2	2	-	2	-	-	-

22ITCP408	OPERATING SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

## COURSE OBJECTIVES

- To learn basic UNIX / LINUX commands
- To develop programs in Linux environment using system calls.
- To implement process synchronization mechanisms in operating systems.
- To learn various process management schemes in operating systems.
- To practice with the important memory management mechanisms.

## LIST OF EXERCISES

1. Study of basic UNIX/Linux commands
2. Shell Programming - I
  - a) To Write a Shell program to count the number of words in a file.
  - b) To Write a Shell program to calculate the factorial of a given number.
  - c) To write a Shell program to generate Fibonacci series.
  - d) Write a Shell Program to wish the user based on the login time.
3. Shell Programming - II
  - a) Loops
  - b) Patterns
  - c) Expansions
  - d) Substitutions
4. Programs using the following system calls of UNIX/Linux operating system: fork, exec, getpid, exit, wait, close, stat, open dir, read dir.
5. Process control system calls - demonstration of fork, exec and wait
6. Deadlock avoidance using semaphores.
7. Program to simulate preemptive and non-preemptive process scheduling algorithms.
8. Implementation of process scheduling
9. Illustrated of inter process communication strategies
10. Implementation of mutual exclusion by semaphores

11. Deadlock prevention & avoidance algorithms
12. Virtual memory: paging and segmentation
13. Implementation of page replacement algorithms
14. Implementation of disk scheduling algorithms
15. Implementation of file structures

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Understand and implement basic services and functionalities of the operating system using system calls.
2. Use modern OS system calls and synchronization libraries in software/hardware interfaces and understand the benefits of thread over process and implement synchronized programs using multithreading concepts.
3. Analyze various IPC techniques in the operating system, implement memory management schemes and page replacement schemes and simulate file allocation and organization techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	3	2	-	-	-	2	2	-	1	2	3	2
CO2	3	3	3	3	2	-	-	-	2	2	-	1	2	3	2
CO3	3	3	2	3	2	-	-	-	2	2	-	1	2	3	2

22ITCP409	COMPUTER GRAPHICS AND MULTIMEDIA LAB	L	T	P	C
		0	0	3	2

## COURSE OBJECTIVES

- To develop, design and implement two dimensional and three dimensional graphical structures.
- To provide knowledge in OpenGL programming.
- To understand various aspects of multimedia and to learn the concept of sound, images and videos.

## LIST OF EXERCISES

- 1) Implementation of Bresenham's Algorithm – Line and Circle.
- 2) Implementation of Bresenham's Algorithm – Ellipse.
- 3) Implementation of Line, Circle and Ellipse attributes.
- 4) Two Dimensional transformations – Translation, Rotation, Scaling, Reflection, Shear.
- 5) Cohen Sutherland 2D line clipping and Windowing.
- 6) Sutherland – Hodgeman Polygon clipping Algorithm.
- 7) Three dimensional transformations – Translation, Rotation, Scaling.
- 8) Drawing three dimensional objects and Scenes.

9) Line DDA, chain of diamonds, chessboard.

10) Generating Fractal images

### **GIMP**

1) Creating Logos.

2) Simple Text Animation.

### **Audacity**

1) Silencing, Trimming and Duplicating the Audio Signal.

2) Giving the Advancing Effect to the Audio Signal.

### **Windows Movie Maker**

1) Applying effect to Video.

2) Creating Titles in Video.

### **Swish**

1) Text Effects.

2) Pre-Loader.

### **Flash**

1) Changing the shape of the object.

2) Imaging Viewing using Mask.

### **Photo Impact**

1) Text Effects.

2) Image Slicing.

## **COURSE OUTCOMES**

At the end of this course, students will able to

1. Apply algorithms, to develop, design and implement two dimensional and threedimensional graphical structures.
2. Apply various clipping algorithms using transformation techniques.
3. Analyze algorithms for various projection types.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	2	3	2	2	-	-	-	-	3	-	-	-	3	-	-
<b>CO2</b>	3	2	2	2	-	-	-	-	3	-	-	-	-	3	-
<b>CO3</b>	3	3	2	2	-	-	-	-	3	-	-	-	-	3	-

<b>22ITCP410</b>	<b>COMPUTER NETWORKS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## **COURSE OBJECTIVES**

- To understand the working principle of various communication protocols.
- To analyze the various routing algorithms.
- To know the concept of data transfer between nodes.

## LIST OF EXERCISES

- 1) Implementation of a socket program for Echo/Ping/Talk commands.
- 2) Creation of a socket between two computers and enable file transfer between them.  
Using (a.) TCP (b.) UDP
- 3) Implementation of a program for Remote Command Execution (Two M/Cs may be used).
- 4) Implementation of a program for CRC and Hamming code for error handling.
- 5) Writing a code for simulating Sliding Window Protocols.
- 6) Create a socket for HTTP for web page upload & Download.
- 7) Write a program for TCP module Implementation.(TCP services).
- 8) Write a program to implement RCP (Remote Capture Screen).
- 9) Implementation (using NS2/Glomosim) and Performance evaluation of the following routing protocols:
  - a. Shortest path routing
  - b. Flooding
  - c. Link State
  - d. Hierarchical
- 10) Broadcast /Multicast routing.
- 11) Implementation of ARP.
- 12) Throughput comparison between 802.3 and 802.11.
- 13) Study of Key distribution and Certification schemes.
- 14) Design of an E-Mail system
- 15) Implementation of Security Compromise on a Node using NS2 / Glomosim
- 16) Implementation of Various Traffic Sources using NS2 / Glomosim

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand OSI Reference Model and in particular have a good knowledge of Layers.
2. Working knowledge of datagram and internet socket programming
3. Implement and compare the various routing algorithms and analyze the various simulation tools.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	1	-	-	-	1	1	2	2	2	1	2	2	2	2
<b>CO2</b>	2	1	2	1	2	1	-	2	2	2	2	2	2	1	1
<b>CO3</b>	2	2	2	1	1	1	1	2	1	2	1	2	2	2	2

## FIFTH SEMESTER

22ITPC501	THEORY OF COMPUTATION	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce and explain the method of constructing Regular Expression, NFA, DFA and Minimal DFA.
- To learn types of grammars and eliminate useless symbols, unit and null productions.
- To introduce the concepts of pushdown automata.
- To provide in-depth understanding of Turing machine and its applications.
- To impart knowledge about decidable and undecidable problems.

### UNIT- I Finite Automata

Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA and NFA – Finite Automaton with  $\epsilon$ -moves –Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NFA's with and without  $\epsilon$ -moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

### UNIT- II Grammars

Grammar Introduction– Types of Grammar - Context Free Grammars and Languages–Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions – Null productions – Greibach Normal form – Chomsky normal form – Problems related to CNF and GNF.

### UNIT - III Pushdown Automata

Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL - problems based on pumping Lemma.

### UNIT – IV Turing Machines

Definitions of Turing machines – Models – Computable languages and functions – Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine-Chomskian hierarchy of languages.

### UNIT – V Unsolvable Problems and Computable Functions

Primitive recursive functions –Recursive and recursively enumerable languages - Universal Turing machine. Measuring and Classifying Complexity: Tractable and Intractable problems-Tractable and possibly intractable problems – P and NP completeness - Polynomial time reductions.

## TEXT BOOKS

1. Hopcroft J.E., Motwani R. and Ullman J.D, “Introduction to Automata Theory, Languages and Computations”, Pearson Education, 2<sup>nd</sup>edition, 2008 (UNIT 1, 2,3).
2. John C Martin, “Introduction to Languages and the Theory of Computation”, Tata McGraw Hill Publishing Company, 3<sup>rd</sup>edition, New Delhi, 2007 (UNIT 4,5).

## REFERENCES

1. Mishra K L P and Chandrasekaran N, “Theory of Computer Science - Automata, Languages and Computation”, Prentice Hall of India, 3<sup>rd</sup>edition,2004.
2. Harry R Lewis and Christos H Papadimitriou, “Elements of the Theory of Computation”, Pearson Education, 2<sup>nd</sup>edition, New Delhi,2003.
3. Peter Linz, “An Introduction to Formal Language and Automata”,NarosaPublishers, 3<sup>rd</sup>edition, New Delhi, 2002.
4. Kamala Krithivasan and Rama. R, “Introduction to Formal Languages, Automata Theory and Computation”, Pearson Education,2009.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Construct NFA, DFA and Minimal DFA
2. Derive a grammar without useless symbols and obtain CNF and GNF
3. Construct pushdown automata for a given context free grammar and language
4. Design a Turing Machine for a given recursively enumerable language
5. Acquire the knowledge on decidable and undecidable problems

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	2	1	-	-	-	-	-	-	-	-	-	3	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	3	1	-	-	-	-	-	-	-	-	3	-	-
CO5	2	2	1	-	-	-	-	-	-	-	-	-	3	-	-

22ITPC502	SYSTEM SOFTWARE AND COMPILER DESIGN	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- View some of the major tasks of the system software of a computer system, focusing on internal working of the hardware and software interface of a typical system.

- Identify and understand the design, function and implementation of assemblers, linkers, loaders, macro processors and system software tools.
- Understand the theory and practice of compiler implementation.
- To learn context free grammars, compiler parsing techniques, construction of syntax trees, symbol tables, intermediate representations and actual code generation.

## **UNIT-I**

Basics of System Software and Assembler, Loaders And Linkers: Introduction – System software and SIC/XE machine architecture-Basic assembler functions: Assembler algorithms and data structures – Machine dependent assembler features – Machine independent assembler features. Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader – Machine dependent loader features – Machine independent loader features.

## **UNIT-II**

Macro Processors and Other System Software: Basic macro processor functions – Macro Definition and Expansion – Macro Processor Algorithm and data structures – Implementation examples: MASM Macro Processor – Text editors – Overview of Editing Process – User Interface-Editor Structure-Interactive Debugging Systems – Debugging functions and capabilities – Relationships with Other parts of the system – User Interface Criteria – Virtual Machines.

## **UNIT-III**

Compiler – Lexical Analysis: Phases of Compiler – Compiler Construction Tools – Lexical Analysis: Role of a Lexical analyzer – input buffering – specification and recognition of tokens – Finite Automata – Designing a lexical analyzer generator – Pattern matching based on NFA.

## **UNIT-IV**

Compiler– Syntax Analysis, Syntax–Directed Translation: Role of Parser – Top–down parsing – recursive descent and predictive parsers (LL) – Bottom–Up parsing – Operator precedence parsing – LR, SLR and LALR parsers – parser generators – syntax–directed translation – S–attributed definition– L–attributed definition.

## **UNIT-V**

Compiler – Code Generation, Optimization: Intermediate languages – graphical representations – DAGs – Three address code-types of three address statements – syntax directed translation into three address code-implementation of three address statements – Code Optimization: Machine dependent and machine independent code generation – Sources of optimization – Code Generation – Semantic stacks – evaluation of expressions – control structures and procedure calls.

## **TEXT BOOKS**

1. Leland Beck, – “System Software-An Introduction to Systems Programming”, Pearson Education, Inc., Third Edition, 2008
2. A.V. Aho, R. Shethi and J. D. Ullman; “Compilers – Principles, Techniques and Tools”, Pearson Education, Second Edition, 2002.

## REFERENCES

1. D.M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw Hill Company, Second Edition, 2009.
2. John J. Donovan, "Systems Programming", Tata McGraw Hill Company, Second Edition, 2000.
3. V. Raghavan, "Principles of Compiler Design", Tata McGraw Hill Education Publishers, 2010.
4. Srimanta Pal, "Systems Programming", Oxford University Press, 2011.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Illustrate system software such as assemblers, loaders, linkers.
2. Discuss about macro processor for implementing different concepts of system software.
3. Design and develop lexical analyzers and finite automata.
4. Design algorithm for parser.
5. Understand the concept of intermediate code generation technique.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	1	2	1	3	1	1
CO2	3	3	2	2	2	-	-	-	-	1	2	1	3	1	1
CO3	3	2	2	2	2	-	-	-	-	1	2	1	3	1	1
CO4	3	2	2	2	2	-	-	-	-	1	2	2	3	1	1
CO5	3	2	2	2	2	-	-	-	-	1	2	1	3	1	1

22ITPC503	WEB ESSENTIALS				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To comprehend and analyze the basic concepts of web programming and internet protocols.
- To describe how the client-server model of Internet programming works.
- To demonstrate the uses of scripting languages
- To write simple scripts for the creation of web sites
- To create database applications

## UNIT I WEBSITE BASICS

Internet Overview - Fundamental computer network concepts - Web Protocols - URL – Domain Name- Web Browsers and Web Servers- Working principle of a Website –Creating a Website - Client-side and server-side scripting



## **UNIT II WEB DESIGNING**

HTML – Form Elements - Input types and Media elements - CSS3 - Selectors, Box Model, Backgrounds and Borders, Text Effects, Animations, Multiple Column Layout, User Interface.

## **UNIT III CLIENT-SIDE PROCESSING AND SCRIPTING**

JavaScript Introduction – Variables and Data Types-Statements – Operators - Literals-FunctionsObjects-Arrays-Built-in Objects- Regular Expression, Exceptions, Event handling, Validation - JavaScript Debuggers.

## **UNIT IV SERVER SIDE PROCESSING AND SCRIPTING – PHP**

PHP - Working principle of PHP - PHP Variables - Constants - Operators – Flow Control and Looping - Arrays - Strings - Functions - File Handling - File Uploading – Email Basics - Email with attachments - PHP and HTML - Simple PHP scripts - Databases with PHP

## **UNIT V SERVLETS AND DATABASE CONNECTIVITY**

Servlets: Java Servlet Architecture – Servlet Life cycle- Form GET and POST actions - Sessions – Cookies – Database connectivity - JDBC  
Creation of simple interactive applications - Simple database applications

## **TEXT BOOKS**

1. Robin Nixon, "Learning PHP, MySQL, JavaScript, CSS & HTML5", Third Edition, O'Reilly publishers, 2014.
2. Paul Deitel, Harvey Deitel, Abbey Deitel, "Internet & World Wide Web - How to Program", 5th edition, Pearson Education, 2012.

## **REFERENCES**

1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.
2. James F. Kurose, "Computer Networking: A Top-Down Approach", Sixth Edition, Pearson Education, 2012
3. Steven Holzener, "PHP – The Complete Reference", 1st Edition, Mc-Graw Hill, 2017
4. Fritz Schneider, Thomas Powell, "JavaScript – The Complete Reference", 3rd Edition, McGraw Hill Publishers, 2017
5. Bates, "Developing Web Applications", Wiley Publishers, 2006

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Apply JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
2. Create simple PHP scripts
3. Design and deploy simple web-applications.
4. Create simple database applications.
5. Handle multimedia components

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	3	2	3	2	-	-	2	2	2	3	3	2	1
<b>CO2</b>	3	3	3	3	3	2	-	-	2	-	2	3	3	2	1
<b>CO3</b>	3	3	3	2	3	2	-	-	2	2	2	3	3	2	1
<b>CO4</b>	3	3	3	3	3	1	-	-	1	1	2	3	3	2	1
<b>CO5</b>	3	3	3	3	3	1	-	-	-	-	2	3	3	2	1

<b>22ITPC504</b>	<b>SOFTWARE ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand the phases of development of a Software Project.
- To understand the major considerations for enterprise integration and deployment concepts of Requirements engineering and Analysis Modeling.
- To learn various testing, maintenance measures and risk management methods.
- To learn the Software quality management and configuration management concepts.
- To understand Software estimation and risk management.

### **UNIT-I**

The Software process– A Generic Process Model– Perspective Process Models– Specialized Process Models– The Unified Process– Personal and team process models– Agile Development– Extreme Programming (XP) – Requirements Engineering– Requirements Analysis– Establishing the Groundwork– Eliciting Requirements– Developing Use Cases– Negotiating Requirements– Validating Requirements– Requirements Analysis– Scenario– Based Modeling.

### **UNIT-II**

Design concepts– The Design Process– Design Concepts– The Design Model– Architectural Design– Assessing Alternative Architectural Designs– Architectural Mapping Using Data Flow– Component– level design– Designing Class– Based Components– Conducting Component– Level Design– User Interface design– User Interface Analysis and Design– Interface Analysis– Pattern based Design– WebApp design– WebApp Design Quality– WebApp Interface design.

### **UNIT-III**

Quality Management– Software Quality– The Software Quality Dilemma– Achieving Software Quality– Review techniques– Cost Impact of Software Defects– Defect Amplification and Removal– Review Metrics and Their Use– Informal Reviews– Formal Technical Reviews– Software Quality Assurance– Test Strategies for Conventional Software– Test Strategies for Object– Oriented Software– SQA Tasks, Goals, and Metrics– Statistical

Software Quality Assurance-A Strategic Approach to Software Testing–System Testing–The Art of Debugging.

#### **UNIT–IV**

Software Configuration Management–The SCM Repository–The SCM Process–Configuration Management for WebApps–A Framework for Product Metrics–Metrics for the Requirements Model–Metrics for the Design Model– Project Management concepts– The management spectrum–People-The Product– The Process–Metrics in the Process and Project Domains.

#### **UNIT–V**

Software Project Estimation–Decomposition Techniques–Empirical Estimation Models–The Make/Buy Decision–Project Scheduling–Defining a Task Set for the Software Project–Defining a Task Network–Reactive versus Proactive Risk Strategies–Risk Identification–Risk Projection–Risk Refinement–The RMMM Plan–Business Process Reengineering–Software Reengineering–Reverse Engineering–Restructuring–Forward Engineering–The SPI Process–The CMMI–The People CMM–SPI Return on Investment–SPI Trends.

#### **TEXT BOOKS**

1. Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, Seventh Edition, McGraw Hill International Edition, 2010.
2. Ian Sommerville, “Software Engineering”, 9th Edition, Pearson Education Asia, 2011.

#### **REFERENCES**

1. Rajib Mall, “Fundamentals of Software Engineering”, Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, “Software Engineering, A Precise Approach”, Wiley India, 2010.
3. Kelkar S.A., “Software Engineering”, Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, “Software Engineering”, Tata McGraw–Hill Publishing Company Limited, 2007.
5. Nasib Singh Gill, “Software Engineering”, Khanna Publishing House.
6. K.K. Aggarwal & Yogesh Singh, “Software Engineering”, New Age International.

#### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Comprehend the basic elements of Software Project Models.
2. Visualize the significance of the different kind of Software Testing methods.
3. Ability to analyze the strategies in Software Designing.
4. Understand the significance of Software Reengineering.
5. Estimate the cost of software, risks of handling, do software planning and configuration management.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
<b>CO2</b>	3	-	-	-	3	-	-	-	3	3	3	3	3	-	-
<b>CO3</b>	3	3	3	3	3	3	3	-	3	3	3	2	3	3	-
<b>CO4</b>	3	2	1	-	-	-	3	-	3	-	3	-	3	2	2
<b>CO5</b>	3	3	-	3	1	-	-	-	3	3	3	3	-	3	1

<b>22ITCP508</b>	<b>SYSTEM SOFTWARE AND COMPILER DESIGN LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### **COURSE OBJECTIVES**

- Be familiar with the main features of C language
- Understands Assembler and loader paradigm
- Apply the concepts of parser

### **LIST OF EXERCISES (SYSTEM SOFTWARE)**

1. Implementation of Token Separation.
2. Implementation of Symbol table Manipulation
3. Implementation of pass one of Two pass Assembler
4. Implementation of pass Two of Two pass Assembler
5. Implementation of one pass Assembler
6. Simulation of absolute loader
7. Simulation of Linking Loader
8. Implementation of Inter-process Communication
9. Implementation of Macro Substitution
10. Design of Editor

### **LIST OF EXERCISES (COMPILER DESIGN)**

1. Design a lexical analyzer for given language and the lexical analyzer should ignore redundant spaces, tabs and new lines. It should also ignore comments. Although the syntax specification states that identifiers can be arbitrarily long, you may restrict the length to some reasonable value. Simulate the same in C language.
2. Write a C program to identify whether a given line is a comment or not
3. Write a C program to recognize strings under 'a', 'a\*b+', 'abb'
4. Write a C program to test whether a given identifier is valid or not.
5. Write a C program to simulate lexical analyzer for validating operators
6. Implement the lexical analyzer using JLex, flex or other lexical analyzer generating tools.

7. Write a C program for implementing the functionalities of predictive parser for the mini language specified in Note 1
8. Write a C program for constructing of LL (1) parsing.
9. Write a C program for constructing recursive descent parsing.
10. Write a C program to implement LALR parsing

### COURSE OUTCOMES

At the end of this course, students will able to

1. Understand and use of assembler and loader.
2. Understand and define the role of lexical analyzer, use of regular expression and transition diagrams.
3. Understand and use Context free grammar, and parse tree construction.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	-	-	-	-	1	1	1	2	1	-
CO2	3	3	2	1	1	-	-	-	-	1	1	1	3	1	-
CO3	3	3	2	1	1	-	-	-	-	1	1	1	3	1	-

22ITCP509	WEB ESSENTIALS LAB				L	T	P	C
					0	0	3	1.5

### COURSE OBJECTIVES

- To analyze, create interactive and dynamic websites.
- To demonstrate the uses of scripting languages
- To write simple scripts for the creation of web sites
- To create database applications

### LIST OF EXERCISES

1. Creation of interactive web sites - Design using HTML and authoring tools
2. Form validation using JavaScript
3. Creation of simple PHP scripts
4. Handling multimedia content in web sites
5. Write programs using Servlets:
  - i. To invoke servlets from HTML forms
  - ii. Session tracking using hidden form fields and Session tracking for a hit count
7. Creation of information retrieval system using web, PHP and MySQL
8. Creation of personal Information System

### COURSE OUTCOMES:

At the end of this course, the students will be able to:

1. Apply JavaScript, HTML and CSS effectively to create interactive and dynamic websites.
2. Create simple PHP scripts and design and deploy simple web-applications.
3. Create simple database applications and Handle multimedia components

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	3	3	3	-	-	-	-	-	-	-	3	2	2
<b>CO2</b>	3	3	3	3	2	-	-	-	2	-	-	-	3	2	1
<b>CO3</b>	3	3	3	3	2	-	-	-	1	-	-	-	3	2	1

<b>22ETIT511</b>	<b>INDUSTRIAL TRAINING / RURAL INTERNSHIP / INNOVATION / ENTREPRENEURSHIP</b>	<b>L</b>	<b>TR</b>	<b>S</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>

Note: \*- Four weeks during the summer vacation before the end of Fourth semester

### **COURSE OBJECTIVES**

- To expose the students to understand technical and professional skill requirements in IT industries.
- To impart professional skills for solving problems in industries.
- To train the students to design innovative solutions for a problem.
- To motivate the students to become an Entrepreneur.
- To develop communication and technical report writing skill.

The students will work for two periods per week guided by student counselor. They will be asked to present a seminar of not less than 15 minutes and not more than 30 minutes on any technical topic of student's choice related to Information Technology and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation, the report and also on the interaction shown during the seminar.

The students will individually undertake a training program in reputed concerns in the field of Information Technology during summer vacation (at the end of fourth semester) for a minimum stipulated period of four weeks. At the end of training the student has to submit the detailed report on the training undertaken within ten days from the commencement of the fifth semester. The student will be evaluated by a team of staff members nominated by the Head of the Department through a viva-voce examination.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the day-to-day job in IT industries, and technical and professional skills needed for an industry.
2. Develop and refine technical and professional skills through hands-on work experience.
3. Design an innovative solution for an Industry requirement by applying the knowledge learned from industry and in academics.
4. Develop a startup for product or services based on the people or industry requirements.
5. Communicate effectively the knowledge learned in internship through document and PowerPoint presentation.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1	-	-	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	1	2	2	-	-	-	-	-	-	-	-	3	-	3	-
<b>CO3</b>	1	-	2	1	2	-	-	-	-	-	-	-	-	2	3
<b>CO4</b>	1	-	-	-	-	-	-	-	2	-	2	1	-	2	3
<b>CO5</b>	1	-	-	-	2	-	-	-	-	3	-	-	-	2	3

## SIXTH SEMESTER

22ITPC601	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- Be familiar with the concepts of Data Warehouse.
- Acquainted with the tools and techniques used for Knowledge Discovery in Databases.
- Contented with the concepts of Data Mining.
- Learn and know the concepts of mining, Classification, prediction and Association rule mining and its application in Data Mining.
- Acquire the knowledge of Cluster Analysis and its applications in Data Mining.

### UNIT-I

Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Clean-up, and Transformation Tools –Metadata.

### UNIT-II

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multi-relational OLAP – Categories of Tools – OLAP Tools and the Internet.

### UNIT-III

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse -Issues –Data Pre-processing.

### UNIT-IV

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining – Classification and Prediction – Basic Concepts – Decision Tree Induction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

### UNIT-V

Cluster Analysis – Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods – Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data – Constraint – Based Cluster Analysis – Outlier Analysis – Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.

### TEXT BOOKS

1. Alex Berson and Stephen J.Smith, “Data Warehousing, Data Mining and OLAP”, Tata McGraw Hill Edition, Thirteenth Reprint, 2008.



2. Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

## REFERENCES

1. Pang–Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Person Education, 2007.
2. K.P. Soman, Shyam Diwakar and V. Aja, “Insight into Data Mining Theory and Practice”, Eastern Economy Edition, Prentice Hall of India, 2006.
3. G.K. Gupta, “Introduction to Data Mining with Case Studies”, Eastern Economy Edition, Prentice Hall of India, 2006.
4. Daniel T.Larose, “Data Mining Methods and Models”, Wiley–Interscience, 2006.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Build Data Warehousing and methods to use large data sets.
2. Use different tools available for Data Warehousing, OLAP and Data Mining.
3. Imply the use of Data Mining applications in different fields.
4. Apply, Compare and contrast Data Mining techniques for Prediction and Association Rule Mining.
5. Equate and distinct the various Clustering Methods and its applications in Data Mining.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	2	2	1	1	1	1	2	1	1	3	2	3
<b>CO2</b>	3	3	2	2	2	1	1	1	1	2	1	1	3	3	2
<b>CO3</b>	3	2	2	2	2	1	1	1	1	2	1	1	3	2	3
<b>CO4</b>	3	3	2	2	2	1	1	1	1	2	1	2	3	2	2
<b>CO5</b>	3	3	2	2	1	1	1	1	1	2	1	2	3	3	2

<b>22ITPC602</b>	<b>MOBILE COMPUTING</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

## UNIT I INTRODUCTION

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA

## **UNIT II MOBILE TELECOMMUNICATION SYSTEM**

Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover - Security

## **UNIT III MOBILE NETWORK LAYER**

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks ( VANET) –MANET Vs VANET – Security.

## **UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER**

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

## **UNIT V MOBILE PLATFORMS AND APPLICATIONS**

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

## **TEXT BOOKS**

1. Jochen Schiller, —Mobile Communications, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, —Fundamentals of Mobile Computing, PHI Learning Pvt.Ltd, New Delhi – 2012

## **REFERENCES**

1. Dharma Prakash Agarwal, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. William.C.Y.Lee, “Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toth, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.
5. Android Developers : <http://developer.android.com/index.html>
6. Apple Developer : <https://developer.apple.com/>
7. Windows Phone DevCenter : <http://developer.windowsphone.com>
8. BlackBerry Developer : <http://developer.blackberry.com>

## **COURSE OUTCOMES**

At the end of this course, students will able to

1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1		-	1	-	-	-	1	-	-	3	-	-
CO2	3	1	3		1	1	-	-	-	1	1	1	-	2	-
CO3	3	2	2	1	2	2	-	-	-	2	2	2	-	-	2
CO4	3	3	2	1	1	1	-	-	-	1	1	1	-	-	2
CO5	3	3	2	1	1	1	-	-	-	1	1	1	-	-	2

22ITCP607	DATA MINING LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To determine the factors such as price, product positioning
- To resolve staff skills, and economic indicators
- To analyze competition, and customer demographics

### LIST OF EXERCISES

1. Write a note on KDD process
2. Study about different tools: Weka, Rapidminer, XLMiner, Hadoop
3. Introduction to the classification of Mining techniques
4. Introduction to Decision Tree and Neural Networks
5. Creation of Data Warehouse
6. Listing applications for mining
7. File format for data mining
8. Conversion of various data files
9. Training the given dataset for an application
10. Testing the given dataset for an application
11. Generating accurate models
12. Data pre-processing – data filters
13. Feature selection
14. Web mining
15. Text mining
16. Design of fact & dimension tables
17. Generating graphs for star schema.
18. Write a program to implement apriorialgorithm in c language
19. Demonstration of Association rule processon dataset contactlenses.arff using apriorialgorithm
20. Demonstration of Association rule process ondataset supermarket.arff using apriorialgorithm

21. To perform classification using Bayesian classification algorithm using R.
22. To perform the cluster analysis by k-means method using R.
23. To perform the hierarchical clustering using R programming.
24. Study of Regression Analysis using R programming.
25. Outlier detection using R programming.

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Learn the different approaches of data warehousing with various technologies to perform the operations of OLAP.
2. Perform data analysis using R programming.
3. Analyze and evaluate the performance of Classification, Clustering, Association Rule Mining using Weka Tool.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	2	2	1	2	-	1	2	3	3	2
CO2	3	3	2	2	-	1	2	-	1	-	2	2	3	3	2
CO3	2	2	3	1	-	-	-	-	2	-	1	3	1	2	1

22ITCP608	NETWORK SECURITY LAB	L	T	P	C
		0	0	3	1.5

## COURSE OBJECTIVES

- To get exposure to the different cipher techniques
- Learn to generate digital signature
- Learn to use network security tools.
- Study Intrusion Detection System
- Understand security threats in wireless network

## LIST OF EXERCISES

1. Implement the following substitution & transposition techniques:
  - a. Caesar Cipher
  - b. Playfair Cipher
  - c. Hill Cipher
  - d. Vigenere Cipher
  - e. Rail fence-row & Column Transformation
2. Implement the following algorithms
  - a. DES
  - b. RSA Algorithm
  - c. Diffie-Hellman Algorithm
  - d. MD5

e. SHA-1

3. Implement the SIGNATURE SCHEME-Digital Signature Standard
4. Demonstrate how to provide secure data storage, secure data transmission and for creating digital signatures (GnuPG).
5. Setup a honey pot and monitor the honeypot on network (KF Sensor)
6. Installation of rootkits and study about the variety of options
7. Perform wireless audit on an access point or a router and decrypt WEP and WPA.(Net Stumbler)
8. Demonstrate intrusion detection system (ids) using any tool (snort or any other s/w)

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Implement the Cryptographic algorithms
2. Apply message Authentication Codes and digital Signature Techniques
3. Detect threats in Wireless network

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2
CO2	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2
CO3	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2

## SEVENTH SEMESTER

22ETHS701	ENGINEERING ETHICS	L	T	P	C
		2	0	0	2

### Course Objectives:

- To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
- To familiarize about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards,
- To educate the Safety and Risk, Risk Benefit Analysis.
- To teach about the Collegiality and Loyalty, Collective Bargaining, Confidentiality, Occupational Crime, Professional, Employee, Intellectual Property Rights.
- To impart knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.

### UNIT-I-Introduction

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

### UNIT-II Challenges

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.

### UNIT – III Risk Analysis

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

### UNIT – IV Loyalty

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

### UNIT – V Business Ethics

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

### TEXT BOOKS

1. Govindarajan M, Natarajan S and Senthilkumar V S, "Professional Ethics and Human values", PHI Learning, New Delhi,2013.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York,2005.

### REFERENCES

1. CharlesEHarris,MichaelSPritchardandMichaelJRabins, "Engineering Ethics –

Concepts and Cases”, Thompson Learning, 2000.

2. Charles D Fleddermann, “Engineering Ethics”, Prentice Hall, NewMexico, 1999. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education,2003.
3. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press,2001.
4. David Ermann and Michele S Shauf, “Computers, Ethics and Society”, Oxford University Press,2003.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the basic concepts of engineering Ethics.
2. Analyze the importance of codes in engineering practice.
3. Comprehend the Risk analysis in Ethics.
4. Describe about Collegiality and Loyalty.
5. Acquire knowledge on Business Ethics.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	-	-	1	1	3	-	-	-	-	-	-	3
CO2	2	-	-	-	-	2	-	3	-	-	-	-	-	-	3
CO3	1	-	-	-	-	2	-	3	-	-	-	-	-	-	3
CO4	1	-	-	-	-	2	-	3	-	-	-	-	-	-	3
CO5	1	-	-	-	-	1	2	3	-	-	-	-	-	-	3

22ITPC702	SOFTWARE PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the various cost estimation models.
- To learn the process of Project kickoff and tracking.
- To understand the use of umbrella activities in project management.
- To learn the project management issues in testing and maintenance phase.
- To appreciate the challenges in people management.

## UNIT I

Project Management Process Framework: phases, Artifacts, workflows, checkpoints – Software Management disciplines: planning, organization, responsibilities, automation – Problems in Software cost estimation – function point models – COCOMO model- Delphi method.

## **UNIT II**

Project initiation – Project Planning and tracking: what, cost, when and how – organisational processes: assigning resources, project tracking – Project Closure: when and how, metrics, Critical path – Tracking - Timeline chart – Earned value chart.

## **UNIT III**

Metrics: Roadmap, measure, setting target and track, minimise variability, act, checklist and tools – Software Configuration Management: basic definitions, processes and activities, status accounting, audit, SCM in geographically distributed teams, metrics – Risk management: cycle, identification, quantification, monitoring, mitigation, risks in global project teams.

## **UNIT IV**

Project Management in testing phase: Test Scheduling, types of tests, people issues in testing, management structures for testing in global teams, metrics – Project Management in the maintenance phase: activities, Management issues, Configuration management, skill sets, Estimation of size, effort and people resources, metrics – Impact of the internet on project Management.

## **UNIT V**

Globalisation Issues: Evolution, Challenges in building Global Teams, Models, effective management techniques – People Focused Process Models: Need for People centric models, P-CMM, other models, criteria to choose the models.

## **TEXT BOOK**

1. Gopaldaswamy Ramesh, “Managing Global Software Projects”, Tata McGraw Hill Publishing Company, New Delhi, 2002.

## **REFERENCES**

1. Bob Hughes, Mikecatterell, “Software Project Management”, Third Edition, Tata McGraw Hill, 2004.
2. Anna Murray, “The Complete Software Project Manager: Mastering Technology from Planning to Launch and Beyond”, John Wiley & Sons, 2016.
3. Robert T. Futrell, “Quality Software Project Management”, PHI, 2002
4. Stark, John, “Decision Engineering: Product Lifecycle Management: 21st Century Paradigm for Product Realisation”, 2<sup>nd</sup> Edition, 2011, Springer London.
5. Royce W, “Software Project management: A Unified Framework”, Addison Wesley, 1998.

## **COURSE OUTCOMES**

At the end of this course, students will be able to

1. Compare the various elements of software management process framework.
2. Able to plan and track software project.
3. Explain existing risk and apply risk assessment.
4. Design software metric for software project management.
5. Outline the global issues in geographically distributed development.



Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	-	-	-	-	-	-	-	-	2	3	-	-	-
CO2	3	3	3	3	3	-	1	-	3	-	3	2	-	3	-
CO3	3	3	-	3	-	3	3	3	3	3	3	-	-	3	-
CO4	3	2	3	2	-	-	-	-	3	-	2	-	3	2	2
CO5	3	3	-	-	-	3	3	-	-	-	1	3	-	-	3

21ETIT707	<b>INDUSTRIAL TRAINING / RURAL INTERNSHIP / INNOVATION / ENTREPRENEURSHIP</b>				<b>L</b>	<b>TR</b>	<b>S</b>	<b>C</b>
					<b>0</b>	<b>0</b>	<b>0</b>	<b>4</b>

Note:\*- Four weeks during the summer vacation before the end of sixth semester

### COURSE OBJECTIVES

- To expose the students to understand technical and professional skill requirements in IT industries.
- To impart professional skills for solving problems in industries.
- To train the students to design innovative solutions for a problem.
- To motivate the students to become an Entrepreneur.
- To develop communication and technical report writing skill.

The students will work for two periods per week guided by student counselor. They will be asked to present a seminar of not less than 15 minutes and not more than 30 minutes on any technical topic of student's choice related to Information Technology and to engage in discussion with audience. They will defend their presentation. A brief copy of their presentation also should be submitted. Evaluation will be done by the student counselor based on the technical presentation, the report and also on the interaction shown during the seminar.

The students will individually undertake a training program in reputed concerns in the field of Information Technology during summer vacation (at the end of sixth semester) for a minimum stipulated period of four weeks. At the end of training the student has to submit the detailed report on the training undertaken within ten days from the commencement of the seventh semester. The student will be evaluated by a team of staff members nominated by the Head of the Department through a viva-voce examination.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the day-to-day job in IT industries, and technical and professional skills needed for an industry.
2. Develop and refine technical and professional skills through hands-on work

- experience.
3. Design an innovative solution for an Industry requirement by applying the knowledge learned from industry and in academics.
  4. Develop a startup for product or services based on the people or industry requirements.
  5. Communicate effectively the knowledge learned in internship through document and PowerPoint presentation.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1	-	-	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	1	2	2	-	-	-	-	-	-	-	-	3	-	3	-
<b>CO3</b>	1	-	2	1	2	-	-	-	-	-	-	-	-	2	3
<b>CO4</b>	1	-	-	-	-	-	-	-	2	-	2	1	-	2	3
<b>CO5</b>	1	-	-	-	2	-	-	-	-	3	-	-	-	2	3

## EIGHTH SEMESTER

<b>21ITPV803</b>	<b>PROJECT WORK AND VIVA VOCE</b>	<b>L</b>	<b>PR</b>	<b>S</b>	<b>C</b>
		<b>0</b>	<b>10</b>	<b>2</b>	<b>6</b>

### COURSE OBJECTIVES

- To inculcate the ability of the student to solve specific problems right from its identification.
- To review literatures based on the problem statement.
- To label methodology for solving the problem.
- To solve problems using modern tools if required.
- To impart the students in preparing project reports and to defend their reports during evaluation.

### METHOD OF EVALUATION:

- The students in a group of 3 to 4 works on a topic approved by the Head of the Department under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor.
- The progress of the project is evaluated based on a minimum of three reviews. The review committee will be constituted by the Head of the Department.
- A project report is required at the end of the semester.
- The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand and articulate problem statement and identify the objectives of the project.
2. Review the state-of-the-art literature on the topic of the proposed work.
3. Design the methodology of the work in terms of block diagram.
4. Design experiments and conduct investigations of the work using modern IT tools and infer the results in graph, table and charts.
5. Communicate effectively through technical report and PowerPoint presentation.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	3	-	-	-	-	-	-	3	-	3	-	3	-	-
<b>CO2</b>	1	2	-	-	-	-	-	-	3	-	3	3	2	3	-
<b>CO3</b>	1	-	2	-	-	-	-	-	3	-	3	-	-	2	3
<b>CO4</b>	1	-	2	2	2	-	-	-	3	-	3	-	-	2	3
<b>CO5</b>	1	-	-	-	-	-	-	-	3	3	3	3	-	2	3

## PROFESSIONAL ELECTIVES – I

22ITPE505	ARTIFICIAL INTELLIGENCE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn about the fundamentals of artificial Intelligence.
- To understand the principles of various types of agents.
- To expose the students to the concepts of uncertain knowledge, reasoning and planning
- To understand the principles and types of deep neural networks
- To develop applications using deep learning concepts.

### UNIT-I

Introduction: What is AI? - The Foundations of Artificial Intelligence - The History of Artificial Intelligence - The State of the Art - Risks and Benefits of AI. Intelligent Agents: Agents and Environments - Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agents - Problem-Solving Agents - Example Problems. Search Algorithms - Uninformed Search Strategies - Informed (Heuristic) Search Strategies - Local Search and Optimization Problems. Game Theory - Optimal Decisions in Games - Heuristic Alpha--Beta Tree Search - Monte Carlo Tree Search.

### UNIT-II

Logical Agents - Knowledge-Based Agents – Logic - Propositional Logic - Propositional Theorem Proving - Effective Propositional Model Checking - Agents Based on Propositional Logic - Syntax and Semantics of First-Order Logic - Using First-Order Logic - Knowledge Engineering in First-Order Logic. Propositional vs. First-Order Inference - Unification and First-Order Inference - Forward Chaining - Backward Chaining – Resolution - Ontological Engineering - Categories and Objects - Events - Mental Objects and Modal Logic - Reasoning Systems for Categories - Algorithms for Classical Planning.

### UNIT-III

Acting under Uncertainty - Bayes' Rule and Its Use - Representing Knowledge in an Uncertain Domain - The Semantics of Bayesian Networks - Exact Inference in Bayesian Networks - Approximate Inference for Bayesian Networks - Time and Uncertainty - Inference in Temporal Models - Hidden Markov Models - Kalman Filters - Dynamic Bayesian Networks - Relational Probability Models - Open-Universe Probability Models

### UNIT-IV

Combining Beliefs and Desires under Uncertainty - Utility Functions - Multiattribute Utility Functions - The Value of Information - Sequential Decision Problems - Algorithms for MDPs - Bandit Problems - Properties of Multiagent Environments - Non-Cooperative and Cooperative Game Theory - Making Collective Decisions

### UNIT-V

Deep Learning: Simple Feedforward Networks - Computation Graphs for Deep Learning - Convolutional Networks - Learning Algorithms – Generalization - Recurrent Neural

Networks – Applications: Recurrent Neural Networks for NLP - Classifying Images using CNN. Humans and Robots.

## REFERENCES

1. Stuart Russell and Peter Norvig, “Artificial Intelligence: A modern approach”, 4th edition, Pearson, 2020.
2. Elaine Rich and Kevin Knight “Artificial Intelligence”, 3<sup>rd</sup> Edition, Tata Mcgraw-Hill, 2009.

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Understand the concept of Artificial Intelligence,
2. Familiar with search techniques and knowledge representation issues
3. Explore the concepts of uncertain knowledge, reasoning and planning
4. Understand the concepts and types of deep learning
5. Develop various applications using deep learning

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	-	-	-	-	-	-	3	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	3	-
CO3	3	3	2	2	2	-	-	-	-	-	-	-	3	3	-
CO4	1	1	3	3	3	3	-	-	-	-	-	-		3	3
CO5	1	1	3	3	3	3	-	-	-	-	-	-	-	3	3

22ITPE505	COGNITIVE SCIENCE	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To provide an understanding of the central challenges in realizing aspects of human cognition.
- To provide a basic exposition to the goals and methods of human cognition.
- To develop algorithms that use AI and machine learning along with human interaction and feedback to help humans make choices/decisions.
- To support human reasoning by evaluating data in context and presenting relevant findings along with the evidence that justifies the answers.

## UNIT I INTRODUCTION TO COGNITIVE SCIENCE

Understanding Cognition, IBM’s Watson, Design for Human Cognition, Augmented Intelligence, Cognition Modeling Paradigms: Declarative/ logic-based computational



22ITPE505	WIRELESS COMMUNICATION	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- Introduce of wireless communication and mobile communication standards.
- Provide understanding of advanced multiple access techniques, Mobile radio Propagation Models and modulation techniques
- Provide understanding of digital cellular systems (GSM, CDMA, GPRS, W-CDMA etc.)

## UNIT I INTRODUCTION TO WIRELESS COMMUNICATIONS

History and evolution of mobile radio systems. Types of mobile wireless services/systems- Cellular, WLL, Paging, Satellite systems, Standards, Future trends in personal wireless systems.

## UNIT II CELLULAR CONCEPTS AND SYSTEM DESIGN FUNDAMENTALS

Cellular concept and frequency reuse, Multiple Access Schemes, channel assignment and handoff, Interference and system capacity, Trunking and Erlang capacity calculations.

## UNIT III MOBILE RADIO PROPAGATION MODELS

Radio wave propagation issues in personal wireless systems, Propagation models, Multipath fading and Base band impulse respond models, parameters of mobile multipath channels, Antenna systems in mobile radio.

## UNIT IV MODULATION TECHNIQUES

Overview analog and digital modulation techniques, Performance of various modulation techniques-Spectral efficiency, Error-rate, Power Amplification, Equalizing Rake receiver concepts, Diversity and space-time processing, Speech coding and channel coding.

## UNIT V SYSTEM EXAMPLES AND DESIGN ISSUES

Multiple Access Techniques-FDMA, TDMA and CDMA systems, operational systems, Wireless networking, design issues in per-sonal wireless systems

## TEXT BOOKS

1. S. Rappaport, Wireless digital communications; Principles and practice, Prentice Hall, NJ, 1996.
2. Schiller, Mobile Communications; Pearson Education Asia Ltd., 2000.

## REFERENCES

1. Feher, Wireless digital communications, PHI, New Delhi, 1999.
2. C. Y. Lee, Mobile communications engineering: Theory and Applications, Second Edition, McGraw Hill, New York.1998.

## COURSE OUTCOMES

At the end of this course, students will able to

1. Understand principles of wireless communication and various mobile network architecture.
2. Understand various Modulation techniques for Mobile Radio.

3. Understand the information theoretical aspects (such as the capacity) of wireless channels
4. Realize various wireless and mobile cellular communication systems
5. Implement practical mobile applications

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	-	-	-	2	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	3	-	-	-	-	2	-	-	-	-	-	-	3	1
<b>CO3</b>	3	3	3	3	-	2	-	-	-	-	-	-	3	-	-
<b>CO4</b>	2	3	2	2	-	-	-	-	-	-	-	-	2	-	1
<b>CO5</b>	2	2	3	3	3	-	-	-	-	-	-	-	2	-	-

<b>22ITPE505</b>	<b>PRINCIPLES AND PRACTICES OF COMMUNICATION SYSTEM</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To introduce the concepts of various analog modulations and their spectral characteristics.
- To understand the properties of random process.
- To know the effect of noise on communication systems.
- To understand the transmission efficiency and concept.
- To study the limits set by Information Theory.

### **UNIT-I AMPLITUDE MODULATION**

Introduction to Modulation, Need for Modulation, Ordinary Amplitude Modulation – Modulation index, Side bands, AM Power, Double Side Band Suppressed Carrier Modulation, Single Side Band Modulation, Vestigial Side Band Modulation, AM demodulation, Applications of AM.

### **UNIT-II ANGLE MODULATION**

Angle Modulation fundamentals, Frequency Modulation – Modulation index and sidebands, Narrowband FM, Wideband FM, Principles of Phase Modulation, Frequency Modulation verses Amplitude Modulation, FM demodulation, Frequency Division Multiplexing, Applications of FM.

### **UNIT-III SIGNAL SAMPLING AND ANALOG PULSE COMMUNICATION**

Ideal Sampling, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position Modulation.

**DIGITAL COMMUNICATION TECHNIQUES:** Quantization, Digital Transmission of Data, Parallel and Serial Transmission, Data Conversion, Time Division Multiplexing, Pulse Code Modulation, Delta Modulation.



## UNIT-IV TRANSMISSION OF BINARY DATA IN COMMUNICATION SYSTEMS:

Digital Codes, Principles of Digital Transmission, Transmission Efficiency, Modem Concepts and Methods – FSK, BPSK, Error Detection and Correction.

## UNIT-V INFORMATION THEORY

Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memoryless channels – Binary Symmetric Channel, Channel Capacity - Shannon - Hartley law – Source coding theorem - Shannon – Fano & Huffman codes.

### TEXT BOOKS

1. Louis E. Frenzel, “Principles of Electronic Communication Systems”, 3<sup>rd</sup> Edition. Tata Mcgraw Hill.
2. Wayne Tomasi, “Electronic Communications Systems”, 5<sup>th</sup> Edition, Pearson Education.

### REFERENCES

1. Lathi B.P, “Modern Digital and Analog Communication Systems”, Oxford University Press, Third Edition, 2007.
2. Sklar B, “Digital Communication Fundamentals and Applications”, Pearson Education, Second Edition, 2009.
3. Papoulis A, “Probability, Random variables and Stochastic Processes”, McGraw Hill, Third Edition, 1991.
4. Hsu H.P, “Schaum Outline Series - Analog and Digital Communications”, TMH, 2006.
5. Couch L, “Modern Communication Systems”, Pearson, 2001

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Analyze the power and transmission bandwidth of Amplitude and Frequency Modulated signals.
2. Familiarize the process of reproduction of base band signal.
3. Analyze various pulse analog and pulse digital Modulation Techniques.
4. Understand the transmission efficiency and concept.
5. Understand the transmission of binary data in communication systems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	-	-	-	3	-	-	-	-	1	-	3	-	-
CO3	2	2	2	2	2	-	-	-	-	-	-	-	3	2	-
CO4	3	2	2	2	2	-	-	-	-	2	-	1	3	2	-
CO5	3	2	2	2	2	-	-	-	-	-	-	1	3	2	-

22ITPE505	VIRTUALIZATION	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the concept of virtualization.
- To understand the various issues in server virtualization.
- To be familiar with the virtualization of various components/functionalities.
- To compare and analyze about storage virtualization.
- To work with virtualization platforms.

### UNIT I INTRODUCTION TO VIRTUALIZATION

System Architectures – Virtual Machine Basics – Process Virtual Machines – System Virtual Machines – Taxonomy of Virtual Machines – Emulation: Basic Interpretation – Threaded Interpretation – Pre-Coded & Direct Interpretation – Binary Translation – Full and ParaVirtualization – Types of Hypervisor – Types of Virtualization.

### UNIT II SERVER VIRTUALIZATION

Server Virtualization – Partitioning Techniques – Hardware Virtualization – Virtual Hardware – Types of Server Virtualization – Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform.

### UNIT III NETWORK VIRTUALIZATION

Design of Scalable Enterprise Networks – Virtualizing the Campus – WAN Design – WAN Architecture – WAN virtualization – Virtual Enterprise Transport Virtualization – VLANs and Scalability – Theory Network Device Virtualization Layer 2 – VLANs Layer 3 VRF Instances Layer 2 – VFIs Virtual Firewall Contexts Network Device Virtualization – Datapath Virtualization Layer 2: 802.1q – Trunking Generic Routing Encapsulation – IPsec L2TPv3 Label Switched Paths – Control-Plane Virtualization – Routing Protocols – VRF-Aware Routing – Multi-Topology Routing.

### UNIT IV STORAGE VIRTUALIZATION

Hardware Devices – SCSI – SCSI Communication – Using SCSI Buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI SAN Backup & Recovery Techniques – RAID – Classic Storage Model – SNIA Shared Storage Model Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual Tape Libraries.

### UNIT V APPLYING VIRTUALIZATION

Comparison of Virtualization Technologies: Guest OS, Host OS, Hypervisor, Emulation, Kernel Level – Shared Kernel – Enterprise Solutions: VMware Server, ESXi, Citrix Xen Server, Microsoft Virtual PC, Microsoft Hyper-V, Virtual Box – Server Virtualization: Configuring Server with Server Virtualization, Adjusting & Tuning Virtual Servers, VM Backup and Migration – Desktop Virtualization: Terminal Services, Hosted Desktop, Web Based Solutions, Localized Virtualized Desktop – Network and Storage Virtualization: VPN, VLAN, SAN and VSAN, NAS.

## TEXT BOOKS

1. Chris Wolf, Erick M. Halter, “Virtualization: From the Desktop to the Enterprise”, APress, 2005.
2. James E. Smith, Ravi Nair, “Virtual Machines: Versatile Platforms for Systems and Processes”, Elsevier/Morgan Kaufmann, 2005.
3. David Marshall, Wade A. Reynolds, “Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center”, Auerbach Publications, 2006.

## REFERENCES

1. William von Hagen, “Professional Xen Virtualization”, Wrox Publications, January, 2008.
2. Kumar Reddy, Victor Moreno, “Network virtualization”, Cisco Press, July, 2006.
3. Amy Newman, Kenneth Hess, “Practical Virtualization Solutions: Virtualization from the Trenches”, Prentice Hall, October 2009.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the concept of virtualization and discuss various virtual machine products.
2. Perform server virtualization.
3. Explain the concept of network virtualization.
4. Discuss various tasks in storage virtualization.
5. Compile all types of virtualization techniques and utilize them in design of virtual machines.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	-	-	-	-	-	-	2	-	-	3	-	-
<b>CO2</b>	2	3	2	2	-	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	2	2	2	-	-	-	-	-	2	-	-	3	-	-
<b>CO4</b>	3	2	2		-	-	-	-	-	2	-	-	-	3	-
<b>CO5</b>	2	2	3	2	2	-	-	-	-	-	2	-	-	3	-

<b>22ITPE505</b>	<b>SIGNALS AND SYSTEMS</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To introduce the fundamental ideas of signals and systems analysis and characterization.
- To provide a foundation to numerous applications that deal with signal and system concepts directly or indirectly. Application areas of signals and systems include audio and image processing, communications, control systems, machine learning, and finance.

- To serve as a central building block for students interested in further studying information processing in any form.

### **UNIT-I**

Signals and systems as seen in everydaylife, and in various branches of engineering and science.

Energy and power signals, continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability.

### **UNIT-II**

Linear shift-invariant (LSI) systems, impulse response and step response, convolution, input output behavior with a periodic convergent inputs. Characterization of causality and stability of linear shift-invariant systems. System representation through differential equations and difference equations.

### **UNIT-III**

Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and orthogonal bases.

### **UNIT-IV**

The Laplace Transform, notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, poles and zeros of system, Laplace domain analysis, solution to differential equations and system behavior.

The z-Transform for discrete time signals and systems- eigen functions, region of convergence, z-domain analysis.

### **UNIT-V**

State-space analysis and multi-input, multi-output representation. The state-transition matrix and its role. The Sampling Theorem and its implications- Spectra of sampled signals.

Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems.

### **TEXT BOOKS**

1. A.V. Oppenheim, A.S. Willsky and I.T. Young, "Signals and Systems", Prentice Hall, 1983.
2. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
3. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.

### **REFERENCES**

1. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
2. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition, 1999.
3. Simon Haykin, Barry van Veen, "Signals and Systems", John Wiley and Sons (Asia) Private Limited, 1998.
4. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.

5. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.
6. J. Nagrath, S. N. Sharan, R. Ranjan, S. Kumar, "Signals and Systems", TMH New Delhi, 2001.
7. Ashok Ambardar, "Analog and Digital Signal Processing", 2nd Edition, Brooks/ Cole Publishing Company (An international Thomson Publishing Company), 1999.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Analyze and Interpret the properties of Signals and Systems.
2. Apply appropriate transformation techniques including Laplace, Fourier, DTFT transform for efficient analysis of signals.
3. Investigate the response of linear and time-invariant system to an arbitrary input signals.
4. Perform sampling and reconstruction of a signal.
5. Cognize the relation between continuous and discrete time systems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	1	1	2	2	-	-	2	-	3	2	-	1	2
CO3	-	3	3	2	1	1	-	-	-	1	1	3	-	2	-
CO4	-	1	2	-	1	-	-	1	-	1	-	2	-	-	3
CO5	-	1	-	-	-	1	1	-	-	-	2	1	-	-	1

22ITPE505	ETHICAL HACKING				L	T	P	C
					3	0	0	3

### COURSE OBJECTIVES

- To explore practical knowledge about ethical hacking methodology
- To learn the importance of evidence handling and storage for various devices
- To understand different types of attacks and their common prevention mechanisms
- To learn how to investigate attacks, IDS, technical exploits and router attacks and "Trap and Trace" computer networks
- To make a comparison between Black Hat vs. Gray Hat vs. White Hat (Ethical) hacking

### UNIT I ETHICAL HACKING OVERVIEW & VULNERABILITIES

Understanding the importance of security - Concept of ethical hacking and essential Terminologies Threat - Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking

## **UNIT II FOOTPRINTING & PORT SCANNING**

Footprinting - Introduction to foot printing, Understanding the information gathering methodology of the hackers, Tools used for the reconnaissance phase, Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting Enumeration-Introduction, Enumerating windows OS & Linux OS

## **UNIT III SYSTEM HACKING**

Aspect of remote password guessing, Role of eavesdropping ,Various methods of password cracking, Keystroke Loggers, Understanding Sniffers ,Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing.

## **UNIT IV HACKING WEB SERVICES & SESSION HIJACKING**

Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers. Understanding Session Hijacking, Phases involved in Session Hijacking,Types of Session Hijacking, Session Hijacking Tools

## **UNIT V HACKING WIRELESS NETWORKS**

Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLANScanners, WLANSniffers,HackingTools,Securing Wireless Network

## **REFERENCES**

1. Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2010
2. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology, 2010
3. RajatKhare, "Network Security and Ethical Hacking", Luniver Press, 2006
4. Ramachandran V, "BackTrack 5 Wireless Penetration Testing Beginner's Guide", 3<sup>rd</sup> Edition, Packt Publishing, 2011
5. Thomas Mathew, "Ethical Hacking", OSB publishers, 2003
6. Matthew Hickey, Jennifer Arcuri, "Hands on Hacking: Become an Expert at Next Gen Penetration Testing and Purple Teaming", 1st Edition, Wiley, 2020.
7. Jon Ericson, Hacking: The Art of Exploitation, 2<sup>nd</sup>Edition, NoStarch Press, 2008.

## **COURSE OUTCOMES**

At the end of this course, students will able to

1. Perform Vulnerability analysis to identify security loopholes in the target organization's network, communication infrastructure, and end systems
2. Employ Interpretation of the legal framework in relation to ethical hacking
3. Recognize and analyze ethical issues in business
4. Analyze Packet sniffing techniques to discover network vulnerabilities and countermeasures to defend sniffing
5. Develop the ability to Perform foot printing and reconnaissance using the latest foot printing techniques and tools as a critical pre-attack phase required in ethical hacking

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	2	2	1	1	1	1	2	1	1	3	2	3
<b>CO2</b>	3	3	2	2	2	1	1	1	1	2	1	1	3	3	2
<b>CO3</b>	3	2	2	2	2	1	1	1	1	2	1	1	3	2	3
<b>CO4</b>	3	3	2	2	2	1	1	1	1	2	1	2	3	2	2
<b>CO5</b>	3	3	2	2	1	1	1	1	1	2	1	2	3	3	2

<b>22ITPE505</b>	<b>ROBOTIC PROCESS AUTOMATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand the fundamental concepts of Robotics □ To outline types of workflows
- To design of Data Manipulations.
- To understand the applications and plugins.
- To Deploy and maintain the BOT.

### **UNIT I INTRODUCTION TO ROBOTICS**

Robotic Process Automation: What is RPA:Benefits of RPA –Components of RPA –Recorder –Development Studio –Extensions and Plugins –Bot Runner –Control Center. RPA Platforms:Automation Anywhere –UiPath –Blue Prism –Work Fusion.UiPath:UiPath Robot –UiPath Orchestrator.

### **UNIT II TYPES OF WORKFLOWS**

Sequences – Flowcharts –State Machines.Variables:Managing Variables –Naming Best Practices.The Variables Panel:Types of Variables.Arguments:Managing Arguments –Naming Best Practices,The Arguments Panel -Using Arguments.Control Flow:Control Flow Activities -The Assign Activity –The Delay Activity –The While Activity –The Do while Activity –The For each Activity –The If Activity.Task Recorder:Advanced UI interactions –Input Methods –Output Methods.

### **UNIT III DATA MANIPULATION**

Variables and scope:Collections –Arguments – Purpose and Use –Data Table Usage – Building a Data Table. File operation:Read Cell –Write Cell –Read Range –Write Range – Append Range.Taking Control:Finding the Control – Anchor Base – Element Exists – Element Scope – Find Relative Element – Mouse Activities – Send Hotkey. Working with UiExplorer: Handling Events – Element Triggering Events –Hotkey Trigger.Revisit Recorder:Basic Recording –Desktop Recording.

## **UNIT IV APPLICATION WITH PLUGINS**

Terminal plugin: SAP automation –How SAP Automation affects data.Examples where SAP automation. Java plugin: JAVA plugin with UiPath Studio. Citrix automation:Citrix environment work –Mail Plugin -PDF

Plugin –Web Integration –Word Plugins –Excel Plugin –Word Plugin -Credential Management.Events and Assistant Bots:What are Assistant Bots –Event Triggers –Hotkey Trigger –Mouse Trigger –System Trigger.

## **UNIT V DEPLOYING AND MAINTAINING THE BOT**

Publishing using publish utility:workflow in UiPath,Orchestration Server:Queues –Assets – Process – Deploying a process.Server to Control Bots:Robot Statuses –Editing the Robot – Deleting the Robot –Displaying logs for a Robot.Server to deploy bots:Connecting a Robot to Orchestrator –Deploy the Robot to Orchestrator.License management:Activating and uploading a license to Orchestrator.Publishing and Managing Updates:Packages –Managing Packages

## **TEXT BOOKS**

1. Tom Taulli, “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems”, 2020.
2. Nandan Mullakara, “Robotic Process Automation Projects: Build real-world RPA solutions using UiPath and Automation Anywhere”, 2020.
3. Gerardus Blokdyk, “RPA robotic process automation”, SecondEdition,Paper Back, 2018.
4. Craig,J.J., “Introduction to Robotics:Mechanics and Control”, Pearson,New Delhi, 2009.
5. Mark W. Spong, Sdeth Hutchinson, and M. Vidyasagar, “Robot Modelling and Control”, John Wiley and Sons Inc, 2005.

## **REFERENCES**

1. Niku Saeed B., “Introduction to Robotics: Analysis, Systems, Applications”, PHI, New Delhi. 2007.
2. Ghosal, A, “Robotics”, OxfordPress,New Delhi, 2006.
3. Mittal R.K. and Nagrath I.J., “Robotics and Control”, Tata McGraw Hill, 2003.
4. Steve Heath, “Embedded System Design”, 2nd Edition, Newnes, Burlington, 2003.
5. Mukherjee S., “Robotics and Automation”, Khanna Publishing House, Delhi.

## **WEB RESOURCES**

- 1.<https://www.laserfiche.com/ecmblog/what-is-robotic-process-automation-rpa/>
- 2.<https://piazza.com/class/j641h48teqh6ba>
- 3.[https://developer.mozilla.org/en-US/docs/Plugins/Guide/Plug-in\\_Basics](https://developer.mozilla.org/en-US/docs/Plugins/Guide/Plug-in_Basics)
- 4.<https://www.edx.org/>

## **COURSE OUTCOMES**

At the end of this course, students will able to

1. Know the fundamentals and components of the robotic kinematic and dynamic analysis
2. To apply the types of work flows to get input and output
3. To study the Data Manipulations to control the operations of robotics
4. Make use of various applications and plugins



## 5. Deploy and maintain BOT

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	-	-	1	-	-	-	-	-	-	2	1	1	-
CO3	-	3	3	2	1	1	1	-	-	1	2	3	1	2	-
CO4	-	1	2	-	-	3	2	1	2	1	-	2	-	1	3
CO5	-	-	-	-	-	1	1	-	-	-	2	1	-	-	3

22ITPE505	FREE AND OPEN SOURCE SOFTWARE	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn about various open source licenses and implications for users, developers and the software community in general.
- To understand working with MySQL.
- To introduce PHP.
- To introduce to python programming.
- To introduce working with webserver.

### UNIT-I

Introduction to Open sources – Need of Open Sources – Advantages of Open Sources – Application of Open Sources. Open source operating systems: LINUX: Introduction – General Overview – Kernel Mode and user mode-Process – Advanced Concepts – Scheduling – Personalities – Cloning – Signals – Development with Linux.

### UNIT-II

MySQL: Introduction – Setting up account – Starting, terminating and writing your own SQL programs – Record selection Technology – Working with strings – Date and Time – Sorting Query Results – Generating Summary – Working with metadata – Using sequences – MySQL and Web.

### UNIT-III

PHP: Introduction – Programming in web environment – variables – constants – data types – operators – Statements – Functions – Arrays – OOP – String Manipulation and regular expression – File handling and data storage – PHP and SQL database – PHP and LDAP – PHP Connectivity – Sending and receiving E-mails – Debugging and error handling – Security – Templates.



## PROFESSIONAL ELECTIVES – II

22ITPE506	CYBER PHYSICAL SYSTEMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To recognize the scope and scale of the potential impact of Cyber Physical System(CPS) technology
- To analyse cyber physical system models
- To design, develop innovative solutions for the innovative real-world problem
- To learn modelling and simulation of hybrid systems
- To analyse the functional behaviour of existing CPS such as Medical CPS, Energy CPS, Agriculture CPS.

### UNIT I Introduction and Design Principles of Cyber Physical Systems

Cyber Physical Systems Concepts – Internet of Things (IoT), Industrial IoT implications - Industry 4.0 - Design Challenges –Cyber Physical System Controls - Mobile Cyber Physical Systems – Cyber Physical System Security.

### UNIT II Cyber Physical System Components

Wireless Sensors and Actuators - Networks for Cyber Physical Systems - CPS Drivers - Community Sensing - Wireless Embedded Microsystems Architecture – CPS SW stack - The Application of Machine Learning in CPS.

### UNIT III Real Time Systems

Introduction to Real-Time Systems, RTS tasks (WCET), RTS Scheduling (Feedback Scheduling), Fault Tolerance and Robustness (RTS and Control), Hybrid Systems

### UNIT IV Security Issues in Cyber Physical Systems

Analysis for Security Attacks in Cyber Physical Systems – Generalized Framework based on Trust with Privacy - Secure Local Communication – Internet Wide Secure Communication - Intrusion Detection, Prevention, and Privacy of Big Data for Cyber Physical Systems – Security and Privacy for Cloud-Based CPSs – Securely Processing CPS Data in the cloud – Safety Measures.

### UNIT V Medical, Energy and Agriculture Cyber Physical Systems

Emergence of CPS in different applications – Motivation for Medical CPS – System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Practitioners’ Implications – Motivation for Energy CPS - System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Cyber Paradigm for Sustainable SEES. Motivation for Agriculture CPS - System Description and Operational Scenarios, CPS in Aerospace, Biometric CPS, - Case studies.

### TEXT BOOKS

1. Raj Rajkumar, Dionisio de Niz and Mark Klein, “Cyber Physical Systems”, 2017, Pearson Education, Inc, ISBN-13: 978-0-321-92696-8.
2. Houbing Song, Gleena A. Fink and Sabina Jeschke, “Security and Privacy in CyberPhysical Systems, Foundations, Principles, and Applications”, 2018, John Wiley, ISBN: 2017012503.
3. Fei Hu, “Cyber-Physical Systems, Integrated Computing and Engineering Design”, 2013, Taylor and Francis Group, ISBN -13: 978-1-4665-7701-5.
4. Gaddadevara Matt Siddesh, Ganesh Chandra Deka et al., “Cyber-Physical Systems, A computational Perspective”, 2016, Taylor and Francis Group, ISBN -13: 978-14822-5975-

## REFERENCES

1. E. A. Lee and S. A. Seshia, "Introduction to Embedded Systems: A Cyber-Physical Systems Approach", 2017, MIT Press.
2. R. Alur, "Principles of Cyber-Physical Systems," 2015, MIT Press.
3. P. Tabuada, "Verification and control of hybrid systems: a symbolic approach", 2009, Springer-Verlag.

## COURSE OUTCOMES

At the end of this course, students will able to

1. Describe the conceptual models of the Cyber Physical System process.
2. Make use of appropriate techniques to schedule the given tasks in real time systems.
3. Identify the network setup requirements for the given Cyber Physical System design.
4. Solve the issues that arise when building and validating security in CPS models.
5. Analyze the functional behaviour of existing CPS such as Medical CPS, Energy CPS, Agriculture CPS

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	2	3	2	1
CO2	3	2	-	2	-	-	-	-	-	-	-	2	3	3	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	2	-
CO4	3	3	2	2	-	-	1	-	-	-	-	2	2	2	-
CO5	3	3	2	3	-	2	1	-	-	-	-	2	2	2	-

22ITPE506	UI AND UX DESIGN				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To understand user experience design principles
- To understand the various elements and how the elements of user experience work together
- To understand strategy, structure, skeleton and scope as an element of user experience
- To identify business goals, user needs, content requirements
- To create a functional specification and an effective information design
- To learn to prioritize specs and requirements
- To architect information effectively and navigation
- To learn resources available to assist with User Experience Design Process

## UNIT I

UX Introduction: User Interaction with the products, Applications and services, Cognitive Model/Mental Model; Necessity of User Experience Design; Definition of User Experience (UX) Design.

Elements of UX Design: Core elements of User Experience, Working of elements, UX Design Process: Defining the UX Design Process and Methodology.

## **UNIT II**

UX Design Process: Research and define: importance of research, Research methods and tools, Understanding the User needs and goals, Understanding the business goals, Deliverables of the research and define phase-Insight on User goals and business goals, Hands-on assignments and Quiz.

## **UNIT III**

UX Design Process: IDEATE/DESIGN - Visual design principles, Information design and data, Visualization: Interaction design, Information architecture, Wire-framing and storyboarding, UI elements and widgets, Screen design and layouts, Hands-on assignments and quiz.

## **UNIT IV**

UX Design Process: PROTOTYPE and TEST: Necessity of testing your design, Usability testing, Types of usability testing, Usability testing process, Plan for the usability tests, Prototype your design to test, Introduction of prototyping tools, Conduction and preparation of usability test results.

## **UNIT V**

UX Design Process: iterate/improve: Understanding the Usability test findings, Applying the Usability test feedback in improving the design. UX Design Process: Communication with implementation team UX Deliverables to be given to implementation team.

## **TEXT BOOKS**

1. Jesse James Garrett, "The Elements of User Experience: User-Centered Design for the Web and Beyond", New Riders Publishing, 2nd Edition, 2002.
2. Steve Krug, "Don't Make Me Think, Revisited: A Common Sense Approach to Web Usability", 3rd Edition, 2014.
3. Thomas Tullis, Willaim Albert, "Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics", Morgan Kaufman, 1st Edition, 2008.

## **REFERENCES**

1. Jeff Gothelf, Josh Seiden, "Lean UX: Applying Lean Principles to Improve User Experience", O'Reilly, 1st Edition, 2013.
2. Kevin Mullet, Darrell Sano, "Designing Visual Interfaces: Communication Oriented Techniques", Soft Press, 1995.
3. Wilbert O. Galitz, "The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques", Wiley, 2002.

## **COURSE OUTCOMES**

At the end of this course, students will be able to

1. To design applications and web pages with effective and easy to use user experience.
2. To utilize tools and techniques for research and build user screens based on best practices.
3. To collect and document business, user and information specification.
4. To implement user screens and package information with ease of navigations.
5. To assist with User Experience Design process with the resources available.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO4	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO5	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1

22ITPE506	DIGITAL SIGNAL PROCESSING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the basic components of DSP systems and classification of signals and systems.
- To study the properties of DFT, methods to implement DFT & FET computations.
- To analyze and study the design techniques for digital filters (IIR & FIR).
- To learn the truncation and rounding off errors using floating point and fixed point representations
- To learn the applications of DSP and Multi-rate signal processing.

### UNIT-I

Basic Elements of Digital Signal Processing Systems – Classification of Signals – The concept of frequency in Continuous time and Discrete time domain – Discrete-time Signals and Systems – Analysis of Discrete Time-Linear Shift-Invariant Systems – Linearity – Causality and Stability criterion. Discrete-time Systems described Difference Equation – Correlation of Discrete-Time Signals

### UNIT-II

Introduction to DFT – Properties of DFT – Filtering methods based on DFT – Relation between DTFT and DFT – FFT computations using Decimation in time and Decimation in frequency algorithms – Overlap-add and save methods.

### UNIT-III

General Consideration – Design of IIR filters – IIR Filter Design by Impulse Invariance & Bilinear Transformation – pre warping – Realization using direct, cascade and parallel forms – Design of Linear Phase FIR Filters – Design of FIR filter using Windows and by Frequency Sampling Method – Frequency Transformation in the Analog Domain and Digital Domain – Realization of FIR filters – Transversal, Linear phase and Polyphase structures..

### UNIT-IV

Fixed point and floating point number representations – Comparison – Truncation and Rounding errors – Quantization noise-derivation for quantization noise power – coefficient quantization error – Product quantization error – Overflow error – Round off noise power – limit cycle oscillations due to product round off and overflow errors – signal scaling.

## UNIT-V

Multirate Signal Processing – Speech Compression – Adaptive Filter – Musical Sound Processing – Image enhancement – Applications of Multi rate signal Processing.

### TEXT BOOKS

1. John G. Proakis & Dimitris G. Manolakis, “Digital Signal Processing Principles, Algorithms & Applications”, Fourth edition, Pearson education/ Prentice Hall, 2007.
2. Alan V. Oppenheim, Ronald W. Schaffer & Hohn. R. Back, “Discrete Time Signal Processing”, Pearson Education, 2nd edition, 2005.

### REFERENCES

1. S. Salivahanan, A. Vallavaraj, C. Gnanapriya, “Digital Signal Processing”, TMH/McGraw Hill International, 2007.
2. S.K. Mitra, “Digital Signal Processing, A Computer Based approach”, Tata McGraw Hill, 1998.
3. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the Fundamentals and classification of systems.
2. Perform DFT and FFT computations
3. Design both analog and digital filters and their conversions.
4. Analyze different types of errors in filters
5. Develop projects in Signal processing, Image processing and Speech Processing

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	-	-	-	-	-	-	-	-	1	-	1
CO2	1	2	2	1	2	-	-	-	-	-	-	1	1	1	-
CO3	2	3	3	2	1	1	1	-	-	1	2	-	1	2	-
CO4	2	1	2	-	-	1	-	-	-	1	-	-	-	1	3
CO5		2	-	-	-	-	-	-	-	-	-	-	-	-	-

22ITPE506	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce basic concepts like acquiring, storing, and processing of images
- To enhance the quality of images in the spatial and frequency domains
- To understand various image transforms, compression algorithms, and morphological operations

- To learn segmentation algorithms and feature extraction techniques for classifying image patterns

## UNIT - I

**Introduction:**The Origins of Digital Image Processing - Examples of Fields that Use Digital Image Processing - Fundamental Steps in Digital Image Processing - Components of an Image Processing System. **Digital Image Fundamentals:**Elements of Visual Perception - Light and the Electromagnetic Spectrum - Image Sensing and Acquisition - Image Sampling and Quantization - Some Basic Relationships Between Pixels - Arithmetic Operations - Set and Logical Operations - Basic Set Operations - Logical Operations - Spatial Operations.

## UNIT - II

**Intensity Transformations:** Background - The Basics of Intensity Transformations and Spatial Filtering - Some Basic Intensity Transformation Functions. **Histogram Processing:**Histogram Equalization - Histogram Matching - Local Histogram Processing - Using Histogram Statistics for Image Enhancement. **Spatial Filtering:**Fundamentals of Spatial Filtering - Smoothing Spatial Filters - Sharpening Spatial Filters. **Filtering in the frequency domain:**Image Smoothing Using Lowpass Frequency Domain Filters - Image Sharpening Using Highpass Filters - Selective Filtering.

## UNIT - III

**Image Transforms:**Fourier-Related Transforms - Walsh-Hadamard Transforms - Slant Transform - Haar Transform - Wavelet Transforms. **Image Compression:**Fundamentals - Huffman Coding -Golomb Coding - Arithmetic Coding - LZW Coding - Run-length Coding - Symbol-based Coding - Bit-plane Coding - Block Transform Coding -Predictive Coding - Wavelet Coding- Digital Image Watermarking. **Morphological Image Processing:**Preliminaries - Erosion and Dilation - Opening and Closing - The Hit-or-Miss Transform - Some Basic Morphological Algorithms.

## UNIT - IV

**Image Segmentation:** Fundamentals - Point, Line, and Edge Detection - Thresholding - Segmentation by Region Growing and by Region Splitting and Merging - Region Segmentation Using Clustering and Superpixels- Region Segmentation Using Graph Cuts - Segmentation Using Morphological Watersheds - The Use of Motion in Segmentation.

## UNIT - V

**Feature Extraction:**Background - Boundary Preprocessing- Boundary Feature Descriptors - Region Feature Descriptors - Principal Components as Feature Descriptors - Scale-Invariant Feature Transform (SIFT).

**Image Pattern Classification:**Patterns and Pattern Classes - Pattern Classification by Prototype Matching - Bayes Classifier for Gaussian Pattern Classes –Developing Image processing applications using Neural Networks and Deep Learning.

## TEXT BOOKS

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing, Fourth Edition, Pearson, 2018.
2. AL. Bovik, “The Essential Guide to Image processing”, Second Edition, Elsevier, 2009.

## REFERENCES

1. Anil K. Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.



- Sanjit K.Mitra, & Giovanni L. Sicuranza, “Non Linear Image Processing”, Elsevier, 2007.
- Maria Petrou, Costas Petrou, “Image Processing: The Fundamentals”, Wiley, Second Edition, 2010.

## COURSE OUTCOMES

At the end of this course, the students will be able to

- Understand the basic steps of image processing
- Enhance the quality of the image using spatial and frequency domain methods
- Analyze image transforms, compression algorithms, and morphological operations
- Segment various types of images
- Extract suitable features and apply the designing concepts of image processing in various applications.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-

22ITPE506	3D PRINTING AND DESIGN	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To impart knowledge and skills related to 3D printing technologies
- To learn to select material and equipment
- To develop a product using this technique in Industry 4.0 environment.

### UNIT - I

3D Printing (Additive Manufacturing) - Introduction, Process, Classification, Advantages, Additive V/s Conventional Manufacturing processes, Applications.

CAD for Additive Manufacturing - CAD Data formats, Data translation, Data loss, STL format.

### UNIT - II

Additive Manufacturing Techniques - Stereo- Lithography, LOM, FDM, SLS, SLM, Binder Jet technology - Process, Process parameter, Process Selection for various applications - Additive Manufacturing Application Domains: Aerospace, Electronics, Health Care, Defence, Automotive, Construction, Food Processing, Machine Tools



22ITPE506	INFORMATION RETRIEVAL	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the role of information retrieval in various real-time applications
- To learn and apply information retrieval models
- To design Web Search Engine
- To be exposed to Link Analysis
- To understand the clustering in organization and some algorithms

### UNIT-I

Introduction- History of IR –Components of IR-Issues– Open source Search engine Frameworks- The impact of the web on IR-The role of artificial intelligence (AI) in IR– IR Versus Web Search- Components of a Search engine – Characterizing the web

### UNIT-II

Boolean and vector-space retrieval models - Term weighting- TF- IDF weighting – cosine similarity – Preprocessing – Inverted indices-efficient processing with sparse vectors– Language Model based IR – Probabilistic IR– Latent Semantic Indexing- Relevance feedback and query expansion.

### UNIT-III

Web search overview, web structure, the user, paid placement, search engine optimization/spam. Web size measurement-search engine optimization/spam –Web Search Architectures - crawling- meta-crawlers – Focused Crawling – web indexes – Near-duplicate detection – Index Compression – XML retrieval

### UNIT-IV

Link Analysis – hub and authorities – Page Rank and HITS algorithms- Searching and Ranking– Relevance Scoring and ranking for Web – Similarity – Hadoop & Map Reduce- Evaluation- Personalized search - Collaborative filtering and content-based recommendation of documents and products – handling “invisible” Web- Snippet generation, Summarization, Question Answering, Cross-Lingual Retrieval

### UNIT-V

Information filtering; organization and relevance feedback – Text Mining- Text classification and clustering – Categorization algorithms: naïve Bayes; decision trees; and nearest neighbor - Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

### TEXT BOOKS

1. C.Manning, P.Raghavan, and H.Schutze, “Introduction to Information Retrieval”, Cambridge University Press, 2008.
2. Ricardo Baeza –Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, 2<sup>nd</sup> Edition, ACM Press Books, 2011.

### REFERENCES

1. Bruce Croft, Donald Metzler and Trevor Strohman, “Search Engines : Information Retrieval in Practice”, 1<sup>st</sup> Edition, Addison Wesley, 2009.

2. Mark Levene, “An Introduction to Search Engines and Web Navigation”, 2<sup>nd</sup> Edition, Wiley, 2010.
3. Stefan Buettcher, Charles L.A. Clarke, Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010.
4. Ophir Frieder, “Information Retrieval: Algorithms and Heuristics: The information Retrieval Series”, 2<sup>nd</sup> Edition, Springer, 2004.
5. Manu Konchady, “Building Search Applications: Lucene, Ling Pipe”, First Edition, Gate Mustru Publishing, 2008.
6. www.nptel.ac.in

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Gain an understanding of the basic concepts and techniques in Information Retrieval.
2. Understand how statistical models of text can be used to solve problems in IR, with a focus on how the vector-space model and language models are implemented and applied to document retrieval problems.
3. Understand how statistical models of text can be used for other IR applications, for example clustering and news aggregation.
4. Appreciate the importance of data structures, such as an index, to allow efficient access to the information in large bodies of text.
5. Understand common text compression algorithms and their role in the efficient building and storage of inverted indices.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	1	-	-	-	2	1	-	-	2	1	1
CO2	3	1	3	1	1	-	-	-	2	-	-	-	2	1	-
CO3	1	2	2	3	1	1	1	-	2	-	-	-	2	2	1
CO4	2	-	1	1	1	-	-	1	2	1	-	-	2	2	-
CO5	2	-	1	2	1	1	1	1	2	1	-	-	2	2	-

22ITPE506	SOFT COMPUTING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- Learn the various soft computing frameworks
- Be familiar with the design of various Neural Networks
- Be exposed to Fuzzy Logic
- Learn Genetic programming and Hybrid Systems.

## **UNIT-I**

Artificial neural network: Introduction, characteristics– learning methods – taxonomy – Evolution of neural networks– basic models – important technologies – Applications. Fuzzy logic: Introduction – Crisp sets– Fuzzy sets – Crisp relations and Fuzzy relations: Cartesian product of relation – Classical relation, Fuzzy relations, Tolerance and Equivalence relations, Non-iterative fuzzy sets. Genetic algorithm– Introduction – Biological background – Traditional optimization and Search techniques – Genetic basic concepts.

## **UNIT-II**

ANS and BPN: Network inputs and outputs – Feedback interconnections and network stability – Feed forward networks – Adaptive networks – Supervised and Unsupervised learning – Back Propagation Network – Approach – Operation – Generalized Delta Rule- Update of output – Layer weights – Updates of hidden layer weights – Training data – Network sizing – Weights and Learning Parameters – BPN Applications – Data compression.

## **UNIT-III**

Membership functions: Features, Fuzzification, methods of membership value assignments– Defuzzification: Lambda cuts – Methods – Fuzzy arithmetic and fuzzy measures: Fuzzy arithmetic – Extension principle-Fuzzy measures – Measures of fuzziness –Fuzzy integrals – Fuzzy rule base and approximate reasoning : Truth values and tables, Fuzzy propositions, formation of rules– Decomposition of rules, Aggregation of fuzzy rules, Fuzzy reasoning– Fuzzy inference systems-Overview of fuzzy expert system–Fuzzy decision making.

## **UNIT-IV**

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

## **UNIT-V**

Neuro-fuzzy hybrid systems – Genetic Neuro Hybrid systems – Genetic fuzzy hybrid and Fuzzy genetic hybrid systems – Simplified fuzzy ARTMAP – Applications: A fusion approach of Multispectral images with SAR, Optimization of Traveling Salesman Problem using Genetic Algorithm approach, Soft computing based hybrid fuzzy controllers.

## **TEXT BOOKS**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI/Pearson Education 2004.
2. S.N. Sivanandam and S.N. Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2011.

## **REFERENCES**

1. S. Rajasekaran and G.A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006.

2. David E. Goldberg, “Genetic Algorithm in Search, Optimization and Machine Learning” Pearson Education India, 2013.
3. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
4. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
5. Simon Haykin, “Neural Networks Comprehensive Foundation” Second Edition, Pearson Education, 2005.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Apply the concepts of neural network and fuzzy logic in traditional optimization and search techniques
2. Train the types of networks in various applications
3. Analyze the concepts of fuzzy logic systems
4. Apply genetic algorithm in various applications
5. Apply the optimization techniques in various fields

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1	2	1	1	1	-	-	-	-	-	-	1	-	1
<b>CO2</b>	-	2	2	1	2	-	-	-	-	-	-	1	1	1	-
<b>CO3</b>	2	3	3	2	1	-	-	-	-	-	2	2	1	2	-
<b>CO4</b>	2	1	2	2	3	1	1	2	3	1	2	3	-	1	3
<b>CO5</b>	2	2	2	3	3	3	2	1	3	-	2	3	-	3	3

## PROFESSIONAL ELECTIVE PRACTICAL – I

22ITEP510	ARTIFICIAL INTELLIGENCE LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To implement basic AI algorithms and apply the concepts of Machine Learning to solve real-world problems
- To perform NLP tasks and implement NLP based systems
- To develop image and video-based systems for object recognition and classification
- To develop AI applications using deep learning techniques
- To simulate games using games theory

### LIST OF EXERCISES

#### PERFORM THE FOLLOWING USING PYTHON AND SUITABLE TOOLKITS

1. Implement Best First Search
2. Implement Dijkstra's algorithm or uniform-cost search
3. Generate the output for A\* algorithm
4. Implement Forward chaining
5. Implement the Greedy Search algorithm
6. Implement the min-max algorithm
7. Filter the given word in a sentence/paragraph.
8. Classify the text in the given sentence
9. Implement Lemmatization and stemming.
10. Implement discrete speech recognizer
11. Detect an object in the given image
12. Classify the image using CNN
13. Implement video classification using suitable classifier
14. Simulate Tic-Tac-Toe game
15. Simulate Hangman game
16. Solve symbol regression problem using genetic algorithm

### COURSE OUTCOMES

At the end of this course, students will able to

1. Implement basic artificial intelligence algorithms
2. Apply different machine learning and deep learning algorithms for real world problems
3. Know the procedure to develop games by applying games theory

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO2</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO3</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-

<b>22ITEP510</b>	<b>VIRTUALIZATION LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## COURSE OBJECTIVES

- To learn and use version control systems
- To develop web applications in cloud
- To learn and work with virtual machine
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

## LIST OF EXERCISES

1. Use gcc to compile c-programs. Split the programs to different modules and create an application using make command.
2. Use version control systems command to clone, commit, push, fetch, pull, checkout, reset, and delete repositories.
3. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
4. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
5. Install Google App Engine. Create hello world app and other simple web applications using python/java.
6. Use GAE launcher to launch the web applications.
7. Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in CloudSim.
8. Find a procedure to transfer the files from one virtual machine to another virtual machine.
9. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
10. Install Hadoop single node cluster and run simple applications like wordcount.



## COURSE OUTCOMES

At the end of this course, students will able to

1. Configure various virtualization tools such as Virtual box, VMare workstation.
2. Design and deploy a web application in a PaaS environment.
3. Simulate a cloud environment to implement new schedulers

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	3	-	-	-	-	-	-	-	-	-	-
CO2	2	-	-	2	3	-	-	-	-	-	-	-	-	-	-
CO3	1	-	3	-	-	2	-	-	-	-	-	-	-	-	-

22ITEP510	UI AND UX DESIGN LAB				L	T	P	C
					0	0	3	1.5

## COURSE OBJECTIVES

- To reinforce the practical application of critical thinking, analyze and process of making and conceptualizing
- To learn how to read design and how to apply them into a broader cultural, technological and social context
- To follow or establish identify guidelines for web or mobile application design.

## LIST OF EXERCISES

1. Understanding UX/UI Design essentials
2. Preparing use case specifications for UI design
  - a. Understanding user stories
  - b. Understanding use cases for UI
  - c. Understanding user persona
3. Wireframing or Information hierarchy UI design
  - a. Selection of wireframing tools
  - b. Design Layouts
  - c. Design Menus
  - d. Define Typography (fonts)
  - e. Define Color
  - f. Design for different type of screens
  - g. Design navigation techniques
  - h. Content placement
  - i. Refinement or adjustment to design
4. Translate wireframing into Visual Design

5. Incorporate accessibility into UI design

6. Usability testing for UI design

### LIST OF PROJECT TITLES

1. GrubHub for Food Trucks

- Research best practices for mobile payment apps
- Design user flows for discovering local food trucks and creating an order
- Create a mobile prototype to test and refine based on user feedback

2. Shopping

- Design an online shopping experience
- Create wireframes and mockups for consumers to browse and purchase products
- Build a responsive site that could be applied to Shopify's platform

3. Kickstarter for Nonprofits

- Research crowdfunding applications to create a competitive analysis
- Develop user personas of both funders and backers
- Design a complex UI that follows well-constructed user flows

4. Product Showcase

- Create a brand identity for a new product
- Design a product landing page to convey a value proposition and competitive differentiators
- Develop a responsive web site to deploy to GitHub Pages

### COURSE OUTCOMES

At the end of this course, students will be able to

1. Investigate visual design concepts by exploring graphic design basics like color, typography, and layouts.
2. Apply UI and UX design concepts and guidelines for web and mobile devices.
3. Demonstrate graphic design skills to effectively visualize and present design solutions and concepts in a clear and concise manner

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1

22ITEP510	SIGNALS AND SYSTEMS LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- Understand the basics of MATLAB
- To learn the basic commands involved in plotting of signals
- Simulate the generation of signals and operations on them.
- Analyse the waveform synthesis using Laplace transforms.

### LIST OF EXERCISES

1. To generate matrix and perform basic operation on matrices Using MATLAB Software.
2. Basic plotting of signals: To study various MATLAB commands for creating two and three dimensional plots.
3. Write a MATLAB program to plot the following continuous time and discrete time signals.
  - i. Step Function
  - ii. Impulse Function
  - iii. Exponential Function
  - iv. Ramp Function
  - v. Sine Function
4. Write a MATLAB program to illustrate Gibb's phenomenon.
5. To performs functions on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.
6. Write a MATLAB program to obtain linear convolution of the given sequences.
7. Write a MATLAB program to obtain Cross correlation of sequence  $x(n)$  and  $y(n)$  & autocorrelation of a sequence  $x(n)$  of the given sequences & verify the property.
8. Write a MATLAB program to generate Fourier series of a Square Wave.
9. To perform waveform synthesis using Laplace Transform of a given signal.
10. To verify Wiener-Khinchine relation

### COURSE OUTCOMES

At the end of this course, the student will be able to:

1. Plot the signals using MATLAB commands and perform the functions on signals.
2. Implement the concept of Fourier series and Fourier transforms.
3. Find cross correlation, autocorrelation of sequence and verify its property.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	1	1	1	-	-	2	1	-	1	2	-	1	2
CO3	1	1	2	2	1	1	-	-	-	2	1	1	-	-	2

22ITEP510	DIGITAL SIGNAL PROCESSING LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To generate various types of continuous and discuss time signals and perform various operations.
- To demonstrate correlation and convolution of discrete sequences.
- To characterize and analyse systems using LaPlace, Fourier and Z- transforms .
- To design IIR and FIR filters.

### LIST OF EXERCISES

1. Generation of elementary signals.
2. Verification of sampling theorem.
3. Impulse and Step Response of LTI systems.
4. Linear and circular convolution of discrete sequences.
5. Correlation and Auto Correlation of Discrete Sequences.
6. Z – Transform and Inverse Z- Transform.
7. Computation of DFT and IDFT of a signal.
8. Spectral Analysis of a signal.
9. Alteration of Sampling rate of a signal.
10. Design of IIR filters.
11. Design of FIR filters. Signal.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Examine the generation of signals.
2. Develop the computation of signals using DFT and IDFT.
3. Design and implement IIR and FIR filters .

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	1	2	2	2	-	2	3	-	3	2	-	1	2
CO3	2	3	3	2	1	1	1	1	1	2	3	1	-	-	2

22ITEP510	DIGITAL IMAGE PROCESSING LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To perform basic image processing operations
- To enhance the images using spatial and frequency domain filters
- To segment the images and extract the features
- To develop real world applications using image processing techniques

### LIST OF EXERCISES

1. Reading the image and performing various pre-processing
2. Implementing point processing techniques
3. Implementing spatial domain filters
4. Implementing histogram processing techniques
5. Implementing image transforms
6. Implementing frequency domain filters
7. Implementing image segmentation algorithms
8. Implementing morphological operations
9. Edge detection using Sobel and Prewitt masks
10. Image compression
11. Object recognition
12. Image classification
13. Mini project to develop a real-world application

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. apply basic operations on the images
2. implement various steps involved in image processing
3. apply the designing concepts of image processing in various applications

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO2	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
CO3	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-

22ITEP510	ETHICAL HACKING LAB	L	T	P	C
		0	0	3	1.5

## COURSE OBJECTIVES

- To understand and analyze security threats & countermeasures related to ethical hacking.
- To learn the different levels of vulnerabilities at a system level.
- To gain knowledge on the different hacking methods for web services and session hijacking.
- To understand the hacking mechanisms on how a wireless network is hacked.

## LIST OF EXERCISES

1. Study of Guessing username and passwords using Hydra
2. Experiment on Recovering password Hashes
3. Implementation to crack Linux passwords
4. Experiments on SQL injections
5. Analysis of WEP flaws
6. Experiments on Wireless DoS Attacks
7. Implementation of Buffer Overflow Prevention
8. Prevention against Cross Site Scripting Attacks
9. Experiments on Metasploit Framework
10. Implementation to identify web vulnerabilities
11. Wireshark: Experiment to monitor live network capturing packets and analyzing over the live network
12. LOIC: DoS attack using LOIC
13. FTK: Bit level forensic analysis of evidential image and reporting the same.
14. Darkcomet : Develop a malware using Remote Access Tool Darkcomet to take a remote access over network
15. HTrack: Website mirroring using Htrack and hosting on a local network.
16. XSS: Inject a client side script to a web application
17. Emailtrackerpro: Email analysis involving header check, tracing the route. Also perform a check on a spam mail and non-spam mail

## COURSE OUTCOMES

At the end of this course, students will able to

1. Understand vulnerabilities, mechanisms to identify vulnerabilities/threats/attacks
2. Use tools to identify vulnerable entry points and Identify vulnerabilities using sniffers at different layers
3. Handle web application vulnerabilities and Identify attacks in wireless networks

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	-	-	-	-	-	-	-	3	2	3
CO2	3	3	2	2	2	-	-	-	-	-	-	-	3	3	2
CO3	3	2	2	2	2	-	-	-	-	-	-	-	3	2	3

22ITEP510	ROBOTIC PROCESS AUTOMATION LAB	L	T	P	C
		0	0	3	1.5

## COURSE OBJECTIVES

- To understand the fundamental concepts of Robotics
- To outline types of workflows
- To design of Data Manipulations.
- To understand the applications and plugins.
- To Deploy and maintain the BOT.

## LIST OF EXERCISES

- To study the
  - Parts of the robot
  - Classification of robots
- Introduction to degrees of freedom and classification of robots
- Rotation representation, Coordinate transformations, DH parameters
- Matrix methods for forward and inverse kinematics analyses
- Study on VREP software package and programming on robots
- Motion planning of robotic arm.
- Pick and place operation by robotic arm using Matlab
- To move the YouBot from its start position to goal position using the Matlab in VREP simulation software.

## COURSE OUTCOMES

At the end of this course, students will able to

1. Explain the robotic kinematic and dynamic analysis and work flows with transformation operations.
2. Make use of various applications and pluginsto move the robotic arm
3. Deploy and maintain BOT to move from one position to another

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	1	2	2	2	-	2	3	-	3	2	-	1	2
CO3	2	3	3	2	1	1	1	-	-	-	3	1	-	-	2

22ITEP510	3D PRINTING AND DESIGN LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To impart knowledge and skills related to 3D printing technologies
- To learn to select material and equipment
- To develop a product using this technique in Industry 4.0 environment.

### LIST OF EXPERIMENTS

1. 3D Modelling of a single component.
2. Assembly of CAD modelled Components
3. Exercise on CAD Data Exchange.
4. Generation of .stl files.
5. Identification of a product for Additive Manufacturing and its AM process plan.
6. Printing of identified product on an available AM machine.
7. Post processing of additively manufactured product.
8. Inspection and defect analysis of the additively manufactured product.
9. Comparison of Additively manufactured product with conventional manufactured counterpart.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Develop CAD models for 3D printing and Import and Export CAD data and generate .stl file.
2. Select a specific material and 3D printing process for the given application.
3. Produce a product using 3D Printing or Additive Manufacturing (AM).

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	-	-	-	-	-	-	-	-	-	1	-	1
CO2	1	2	2	1	2	-	-	-	-	-	-	1	1	1	-
CO3	2	3	3	2	1	1	1	-	-	1	2	-	1	2	-



22ITEP510	SOFT COMPUTING LAB	L	T	P	C
		0	0	3	1.5

## COURSE OBJECTIVES

- To understand the fundamental concepts behind soft computing techniques.
- To implement perceptron rule.
- To analyse the various architectures and algorithms of neural networks.
- To classify fuzzy concepts and implement crisp model.

## LIST OF EXERCISES

1. Introduction to fuzzy sets:  
Write a program to implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.
2. Implement the following perceptron rule:
  - a. Write a program to implement Hebb's rule.
  - b. Write a program to implement of delta rule.
3. Implementation of Artificial Neural Networks
  - Write a program to implement artificial neural network without back propagation.
  - Write a program to implement artificial neural network with back propagation.
4. Implementation of Genetic Algorithm
  - Implement travelling sales person problem (TSP) using genetic algorithms.
5. Implementation of neural network
  - a. Korhonen Self organizing map
  - b. Adaptive resonance theory
6. Analysis of co-variance  
Plot the correlation plot on dataset and visualize giving an overview of relationships amongst the data . Analysis of covariance: variance (ANOVA), if the data have categorical variables.
7. Implementing data fitting by regression.
  - Implement linear regression and multi-regression for a set of data points.
8. Classification by fuzzy concepts
  - Implement SVM classification by Fuzzy concepts.
9. Implementing crisp model
  - Implement crisp partitions for real-life iris dataset.

## COURSE OUTCOMES

At the end of the semester, the students must be able to

1. Determine and construct a soft computing system required to address a computational task.
2. Examine the neural networks, Genetic algorithm and its implementation.
3. Demonstrate fuzzy concepts using problems in real – time scenarios.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1	2	1	1	1	-	-	-	-	-	2	1	-	1
<b>CO2</b>	1	2	1	2	2	2	-	-	2	-	3	2	-	1	2
<b>CO3</b>	2	3	3	2	1	1	1	2	3	1	1	3	-	-	2

### PROFESSIONAL ELECTIVES – III

22ITPE603	SOCIAL NETWORK INFORMATION ANALYSIS	L	T	P	C
		3	0	0	3

#### COURSE OBJECTIVES

- To understand the concept of semantic web and related applications
- To learn knowledge representation using ontology
- To understand human behavior in social web and related communities
- To learn visualization of social networks

#### UNIT-I

Introduction – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis

#### UNIT-II

Ontology-based knowledge Representation –Resource Description Framework – Web Ontology Language–Modeling and aggregating social network data: State-of-the-art in network data representation – Ontological representation of social individuals – Ontological representation of social relationships – Aggregating and reasoning with social network data – Advanced representations.

#### UNIT-III

Extracting evolution of Web Community from a Series of Web Archive–Detecting communities in social networks – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks

#### UNIT-IV

Understanding and predicting human behaviour for social communities – User data management – Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness – Privacy in online social networks – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and countermeasures.

#### UNIT-V

Graph theory – Centrality – Clustering –Node–Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix-based representations – Matrix and Node–Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare–Collaboration networks – Co–Citation networks.

#### TEXT BOOKS

1. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 1st Edition, 2010.
2. Peter Mika, “Social Networks and the Semantic Web”, Springer, First Edition, 2007.

## REFERENCES

1. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer, First Edition, 2011.
2. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé –Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.
4. John G Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Know basic notation and terminology used in network science
2. Work on the internal components of the social network
3. Model and visualize the social network
4. Understand the behaviour of the users in the social network
5. Predict the possible next outcome of the social network

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2	2	2	1	1	1	1	2	1	1	2	2	2
<b>CO2</b>	3	3	2	2	2	1	1	1	1	1	1	1	2	1	1
<b>CO3</b>	3	2	2	2	2	1	1	1	1	2	1	1	2	2	2
<b>CO4</b>	2	2	2	2	2	1	1	1	1	2	1	2	2	2	2
<b>CO5</b>	2	2	2	2	2	1	1	1	1	1	1	1	2	1	1

<b>22ITPE603</b>	<b>MOBILE ADHOC AND WIRELESS SENSOR NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To introduce the basics of routing in cellular and ad hoc networks.
- To impart knowledge about quality of service, QoS solutions, QoS routing protocols.
- To enable the students to understand the importance of Energy Management schemes in Mobile ad hoc and wireless sensor networks.
- To describe about sensor networks, its architecture and Standards.
- To expose the students to hybrid wireless networks.

## **UNIT-I**

Routing: Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive, Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Mesh based protocols – Multicast with Quality of Service Provision.

## **UNIT-II**

Quality of Service: Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based QoS Routing Protocols.

## **UNIT-III**

Energy Management: Need for Energy Management – Classification of Energy Management Schemes – Battery Management and Transmission Power Management Schemes – Network Layer and Data Link Layer Solutions – System power Management schemes.

## **UNIT-IV**

Sensor Networks: Introduction – Sensor Network architecture-Data Dissemination – Data Gathering – MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks – Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks.

## **UNIT-V**

Hybrid Wireless Networks : Introduction – Next Generation Hybrid Wireless Architectures – Routing in Hybrid Wireless Networks – Pricing in Multi-Hop Wireless Networks – Power Control Schemes in Hybrid Wireless Networks – Load Balancing in Hybrid Wireless Networks

## **TEXT BOOKS**

1. C. Siva Ram Murthy and B.S.Manoj, “Ad hoc Wireless Networks – Architectures and Protocols”, 1st Edition, Pearson Education, 2006.
2. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks – An Information Processing Approach”, 1st Edition, Morgan Kaufman Publishers, 2004.

## **REFERENCES**

1. C.K. Toh, “Adhoc Mobile Wireless Networks: Protocols and Systems”, Pearson Education, 2002.
2. Thomas Krag and Sebastin Buettrich, “Wireless Mesh Networking”, O’Reilly Publishers, 2007.
3. Carlos De Moraes Cordeiro, Dharma Prakash Agarwal, “Adhoc and Sensor Networks: Theory and Applications”, World Scientific Publishing Company Private Limited, 2006.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Implement Routing in cellular and Ad Hoc Networks
2. Estimate quality of service in Mobile ad hoc and wireless sensor networks
3. Analyze Energy Management in mobile and wireless sensor networks
4. Gain knowledge about architecture standards, recent trends in sensor networks
5. Design hybrid wireless networks

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	2	-	-	-	-	-	3	-	1
CO2	3	3	3	2	-	2	-	-	-	-	-	-	-	3	-
CO3	3	3	2	2	-	-	2	-	-	-	-	-	3	-	-
CO4	2	2	-	-	-	2	-	-	-	-	-	-	3	-	-
CO5	3	3	3	3	-	-	1	-	-	-	-	-	3	3	-

22ITPE603	SOFTWARE DEFINED NETWORKS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the fundamentals of software defined networks.
- To study about SDN controllers.
- To understand the data centers.
- To study about the SDN Programming.
- To study about the various applications of SDN

### UNIT-I

INTRODUCTION: History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Data Planes

### UNIT-II

OPEN FLOW & SDN CONTROLLERS: Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

### UNIT-III

DATA CENTERS: Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

### UNIT-IV

SDN PROGRAMMING: Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

### UNIT-V

SDN: Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

## TEXT BOOKS

1. Paul Goransson and Chuck Black, —Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, —SDN: Software Defined Networks, O'Reilly Media, 2013.

## REFERENCES

1. Siamak Azodolmolky, —Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, —SDN and Open Flow for Beginners, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, —Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

## COURSE OUTCOMES

1. Analyze the evolution of software defined networks.
2. Express the various components of SDN and their uses.
3. Investigate the use of SDN in the current networking scenario.
4. Design and develop various applications of SDN.
5. Perform data centre orchestration using modern tools and techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	3	-	-	-	-	3	-	1	-
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	-	3	-	3	-	-	3	-	3	-	-	3	-	3	-
CO4	2	2	3	-	-	-	-	-	3	-	2	-	3	3	-
CO5	3	3	3	3	3	-	2	-	3	-	-	2	3	3	3

22ITPE603	PARALLEL AND DISTRIBUTED COMPUTING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES:

- To introduce the fundamentals of parallelism and parallel architecture.
- To understand the concept of parallel algorithms and design.
- To introduce the fundamentals of distributed systems.
- To understand the concept of distributed transactions.
- To study the distributed system architecture.

## **UNIT- I                      Parallelism Fundamentals**

Motivation – Key Concepts and Challenges – Overview of Parallel computing – Flynn’s Taxonomy – Multi-Core Processors – Shared vs Distributed memory.

### **Parallel Architectures**

Introduction to OpenMP Programming – Instruction Level Support for Parallel Programming – SIMD – Vector Processing – GPUs.

## **UNIT- II                      Parallel Algorithm and Design**

Preliminaries – Decomposition Techniques – Characteristics of Tasks and Interactions – Mapping Techniques for Load balancing – Parallel Algorithm Models.

## **UNIT- III                      Introduction to Distributed Systems**

Introduction – Characterization of Distributed Systems – Distributed Shared Memory – Message Passing – Programming Using the Message Passing Paradigm – Group Communication – Case Study (RPC and Java RMI).

### **Coordination**

Time and Global States – Synchronizing Physical Clocks – Logical Time and Logical Clock – Coordination and Agreement – Distributed Mutual Exclusion – Election Algorithms – Consensus and Related Problems.

## **UNIT- IV                      Distributed Transactions**

Transaction And Concurrency Control – Nested Transactions – Locks – Optimistic Concurrency Control – Timestamp Ordering Distributed Transactions – Flat and Nested – Atomic – Two Phase Commit Protocol – Concurrency Control.

## **UNIT- V                      Distributed System Architecture and its Variants**

Distributed File System: Architecture – Processes – Communication Distributed Web-based System: Architecture – Processes – Communication. Overview of Distributed Computing Platforms.

### **Recent Trends**

### **TEXT BOOKS**

1. George Coulouris, Jean Dollimore, Tim Kindberg, and Gordon Blair, “Distributed Systems: Concepts and Design”, 5th Edition, Pearson / Addison – Wesley, 2012
2. AnanthGrama, Anshul Gupta, George Karypis and Vipin Kumar, “Introduction to Parallel Computing”, Pearson, 2nd Edition, 2008.

### **REFERENCES**

1. Andrew S. Tanenbaum and Maarten Van Steen, “Distributed Systems: Principles and Paradigms”, Pearson, 2nd Edition, 2006
2. Pradeep K. Sinha, “Distributed Operating System: Concepts and Design”, PHI Learning Pvt. Ltd., 2007

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Understand the fundamentals of Parallelism and parallel architecture.



2. Design Parallel algorithms.
3. Understand Distributed systems.
4. Analyze distributed transactions.
5. Understand distributed system architecture.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	2	2	3	-	-	-	-	-	-	2	2	-	-	3	-
<b>CO3</b>	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	2	3	2	-	2	-	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	2	2	-	-	-	-	-	-	-	-	-	-	3	-

<b>22ITPE603</b>	<b>INFORMATION CODING THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To acquire knowledge about information and entropy.
- To acquire knowledge about Hamming weight, minimum distance decoding and different types of codes.
- They also learn about syndrome calculation and design of an encoder and decoder.
- To gain knowledge about text compression techniques. They also learn about speech and audio coding.
- To know about, image compression, graphics interchange format, JPEG and MPEG standards.

### **UNIT-I**

Information theory : Information – Entropy, Information rate, classification of codes, Kraft McMillan inequality, Source coding theorem, ShanNon-Fano coding, Huffman coding, Extended Huffman coding – Joint and conditional entropies, Mutual information – Discrete Memory less channels – Binary Symmetric Channel – Channel capacity, Shannon limit.

### **UNIT-II**

Error control coding: block codes: Definitions and Principles: Hamming weight, Hamming distance, Minimum distance decoding – Single parity codes, Hamming codes, Repetition codes – Linear block codes, Cyclic codes – Syndrome calculation, Encoder and decoder.

### **UNIT-III**

Error control coding: convolutional codes: Convolutional codes – code tree, trellis, state diagram – Encoding – Decoding: Sequential search and Viterbi algorithm – Principle of Turbo coding.

## UNIT-IV

Source coding: text, audio and speech: Text: Adaptive Huffman Coding, Arithmetic Coding, LZW algorithm – Audio: Perceptual coding, Masking techniques, Psychoacoustic model, MEG Audio layers I,II,III, Dolby AC3 – Speech: Channel Vocal coder, Linear Predictive Coding.

## UNIT-V

Source coding: image and video: Image and Video Formats – GIF, TIFF, SIF, CIF, QCIF – Image compression: Read, JPEG – Video Compression: Principles– I, B, P frames, Motion estimation, Motion compensation, H.26-, MPEG standard.

## TEXT BOOKS

1. R. Bose, “Information Theory, Coding and Cryptography”, TMH 2007.
2. Fred Halsall, “Multimedia Communications: Applications, Networks, Protocols and Standards”, Perason Education Asia, 2002.

## REFERENCES

1. K. Sayood, “Introduction to Data Compression” 3/e, Elsevier, 2006.
2. S. Gravano, “Introduction to Error Control Codes”, Oxford University Press 2007.
3. Amitabha Bhattacharya, “Digital Communication”, TMH, 2006.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Analyze and design an Information coding system.
2. Able to solve a discrete symmetric channel.
3. Gain the basic knowledge on Error Control Coding and Convolutional codes
4. Ability to develop applications using Text, Audio and Speech source codes
5. Develop skill to implement the image and video source codes

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	-	-	1	-	-	-	2	-	-
CO2	3	2	2	1	-	1	-	-	-	1	-	1	-	2	-
CO3	3	2	2	1	-	1	-	-	-	1	-	1	-	-	2
CO4	3	2	2	-	-	1	-	-	1	1	-	1	-	2	-
CO5	3	-	2	-	-	1	-	-	1	1	-	2	-	-	3

22ITPE603	CYBER LAW AND ETHICS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To explore technical, legal, and social issues related to cybercrimes, laws, and cyber ethics.
- Learn about cyber ethics, its role, and significance.

### UNIT I Fundamental of Cyber Crime

Definition and Origin of the Word, Cyber Crime and Information Security, identifying Cyber Criminals, Classification of Cybercrimes, E-mail Spoofing, Spamming, Cyber Defamation, Internet Time Theft, Salami Attack, Salami technique Data Diddling, Forgery, Web Jacking, Newsgroup Spam, Industrial Spying, Hacking, Online Frauds, Pornographic Offenders, Software Piracy, Computer Sabotage, Email Bombing, Password Sniffing, Credit Card Frauds, Identity Theft

### UNIT II Attacks and Techniques used in Cyber Crime

Keyloggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer overflow. Phishing, working of Phishing, Methods & techniques of Phishing, Types of Phishing scams, Phishing countermeasures, Identity theft types and techniques of identity thefts and its countermeasures

### UNIT III Cyber Law & Related Legislation

Introduction to cyber law, Patent law, Trademark law, Copyright, software Copyright or patented, Domain names and Copyright disputes, electronic database and its protection, IT Act and civil procedure code, IT Act and Criminal procedural code

### UNIT IV IT ACT and Offenses

Overview of IT Act, 2000, Amendments and limitations of IT Act, Digital signatures, Cryptographic algorithm, Public cryptography, Private cryptography, Electronic governance, Legal recognition of Electronic records, Legal recognition of Digital signature, Certifying authorities, Cyber crime and offences, Network service Providers liability, Cyber regulations appellate tribunal, penalties and adjudication

### UNIT V Cyber Ethics

The Importance of Cyber Law, Significance of cyber ethics, Need of Cyber regulations and ethics. Ethics in Information society, Introduction to artificial intelligence ethics: Ethical issues in AI and core principles, Introduction to block chain ethics

## REFERENCES

1. Nina Godbole and SunitBelpure, "Cyber Security - Understanding Cyber Crimes, Computer Forensics and Legal Perspectives", Wiley
2. Kumar K, "Cyber Laws: Intellectual property & E Commerce, Security", Dominant Publisher
3. Christoph Stuckelberger, Pavan Duggal, Globethic, "Cyber Ethics 4.0, Information Security policy & Implementation Issues, NIIT | PHI
5. Verma S, K, Mittal Raman, "Legal Dimensions of Cyber Space", Indian Law Institute
6. Sudhir Naib, "The Information Technology Act, 2005: A Handbook", OUP
7. S. R. Bhansali, "Information Technology Act, 2000", University Book House Pvt. Ltd
8. Vasu Deva, "Cyber Crimes and Law Enforcement", Commonwealth Publishers

## COURSE OUTCOMES

At the end of this course, students will be able to:

1. Describe the major types of cybercrime.
2. Carry out all the attacks and techniques used in cybercrime.
3. Discuss Information Technology act and Related Legislation.
4. Understand IT act and other legal procedures related to cyber crime
5. Classify the cyber ethics in society.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	1	1	1	1
CO2	3	2	2	3	3	-	-	-	-	-	-	1	1	1	1
CO3	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1
CO4	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1
CO5	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1

22ITPE603	GIS AND REMOTE SENSING	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the fundamental scientific principles behind remote sensing
- To introduce the students to the basic concepts and principles of various components of remote sensing.
- To understand the basic image processing concepts
- To provide an exposure to Geographic Information System (GIS) and its practical applications.
- To understand the nature of remote sensing data and techniques for data entry, storage and processing.

### UNIT-I

EMR and its Interaction with Atmosphere & Earth Material: Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan–Boltzman and Weins Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

### UNIT-II

Platforms and Sensors: Types of platforms – orbit types, Sun–synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and spaceborne TIR and microwave sensors.

### UNIT-III

Image Interpretation And Analysis: Types of Data Products – types of image interpretation – basic elements of image interpretation – visual interpretation keys – Digital Image Processing

– Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

#### UNIT-IV

Geographic Information System: Introduction – Maps – Definitions – Map projections – types of map projections – map analysis – GIS definition – basic components of GIS – standard GIS softwares – Data type-Spatial and Non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

#### UNIT-V

Data Entry, Storage And Analysis: Data models – vector and raster data – data compression – data input by digitization and scanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

#### TEXT BOOKS

1. Lillesand, T.M., Kiefer, R.W. and J.W. Chipman. “Remote Sensing and Image Interpretation” 5th Edition., John Willey and Sons Asia Pvt. Ltd., New Delhi, 2004.
2. Anji Reddy, M. “Textbook of Remote Sensing and Geographical Information System” 2nd edition. BS Publications, Hyderabad, 2001.

#### REFERENCES

1. Lo. C.P. and A.K.W. Yeung, “Concepts and Techniques of Geographic Information Systems”, Prentice Hall of India Pvt. Ltd., New Delhi, 2002
2. Peter A. Burrough, Rachael A. McDonnell, “Principles of GIS”, Oxford University Press, 2000.
3. Ian Heywood “An Introduction to GIS”, Pearson Education Asia, 2000.

#### COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Cognize the spectral signature concepts and spectral reflective characteristics of water.
2. Perform analysis of images and apply suitable interpretation technique.
3. Process and analyze spatial and attribute data for preparing theoretic maps.
4. Design solutions for complex problems such as GIS highway alignment.
5. Formulate and solve the problems using modern tools and techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	1	3	2	-
<b>CO2</b>	3	3	-	2	-	-	-	-	-	-	-	1	3	2	2
<b>CO3</b>	3	3	-	2	-	-	-	-	-	-	-	2	3	3	3
<b>CO4</b>	3	3	3	3	-	-	2	-	-	-	-	2	3	3	3
<b>CO5</b>	3	3	3	3	3	2	2	-	-	-	-	2	3	3	3

22ITPE603	SOFTWARE TESTING AND QUALITY ASSURANCE	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To impart knowledge on software testing, quality and Software Quality Assurance (SQA).
- To introduce the various software testing techniques and different levels of testing.
- To introduce the SQA standards and components of SQA system.
- To explain the components of quality plan for software projects.
- To describe the planning of both development and quality objectives

### UNIT-I

Phases of Software project – Quality, Quality assurance and quality control – Testing, Verification and Validation – White box testing – Static testing – Structural testing – Black box testing – Definition, need for black box testing – Black box testing techniques – Requirements based testing, Positive and Negative testing, Boundary Value Analysis, Decision Tables, Equivalence Partitioning, Graph based Testing, Compatibility Testing, Domain Testing.

### UNIT-II

Integration testing – Integration testing as a type of testing – Integration testing as a phase of testing – Scenario testing – Defect bash – System and Acceptance testing – System testing overview – Need for System testing – Functional system testing – Non-functional testing – Acceptance testing.

### UNIT-III

Performance testing – Factors governing performance testing – Methodology for performance testing – Tools for performance testing – Process for performance testing – Regression testing – Types of Regression testing – When and how to do Regression testing – Test planning – Test management – Test process – Test reporting.

### UNIT-IV

Software quality – definition – Software quality assurance-definition and objectives – Software quality assurance and software engineering – Software quality factors – The components of the software quality assurance system – The SQA system – SQA architecture Pre-project components – Software project life cycle components – Infrastructure components for error prevention and improvement – Management SQA components – SQA standards, system certification, and assessment components – Organizing for SQA – The human components – Considerations guiding construction of an organization's SQA system.

### UNIT-V

Development plan and quality plan objectives – Elements of the development plan – Elements of the quality plan – Development and quality plans for small projects and for internal projects – Integrating quality activities in the project life cycle-Classic and other



<b>22ITPE603</b>	<b>OBJECT ORIENTED ANALYSIS AND DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To understand objects, classes and inheritance.
- To understand utilization of software objects to build software projects.
- To use UML in requirements elicitation and designing.
- To develop applications using UML.

### **UNIT-I**

Overview of Object Oriented System Development: Introduction – Object Oriented System Development Methodology – Overview of Unified Approach – Object Basics – Systems Development Life Cycle-Unified Approach.

### **UNIT-II**

Methodology and Modelling: Introduction –Rumbaugh et al.’s Object Modelling Technique - Booch Methodology – Jacobson et al. Methodologies – Patterns –Framework – Unified approach – Unified Modelling Language.

### **UNIT-III**

Object Oriented analysis: Use Case Driven Object Oriented Analysis Object Oriented Analysis: Classification Noun Phrase Approach – Common Class Patterns Approach – Object Relationship analysis.

### **UNIT-IV**

Object Oriented Design: Object Oriented Design Process – Object Oriented Design Axioms – Corollaries – Designing Classes: Defining Attributes and methods –Object Store and Access layer – Designing the View Layer Classes.

### **UNIT-V**

Applications: Data Acquisition: Weather Monitoring Station – Frameworks: Foundation Class library – Client/Server Computing: Inventory Tracking.

## **TEXT BOOKS**

1. Ali Bahrami, “Object oriented systems development using the unified modelling language”, Tata McGraw Hill, 1st Edition 2008.
2. Grady Booch, "Object Oriented Analysis and Design with Applications”, Pearson Education, Inc, Second Edition, 2008.

## **REFERENCES**

1. John Deacon, “Object Oriented Analysis and Design”, Addison Wesley, 1st Edition,2005.
2. Pinson L. and Wiener R., "Application of Object Oriented Programming",Addison Wesley Publishing Company, 1990.
3. Taylor D., "Object Oriented Information Systems", John Wiley and Sons, 1992.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Introduce the Object Oriented Development Approach.
2. Analyze the Systems Development Life Cycle.
3. Identify the basic software requirements UML Modeling.



4. Express software design with UML diagrams.
5. Develop applications using UML.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	3	1	2	-	2	-	-	-	-	-	-	3	1	-
<b>CO2</b>	3	3	2	2	-	-	1	-	-	-	-	-	3	1	-
<b>CO3</b>	3	3	3	2	1	-	2	-	1	-	-	-	3	1	-
<b>CO4</b>	3	2	2	1	-	1	-	-	-	-	-	-	3	1	-
<b>CO5</b>	2	2	1	3	-	1	-	1	-	-	-	-	3	1	-

## PROFESSIONAL ELECTIVES – IV

22ITPE604	COMPUTER VISION	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To review image processing techniques for computer vision.
- To understand shape and region analysis.
- To understand Hough, Transform and its applications to detect lines, circles, ellipses.
- To understand three-dimensional image analysis techniques and motion analysis.
- To study some applications of computer vision algorithms.

### UNIT I IMAGE PROCESSING FOUNDATIONS

Review of image processing techniques – classical filtering operations – thresholding techniques - edge detection techniques – corner and interest point detection – mathematical morphology – texture.

### UNIT II SHAPES AND REGIONS

Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.

### UNIT III HOUGH TRANSFORM

Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.

### UNIT IV 3D VISION AND MOTION

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – pointbasedrepresentation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion – spline-based motion – optical flow – layered motion.

### UNIT V APPLICATIONS

Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application- In-vehicle vision system- locating roadway – road markings – identifying road signs – locating pedestrians.

### TEXT BOOKS

1. Baggio D L et al., Mastering OpenCV with Practical Computer Vision Projects, Packt Publishing, 2012.

## REFERENCES

1. E. R. Davies, "Computer & Machine Vision", Fourth Edition, Academic Press, 2012.
2. Jan Erik Solem, "Programming Computer Vision with Python: Tools and algorithms for analyzing images", O'Reilly Media, 2012.
3. Mark Nixon and Alberto S. Aquado, "Feature Extraction & Image Processing for Computer Vision", Third Edition, Academic Press, 2012.
4. R. Szeliski, "Computer Vision: Algorithms and Applications", Springer 2011.
5. Simon J. D. Prince, "Computer Vision: Models, Learning, and Inference", Cambridge University Press, 2012.

## COURSE OUTCOMES

At the end of this course, students will able to

1. Implement fundamental image processing techniques required for computer vision.
2. Implement boundary tracking techniques and perform shape analysis
3. Apply Hough Transform for line, circle, and ellipse detections.
4. Apply 3D vision techniques and implement motion related techniques.
5. Develop applications using computer vision techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	-	-	-	-	-	-	1	-	1
CO2	1	2	2	-	-	-	-	-	-	-	-	-	1	-	-
CO3	-	2	3	2	1	1	-	-	-	-	2	2	1	1	-
CO4	2	1	2	2	3	1	-	-	-	-	2	1	-	-	3
CO5	2	2	2	3	3	3	2	1	3	-	2	2	-	3	3

22ITPE604	NETWORK MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the network management standards and network management function models
- To understand the basic requirements of network
- To understand about SNMP
- To understand network management architectures
- To learn about remote network monitoring and management open source tools.

## **UNIT- I Network Management Architectures & Applications**

Management Standards and Models, Network Design Issues for the Project, Network Management Functions – Configuration, Configuration Management & Auto-discovery, Configuration Database & Reports, Abstract Syntax Notation One (ASN.1)

## **UNIT- II Network management and functions**

Introduction- Basic Concepts and task: functional areas, SNMP, Client Pull & Server Push, Ports & UDP, Parts of SNMP, Nodes, SNMP Agents, Proxy & Gateway Agents, Basic Operations, Languages of SNMP, SNMP Data Types, Managed “Objects” & MIBs, Commercial SNMP Applications, SNMP & Windows services

### **Network Management Functions – Fault**

Fault Management, Fault Identification and Isolation, Event Correlation Techniques, Simple Network Management Protocol - SNMP v2, Protocol Specification, Version 2 MIB Enhancements, MIB-II, Case Diagrams

## **UNIT- III Simple Network Management Protocol - SNMP v3**

Version 3 Protocol & MIB, Simple Network Management Protocol - SNMP v3, User Based Security Model, View Based Access Model, Network Management Functions - Accounting & Performance, Accounting Management, Performance Management, Network Usage, Metrics and Quotas

## **UNIT- IV Network Management Architectures & Applications**

Management Standards and Models, NM Standards - International standard (ISO/OSI), Internet model, TMN Architecture, Organization Model, 2 &3 tier models, Information Model, Communication Model

## **UNIT- V Remote Network Monitoring RMON 1**

Statistics Collection, Alarms and Filters, Remote Network Monitoring RMON 2, Monitoring Network Protocol Traffic, Application-Layer Visibility

### **Management Open Source Tools**

OpenNMS, NMIS, op5, Nagios

### **Contemporary issues**

## **TEXT BOOK**

1. Verma, Dinesh Chandra, “Principles of Computer Systems and Network Management”, Springer, 2010

## **REFERENCES**

1. Mani Subramanian, “Network Management Principles and practice”, Addison Wesley New York, 2010.
2. GhislainHachey, “Instant OpenNMS Starter”, packt, June 2013

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Understand the principles of network management standards and models.
2. Analyze the network management functions and components.
3. Examine and analyse the models of SNMP V3 protocols.

4. Apply the network management architectures, standards and models.
5. Demonstrate the functions of remote network monitoring and open source tools.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	2	3	2	-	2	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	2	3	2	-	2	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	2	2	3	-	-	-	-	-	-	-	-	-	-	3	-
<b>CO5</b>	2	2	2	3	-	-	-	-	-	2	-	-	3	-	-

<b>22ITPE604</b>	<b>ANALYSIS AND DESIGN OF SERVICE ORIENTED ARCHITECTURE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To understand the key principles behind SOA.
- To be familiar with the web services technology elements for realizing SOA.
- To learn the various web service standards.
- To analyze and model services using REST and SOAP based web services.
- To learn and apply advanced concepts such as service composition and orchestration.

## **UNIT I INTRODUCTION TO SERVICE ORIENTED ARCHITECTURE**

Introduction to Service Orientation- Comparing SOA with Client-Server and Distributed architectures - Needs and effects of Service - Orientation on the Enterprise – Characteristics of SOA - Types of SOA.

## **UNIT II SOA PROJECT AND LIFECYCLE STAGES**

Methodology and Project Delivery Strategies-SOA Project Stages-SOA Adoption Planning-Service Inventory Analysis-Service Modeling-Service Oriented Design -Service Logic Design-Service Development- Service Testing-Service Deployment and Maintenance-Service Usage and Monitoring - Service Discovery-Service Versioning and Retirement - Project Stages and Organizational Roles, Case Study: Apply the concepts of SOA Lifecycle to an appropriate use case.

## **UNIT III WEB SERVICES AND SERVICE LAYERING**

Web services – Service descriptions – Messaging with SOAP –Message exchange Patterns – Coordination –Atomic Transactions – Business activities – Orchestration – Choreography - Service layer abstraction – Application Service Layer – Business Service Layer – Orchestration Service Layer.

## UNIT IV SOA ANALYSIS AND DESIGN

Service oriented analysis – Business-centric SOA – Deriving business services- service modeling - Service Oriented Design – Service Modelling -WSDL basics – SOAP basics – SOA composition – Entity-centric business service design – Application service design – Task centric business service design- Design standards and guidelines - Composition – WSBPEL – WS-Coordination – WS-Policy – WS-Security .

## UNIT V ANALYSIS AND MODELLING USE CASE

Analysis and Modeling with web services and Microservices - Analysis and Modeling with REST Services and Microservices - Service API and Contract Versioning with Web Services and REST Services – Versioning - Versioning Strategies - Case Study-Implement an application using web services and REST services.

## TEXT BOOK

- 1.Thomas Erl. “Service-Oriented Architecture: Analysis and Design for Services and Microservices”, Second Edition, Prentice Hall, 2016

## REFERENCES

1. H. Howell-Barber and James P. Lawler, “Service-Oriented Architecture: SOA Strategy, Methodology, and Technology”, Auerbach Publications, 2007.
2. Ron Schmelzer et al., “XML and Web Services”, Pearson Education, 2002.
3. Sandeep Chatterjee and James Webber, “Developing Enterprise Web Services: An Architect's Guide”, Prentice Hall, 2004.
4. Thomas Erl, “Next Generation SOA: A Concise Introduction to Service Technology & Service-Oriented”, PHI, 2014
5. <https://www.ibm.com/developerworks/library/ws-soad1/>.

## COURSE OUTCOMES

At the end of this course, students will able to

1. Analyze and Design SOA based applications.
2. Explain SOA applications using SOAP based Web services
3. Describe about REST services.
4. Build SOA-based applications for intra-enterprise applications.
5. Construct SOA based inter-enterprise applications.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	2	2	-	2	-	-	-	-	3	3	1
CO2	3	3	3	3	2	2	-	1	-	-	-	-	3	3	1
CO3	3	3	3	3	1	-	-	-	2	1	-	-	3	3	1
CO4	3	3	3	3	3	-	1	-	2	3	3	-	3	3	2
CO5	3	3	3	3	3	-	1	-	2	2	3	1	3	3	3

22ITPE604	QUANTUM COMPUTING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To know the background of classical computing and quantum computing.
- To learn the fundamental concepts behind quantum computation.
- To study the details of quantum mechanics and the relation to Computer Science.
- To gain knowledge about the basic hardware and mathematical models of quantum computation.
- To learn the basics of quantum information and the theory behind it.

### UNIT I FUNDAMENTAL CONCEPTS

Global Perspectives – Quantum Bits – Quantum Computation – Quantum Algorithms – Experimental Quantum Information Processing – Quantum Information.

### UNIT II QUANTUM MECHANICS AND OVERVIEW OF COMPUTATIONAL MODELS

Quantum Mechanics: Linear Algebra – Postulates of Quantum Mechanics – Application: Superdense Coding – Density Operator – The Schmidt Decomposition and Purifications – EPR and the Bell Inequality – Computational Models: Turing Machines – Circuits – Analysis of Computational Problems.

### UNIT III QUANTUM COMPUTATION

Quantum Circuits: Quantum Algorithms – Universal Quantum Gates – Quantum Circuit Model of Computation – Simulation – Quantum Fourier Transform and Applications – Quantum Search Algorithms – Quantum Computers

### UNIT IV QUANTUM INFORMATION

Quantum Noise and Quantum Operations: Classical Noise and Markov processes – Quantum Operations – Examples – Applications – Distance Measures for Quantum Information – Quantum Error Correction – Entropy

### UNIT V QUANTUM INFORMATION THEORY

Quantum States and Accessible Information – Data Compression – Classical Information Over Noisy Quantum Channels – Quantum Information Over Noisy Quantum Channels – Entanglement as a Physical Resource – Quantum Cryptography.

### TEXT BOOK

1. Michael A. Nielsen, Issac L. Chuang, “Quantum Computation and Quantum Information”, Tenth Edition, Cambridge University Press, 2010.

### REFERENCES

1. Scott Aaronson, “Quantum Computing Since Democritus”, Cambridge University Press, 2013.
2. N. David Mermin, “Quantum Computer Science: An Introduction”, Cambridge University Press, 2007.

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Understand the basics of quantum computing and the background of Quantum Mechanics.
2. Analyse the computation models.
3. Model the circuits using quantum computation.
4. Understand the quantum operations such as noise and error–correction.
5. Appreciate the need of quantum computing.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	2	1	1	1	-	-	-	-	-	-	1	-	1
<b>CO2</b>	-	2	2	1	2	-	-	-	-	-	-	1	1	1	-
<b>CO3</b>	2	3	3	2	1	-	-	-	-	-	2	2	1	2	-
<b>CO4</b>	2	1	2	2	3	1	1	2	3	1	2	3	-	1	3
<b>CO5</b>	2	2	2	3	3	3	2	1	3	-	2	3	-	3	3

<b>22ITPE604</b>	<b>CYBER PHYSICAL SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To recognize the scope and scale of the potential impact of Cyber Physical System(CPS) technology
- To analyse cyber physical system models
- To design, develop innovative solutions for the innovative real-world problem
- To learn modelling and simulation of hybrid systems
- To analyse the functional behaviour of existing CPS such as Medical CPS, Energy CPS, Agriculture CPS.

### UNIT I Introduction and Design Principles of Cyber Physical Systems

Cyber Physical Systems Concepts – Internet of Things (IoT), Industrial IoT implications - Industry 4.0 - Design Challenges –Cyber Physical System Controls - Mobile Cyber Physical Systems – Cyber Physical System Security.

### UNIT II Cyber Physical System Components

Wireless Sensors and Actuators - Networks for Cyber Physical Systems - CPS Drivers - Community Sensing - Wireless Embedded Microsystems Architecture – CPS SW stack - The Application of Machine Learning in CPS.

### UNIT III Real Time Systems

Introduction to Real-Time Systems, RTS tasks (WCET), RTS Scheduling (Feedback Scheduling), Fault Tolerance and Robustness (RTS and Control), Hybrid Systems

### UNIT IV Security Issues in Cyber Physical Systems

Analysis for Security Attacks in Cyber Physical Systems – Generalized Framework based on Trust with Privacy - Secure Local Communication – Internet Wide Secure Communication -



Intrusion Detection, Prevention, and Privacy of Big Data for Cyber Physical Systems – Security and Privacy for Cloud-Based CPSs – Securely Processing CPS Data in the cloud – Safety Measures.

## UNIT V Medical, Energy and Agriculture Cyber Physical Systems

Emergence of CPS in different applications – Motivation for Medical CPS – System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Practitioners’ Implications – Motivation for Energy CPS - System Description and Operational Scenarios – Key Design Drivers and Quality Attributes – Cyber Paradigm for Sustainable SEES. Motivation for Agriculture CPS - System Description and Operational Scenarios, CPS in Aerospace, Biometric CPS, - Case studies.

### TEXT BOOKS

1. Raj Rajkumar, Dionisio de Niz and Mark Klein, “Cyber Physical Systems”, 2017, Pearson Education, Inc, ISBN-13: 978-0-321-92696-8.
2. Houbing Song, Gleena A. Fink and Sabina Jeschke, “Security and Privacy in CyberPhysical Systems, Foundations, Principles, and Applications”, 2018, John Wiley, ISBN: 2017012503.
3. Fei Hu, “Cyber-Physical Systems, Integrated Computing and Engineering Design”, 2013, Taylor and Francis Group, ISBN -13: 978-1-4665-7701-5.
4. Gaddadevara Matt Siddesh, Ganesh Chandra Deka et al., “Cyber-Physical Systems, A computational Perspective”, 2016, Taylor and Francis Group, ISBN -13: 978-14822-5975-9.

### REFERENCES

1. E. A. Lee and S. A. Seshia, “Introduction to Embedded Systems: A Cyber-Physical Systems Approach”, 2017, MIT Press.
2. R. Alur, “Principles of Cyber-Physical Systems,” 2015, MIT Press.
3. P. Tabuada, “Verification and control of hybrid systems: a symbolic approach”, 2009, Springer-Verlag.

### COURSE OUTCOMES

At the end of this course, students will able to

1. Describe the conceptual models of the Cyber Physical System process.
2. Make use of appropriate techniques to schedule the given tasks in real time systems.
3. Identify the network setup requirements for the given Cyber Physical System design.
4. Solve the issues that arise when building and validating security in CPS models.
5. Analyze the functional behaviour of existing CPS such as Medical CPS, Energy CPS, Agriculture CPS

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	-	-	-	-	-	-	-	-	-	2	3	2	1
CO2	3	2	-	2	-	-	-	-	-	-	-	2	3	3	2
CO3	3	3	2	2	-	-	-	-	-	-	-	2	2	2	-
CO4	3	3	2	2	-	-	1	-	-	-	-	2	2	2	-
CO5	3	3	2	3	-	2	1	-	-	-	-	2	2	2	-

22ITPE604	TEXT AND SPEECH ANALYSIS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the basic characteristics of text, language models and naïve Bayes classifier.
- To learn various steps of text analysis task.
- To study information extraction algorithms and sentiment analysis methods
- To explore information retrieval and question answering systems
- To understand fundamentals of phonetics and various speech analysis methods.

### UNIT – I

Regular Expressions – Words – Corpora - Text Normalization - Minimum Edit Distance - N-Grams - Evaluating Language Models - Generalization and Zeros – Smoothing - Kneser-Ney Smoothing - Huge Language Models and Stupid Backoff - Naive Bayes Classifiers - Training the Naive Bayes Classifier - Optimizing for Sentiment Analysis - Naive Bayes for other text classification tasks - Naive Bayes as a Language Model.

### UNIT - II

Lexical Semantics - Vector Semantics - Words and Vectors - Cosine for measuring similarity - TF-IDF: Weighing terms in the vector - Pointwise Mutual Information (PMI) - Applications of the tf-idf or PPMI vector models - Word2vec - Visualizing Embeddings - Semantic properties of embeddings - Bias and Embeddings - Evaluating Vector Models - English Word Classes - Part-of-Speech Tagging - Named Entities and Named Entity Tagging - HMM Part-of-Speech Tagging - Conditional Random Fields (CRFs) - Evaluation of Named Entity Recognition.

### UNIT - III

Information Extraction: Relation Extraction - Relation Extraction Algorithms - Extracting Times - Extracting Events and their Times - Template Filling - Word Senses - Relations Between Senses - WordNet: A Database of Lexical Relations - Word Sense Disambiguation - Semantic Roles - Diathesis Alternations - The Proposition Bank - FrameNet- Semantic Role Labeling- Selectional Restrictions - Available Sentiment and Affect Lexicons - Creating Affect Lexicons by Human Labeling- Semi-supervised Induction of Affect Lexicons - Supervised Learning of Word Sentiment - Using Lexicons for Sentiment Recognition.

### UNIT - IV

Information Retrieval: IR-based Factoid Question Answering - Entity Linking- Knowledge-based Question Answering - Using Language Models to do QA - Classic QA Models. Chatbots - Simple Frame-based Dialogue Systems - The Dialogue-State Architecture - Evaluating Dialogue Systems - Dialogue System Design.

### UNIT - V

Phonetics: Speech Sounds and Phonetic - Articulatory Phonetics - Prosody - Acoustic Phonetics and Signals. Automatic Speech Recognition and Text-to-Speech :The Automatic Speech Recognition Task - Feature Extraction for ASR - Speech Recognition Architecture - CTC - ASR Evaluation: Word Error Rate – TTS - Other Speech Tasks.

## TEXT BOOKS

1. Dan Jurafsky and James H. Martin, “Speech and Language Processing”, 3rd edition, Pearson, 2020.
2. Stuart Russell and Peter Norvig, “Artificial Intelligence: A modern approach”, 4th edition, Pearson, 2020

## REFERENCES

1. Steven Bird, Ewan Klein, Edward Loper, “Natural Language Processing with Python – Analyzing Text with the Natural Language Toolkit”, O’Reilly Media, First edition, 2009
2. Daniel de Kok, Harm Brouwer, “Natural Language Processing for the Working Programmer”, nlpwp.org, 2011

## COURSE OUTCOMES

At the end of this course, students will able to

1. Acquire the knowledge of the basic characteristics of text, language models and naïve Bayes classifier.
2. Implement various steps of text analysis task.
3. Apply information extraction algorithms and perform sentiment analysis
4. Develop information retrieval and question answering systems
5. Understand phonetics and various speech analysis methods.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO5	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-

22ITPE604	MODERN CRYPTOGRAPHY	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the mathematics behind Cryptography.
- To understand the security concerns and vulnerabilities
- To familiarize with different types of cryptosystems
- To create an awareness for the design of various cryptographic primitives
- To analyze different types of attacks on various cryptosystems

## **UNIT 1**

Basics of Algebra and Number Theory: Integer Arithmetic-Modular Arithmetic- Algebraic structures – Prime Numbers -Fermat's and Euler's Theorem – Factorization - Chinese Remainder Theorem - Linear and Quadratic Congruence -Discrete Logarithms

## **UNIT II**

Security services - Confidentiality, Integrity, Authentication, Non-repudiation,Access control – Security Mechanisms(Data Integrity, Digital Signature, Authentication, Access control) - Security Principles- Introduction to Cryptography:Classification of Cryptosystems- Cryptanalytic attacks- Cipher Properties (Confusion,Diffusion) - Traditional Secret Key Ciphers: Substitution Ciphers (monoalphabetic ciphers, poly alphabetic ciphers)- Transposition Ciphers-Stream and Block Ciphers. Modern Secret Key Ciphers:- Substitution Box-Permutation Box-Product Ciphers

## **UNIT III**

Data Encryption Standard (DES) (Fiestel and Non-Fiestel Ciphers, Structure of DES, DES Attacks, 2-DES, 3-DES) -Advanced Encryption Standard (AES) (Structure, Analysis)- Cryptographic Hash Functions– Properties - Secure Hash Algorithm-Message Authentication Code (MAC)

## **UNIT IV**

Public Key Cryptosystems (PKC): - Types of PKC –Trapdoor -one way functions -RSA Cryptosystem (Integer Factorisation Trapdoor, Key Generation, Encryption, Decryption) - El Gamal Cryptosystem (Discrete Logarithm Trapdoor, Key Generation, Encryption, Decryption) - Diffie-Hellman Key Exchange Protocol, Man in the Middle attack on Diffie-Hellman Protocol

## **UNIT V**

Digital Signature:Signing – Verification - Digital signature forgery (Existential forgery, Selective forgery, Universal forgery) - RSA Digital Signature Scheme - El Gamal Signature Scheme - IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload-Intruders, Intrusion Detection, Distributed Denial of Service attacks

## **TEXT BOOKS**

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay, “Cryptography & Network Security”, Second Edition, Tata McGraw Hill, New Delhi, 2010
2. Douglas R. Stinson, “Cryptography: Theory and Practice”, Third Edition, CRC Press.
3. William Stallings, “Cryptography and Network Security – Principles and Practices”, Pearson Education, Fourth Edition, 2006.

## **REFERENCES**

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, Tata McGraw Hill, 2003.
2. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning India, 2011
3. Bruce Schneier, “Applied Cryptography: Protocols, Algorithms, and Source Code in C”, Second Edition, John Wiley and Sons Inc, 2001.
4. Thomas Mowbray, “Cybersecurity : Managing Systems Conducting Testing, and Investigating Intrusions”, John Wiley, 2013
5. Wenbo Mao, “Modern Cryptography- Theory & Practice”, Pearson Education, 2006.

## **COURSE OUTCOMES**

At the end of this course, students will be able to

1. Evaluate whether a given protocol is strong/weak

2. Produce strong evidence that a particular protocol is strong/weak
3. Weigh and compare different cryptographic protocols
4. Be able to find and recognize common vulnerabilities in cryptographic systems
5. Design and analyze simple cryptographic protocols

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
<b>CO2</b>	3	2	2	-	-	-	-	-	-	-	-	1	-	-	-
<b>CO3</b>	3	2	2	1	1	-	-	-	-	-	-	1	2	2	1
<b>CO4</b>	3	2	2	1	1	-	-	-	-	-	-	1	2	2	1
<b>CO5</b>	3	2	2	1	1	-	-	-	-	-	-	1	2	2	1

<b>22ITPE604</b>	<b>CRYPTOCURRENCY AND BLOCK CHAIN TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- How assets can be transferred in a blockchain network
- Detailed Study of Blockchain
- Deploying transactions on the Blockchain node
- Learn, develop, and advance their skills in Ethereum development
- In depth knowledge on Smart Contract Deployment

### **UNIT I BLOCKCHAIN CONCEPTS**

Blockchain definitions How are blockchains different from databases? Versions of Blockchain Characteristics of blockchain Public blockchain (permissionless) Private blockchain (permissioned) Consortium blockchain Layers of Blockchain Block attributes. Structure of the block. Block header. Linking blocks Cryptography in blockchain. Classical cryptography. Cryptographic primitives. Symmetric key cryptography. Hashing in blockchain. Linking blocks in a blockchain. Nash Equilibrium. Prisoner's Dilemma. Byzantine Generals' Problem. Zero-Sum Games.

### **UNIT II ETHEREUM BLOCKCHAIN**

Overview of Ethereum. Ethereum accounts Transactions Consensus Timestamp Nonce Block time Forking Genesis block Ether denominations Ethereum virtual machine Gas Peer discovery Whisper and Swarm Geth Installing geth Connecting to the mainnet network Creating a private network Creating accounts Mining Fast synchronization Ethereum Wallet Mist Sybil attack Serenity. Consensus Mechanism. Proof of Work. Proof of Stake. Delegated Proof of Stake.

### **UNIT III SMART CONTRACT WITH SOLIDITY**

What Is a Smart Contract?. Life Cycle of a Smart Contract. Solidity. The Ethereum Contract ABI. Smart contract templates. Oracles. Types of blockchain oracles. Deploying smart contracts. Statements and Expressions in Solidity. Data Types of Solidity. Tokens. Mining Ether. Truffle Suite.Ganache. Deploying using Ganache. Private Ethereum Blockchain with Geth.

## UNIT IV SMART CONTRACT SECURITY

Smart Contract Vulnerability. Preventative Techniques. PoWHC and Batch Transfer Overflow. Unexpected Ether. Parity Multisig Wallet. PRNG Contracts. Reentrancy Honey Pot. Short Address/Parameter Attack. Etherpot. Race Conditions/Front Running. Denial of Service (DoS). Wallet Cyberattacks. Blockchain network attacks. Platform attacks. Phishing Attack. Online Wallet Phishing-Malware Attacks. Double Spending or 51 Percent Attack. Credential Attacks.

## UNIT V CRYPTOCURRENCY

About Crypto Currency Bitcoin Bitcoin public addresses Bitcoin Transaction output Bitcoin Transaction input Bitcoin Transaction verification Mining and consensus Mining a block Verification of transactions Key management Wallet balance. Altcoins. Proof of Storage. Proof of Stake (PoS). Proof of coinage. Proof of Deposit. Stellar (XLM). Binance Coin (BNB). Cardano (ADA). Dogecoin (DOGE). XRP (XRP). Litecoin (LTC)

## TEXT BOOKS

1. Bikramaditya Singhal, Gautam Dhameja and Priyansu Sekhar Panda, "Beginning Blockchain", Apress, 2018
2. Andreas M. Antonopoulos and Dr. Gavin Wood, "Mastering Ethereum", O'Reilly Media, 2018
3. Chris Dannen, "Introducing Ethereum and Solidity", Apress, 2017
4. Elad Elrom, "The Blockchain Developer", Apress, 2019

## REFERENCES

1. Mayukh Mukhopadhyay, "Ethereum Smart Contract Development", Packt Publishing, 2018
2. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.

## COURSE OUTCOMES

At the end of this course, students will be able to

1. Record transactions between parties
2. Implement advanced concepts such as privacy, security and decentralized file management.
3. Analyse how cryptocurrencies are created, transacted, and stored
4. Design decentralized applications for countless applications
5. Instantiate an Ethereum application on the network.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	1	1	1	-	-	-	-	-	1	2	2	2
CO2	2	2	2	1	1	1	-	-	-	-	-	1	3	2	2
CO3	2	3	3	1	1	1	-	-	-	-	-	1	3	2	2
CO4	2	3	3	1	1	1	-	-	-	-	-	1	3	2	2
CO5	2	3	3	1	1	1	-	-	-	-	-	1	3	2	2

<b>22ITPE604</b>	<b>BIO INFORMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To study the fundamentals of Bio informatics technologies
- To learn principles of modern bio-informatics and to apply basic predictive methods those are common use in the field.
- To study the tools and databases applied in the field.

## **UNIT-I**

Introduction: Need for Bioinformatics technologies –Overview of Bioinformatics technologies Structural bioinformatics –Data format and processing–Secondary resources and applications –Role of Structural bioinformatics –Biological Data Integration System.

## **UNIT-II**

Data warehousing and datamining in bioinformatics: Bioinformatics data –Data warehousing architecture –data quality –Biomedical data analysis – DNA data analysis – Protein data analysis –Machine learning –Neural network architecture and applications in bioinformatics.

## **UNIT-III**

Modeling for bioinformatics: Hidden markov modeling for biological data analysis – Sequence identification –Sequence classification–multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling –Probabilistic modeling – Bayesian networks –Boolean networks–Molecular modeling –Computer programs for molecular modeling.

## **UNIT-IV**

Pattern matching and visualization: Gene regulation –motif recognition –motif detection –strategies for motif etection –Visualization –Fractal analysis –DNA walk models–one dimension –two dimension –higher dimension –Game representation of Biological sequences –DNA, Protein, Amino acid sequences.

## **UNIT-V**

Microarray analysis: Microarray technology for genome expression study –image analysis for data extraction –preprocessing –segmentation –gridding –spot extraction – normalization, filtering –cluster analysis –gene network analysis –Compared Evaluation of Scientific Data Management Systems –Cost Matrix –Evaluation model –Benchmark – Tradeoffs.

## **TEXT BOOKS**

1. Yi-Ping Phoebe Chen (Ed), “BioInformatics Technologies”, First Indian Reprint, Springer Verlag, 2007.





## PROFESSIONAL ELECTIVES –V

22ITPE605	BUSINESS ANALYTICS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the Analytics Life Cycle.
- To comprehend the process of acquiring Business Intelligence
- To understand various types of analytics for Business Forecasting
- To model the supply chain management for Analytics.
- To apply analytics for different functions of a business

### UNIT I INTRODUCTION TO BUSINESS ANALYTICS

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

### UNIT II BUSINESS INTELLIGENCE

Data Warehouses and Data Mart - Knowledge Management – Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence – OLAP –, Analytic functions

### UNIT III BUSINESS FORECASTING

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling – Machine Learning for Predictive analytics.

### UNIT IV HR & SUPPLY CHAIN ANALYTICS

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain

### UNIT V MARKETING & SALES ANALYTICS

Marketing Strategy, Marketing Mix, Customer Behavior – selling Process – Sales Planning – Analytics applications in Marketing and Sales

### REFERENCES

1. R. Evans James, “Business Analytics”, 2017
2. R N Prasad, Seema Acharya, “Fundamentals of Business Analytics”, 2016
3. Philip Kotler and Kevin Keller, “Marketing Management”, 15th edition, PHI, 2016
4. VSP RAO, “Human Resource Management”, 3rd Edition, Excel Books, 2010.
5. Mahadevan B, “Operations Management -Theory and Practice”, 3<sup>rd</sup> Edition, Pearson Education, 2018.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Explain the real world business problems and model with analytical solutions.
2. Identify the business processes for extracting Business Intelligence
3. Apply predictive analytics for business fore-casting
4. Apply analytics for supply chain and logistics management.
5. Use analytics for marketing and sales.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	-	-	-	-	-	-	1
CO2	-	3	-	2	-	1	1	-	-	-	-	-	-	3	-
CO3	-	-	3	3	3	-	2	1	-	-	-	-	-	-	3
CO4	-	-	-	3	3	-	-	-	-	2	2	3	3	-	-
CO5	-	-	-	-	3	3	-	1	1	-	3	2	-	-	3

<b>22ITPE605</b>	<b>DIGITAL AND MOBILE FORENSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- Describe basic principles of digital forensics and identify the unique challenges involved in mobile forensics.
- Describe mobile ecosystem security mechanisms and risks
- Understand the procedures of the validation, preservation, acquisition, examination, analysis and reporting of digital information from a mobile device.
- Explain and compare various data acquisition and analysis techniques used in mobile forensics.
- Conduct the logical acquisition and physical acquisition to extract data from mobile devices

### UNIT – I

**INTRODUCTION TO WIRELESS TECHNOLOGIES:** Overview of wireless technologies and security: Personal Area Networks, Wireless Local Area Networks, Metropolitan Area Networks, Wide Area Networks. Wireless threats, vulnerabilities and security: Wireless LANs, War Driving, War Chalking, War Flying, Common Wi-fi security recommendations, PDA Security, Cell Phones and Security, Wireless DoS attacks, GPS Jamming, Identity theft.

### UNIT - II

**SECURITY FRAMEWORK FOR MOBILE SYSTEMS :** CIA triad in mobile phones-Voice, SMS and Identification data interception in GSM: Introduction, practical setup and

tools, implementation- Software and Hardware Mobile phone tricks: Netmonitor, GSM network service codes, mobile phone codes, catalog tricks and AT command set- SMS security issues.

### UNIT - III

MOBILE PHONE FORENSICS :Crime and mobile phones, evidences, forensic procedures, files present in SIM card, device data, external memory dump, evidences in memory card, operators systems- Android forensics: Procedures for handling an android device, imaging android USB mass storage devices, logical and physical techniques.

### UNIT – IV

INTRODUCTION TO DIGITAL FORENSICS : Digital forensics: Introduction – Evidential potential of digital devices: closed vs. open systems, evaluating digital evidence potential- Device handling: seizure issues, device identification, networked devices and contamination.

### UNIT - V

ANALYSIS OF DIGITAL FORENSIC TECHNIQUES : Digital forensics examination principles: Previewing, imaging, continuity, hashing and evidence locations- Seven element security model- developmental model of digital systems- audit and logs- Evidence interpretation: Data content and context.

### TEXT BOOKS

1. Gregory Kipper, “Wireless Crime and Forensic Investigation”, Auerbach Publications, 2007.
2. Iosif I.Androulidakis, “ Mobile phone security and forensics: A practical approach”, Springer publications, 2012.

### REFERENCES

1. Andrew Hoog, “Android Forensics: Investigation, Analysis and Mobile Security for Google Android”, Elsevier publications, 2011.
2. Angus M.Marshall, “ Digital forensics: Digital evidence in criminal investigation”, John – Wiley and Sons, 2008.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Learn concepts of wireless technologies
2. Apply the security framework for mobile systems
3. Understand the mobile phone forensics and handle various security issues
4. Apply the basis in digital forensics
5. Analyse and apply digital forensic techniques

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1	1	-	-	-	-	-	-	1	3	1	-
CO2	3	2	2	1	1	-	-	-	-	-	-	1	3	1	-
CO3	3	2	2	1	1	-	-	-	-	-	-	1	3	1	-
CO4	3	2	2	1	1	-	-	-	-	-	-	1	3	1	-
CO5	3	2	2	1	2	-	-	-	-	-	-	1	3	1	-

<b>22ITPE605</b>	<b>SOCIAL NETWORK SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- Describe the significance of security in online social networks
- Outline the trust management policies in achieving security
- Gain knowledge on information sharing and identity management actions
- Handle and manage digital identity in online social network
- Analyze various privacy and terrorism issues on Online Social Networks

### **UNIT I ONLINE SOCIAL NETWORKS AND SECURITY ISSUES**

Introduction- Social Networks: The Meaning of Community –Evolution of Online Social Networks – Trust Management – Controlled Information Sharing – Identity Management

### **UNIT II TRUST MANAGEMENT IN ONLINE SOCIAL NETWORKS**

Trust, Policies and Reputation Systems – Trust properties – Trust Components – Social trust and Social Capital – Trust Evaluation Model

### **UNIT III INFORMATION SHARING IN ONLINE SOCIAL NETWORKS**

Access control in Data Management System – Access control Models – Relationship – based Access control – Privacy settings in Commercial Online Social Networks – Existing Access control approaches

### **UNIT IV IDENTITY MANAGEMENT IN ONLINE SOCIAL NETWORKS**

Digital Identity – Identity Management Models – Self-Presentation – Identity Disclosure – Identity Theft

### **UNIT V NETWORK ANALYSIS, PRIVACY AND TERRORISM**

Privacy in Online Social Networks – Privacy Threats and Defenses – Terrorism Threats and Defenses

### **REFERENCES**

1. Barbara Carminati, Elena Ferrari, Marco Viviani, “Security and Trust in Online Social Networks”, Morgan & Claypool, 2013.
2. Richard Chbeir, Bechara Al Bouna, “Security and Privacy Preserving in Social Networks”, Springer- Verlag Wein, 2013..
3. Yaniv Altshuler, Yuval Elovici, Armin. B. Cremers, Nadav Aharoni, Alex Pentland, “Security and Privacy in Social Networks”, Springer Science Business Media, New York, 2013.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Know security issues in online social networks
2. Create Policies of trust for online social networks
3. Carry out secured information sharing and take identity management actions
4. Handle and manage digital identity in online social network
5. Manage Privacy threats in Online Social Networks

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	-	-	-	-	2	-	-	-	-	-	2	3	2	-
<b>CO2</b>	1	-	-	2	-	2	1	-	-	1	1	2	3	2	-
<b>CO3</b>	1	2	-	2	-	2	1	-	-	1	1	2	3	2	-
<b>CO4</b>	1	2	3	2	2	2	1	1	-	1	1	2	3	3	2
<b>CO5</b>	1	2	3	2	3	2	1	1	-	1	1	2	3	3	2

<b>22ITPE605</b>	<b>HUMAN COMPUTER INTERACTION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To learn the principles and fundamentals of human computer interaction (HCI).
- To analyze HCI theories, as they relate to collaborative or social software.
- To understand components of interfaces and screens, including windows, menus and controls.
- To understand user interface design principles, and apply them to designing an interface.
- To understand the rationale and guidelines for an effective interface design methodology.

### **UNIT I DESIGN PROCESS**

Humans – Information Process – Computer – Information Process – Differences and Similarities between them – Need for Interaction – Models – Ergonomics – Style – Context – Paradigms – Designing of Interactive Systems – Usability – Paradigm Shift – Interaction Design Basics – Design Process – Scenarios – Users Need –Complexity of Design.

### **UNIT II DESIGN AND EVALUATION OF INTERACTIVE SYSTEMS**

Software Process – Usability Engineering – Issue based Information Systems – Iterative Design Practices – Design Rules – Maximum Usability – Principles – Standards and Guidelines – Design Patterns – Programming Tools – Windowing Systems – Interaction Tool Kit – User Interface Management System – Evaluation Techniques – Evaluation Design – Evaluating Implementations – Observational Methods.

### **UNIT III MODELLING INTERFACES**

Universal Design Principles – Multimodal Systems – User Support – Presentation and Implementation Issues – Types – Requirements – Approaches – Cognitive Model – Hierarchical Model – Linguistic Model – Physical and Device Models – Socio Technical Models – Communication and Collaboration Models – Task Models – Task Analysis And Design Dialogue Notations And Design – Dialogue Need – Dialogue Design Notations –

Graphical – Textual – Representing Dialogue – Formal Descriptions – Dialogue Analysis – System Models – Interaction Models – Relationship With Dialogue – Formalisms – Formal Notations – Interstitial Behavior.

#### **UNIT IV EXPERIMENTAL DESIGN AND STATISTICAL ANALYSIS OF HCI**

Basic Design Structure – Single Independent Variable – Multiple Independent Variable – Factorial Design – Split-Plot Design – Random Errors – Experimental Procedure – Statistical Analysis – T Tests – Analysis of Variance Test – Regression – Chi-Square Test – Survey – Probabilistic Sampling – Non-Probabilistic Sampling – Developing Survey Questions.

#### **UNIT V CURRENT TRENDS**

Virtual Reality – Modeling Rich Interaction – Status Event Analysis – Properties – Rich Contexts – Sensor-Based Systems – Groupware – Applications – Ubiquitous Computing – Virtual Reality – Wearable User Interfaces – User Interfaces For MR Applications.

#### **TEXT BOOKS**

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Third Edition, Prentice Hall, 2004.
2. Preece, J., Sharp, H., Rogers, Y., “Interaction Design: Beyond Human-Computer Interaction”, Fourth Edition, Wiley, 2015.

#### **REFERENCES**

1. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, “Research Methods in Human-Computer Interaction”, Wiley, 2010.
2. Ben Shneiderman, Catherine Plaisant, “Designing the User Interface: Strategies for Effective Human-Computer Interaction”, Fifth Edition, Addison Wesley, 2009.
3. Jeff Johnson, “Designing with the Mind in Mind: Simple Guide to Understanding User Interface Design Rules”, Second Edition, Morgan Kaufmann, 2014.

#### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Interpret the contributions of human factors and technical constraints on human-computer interaction.
2. Apply HCI techniques and methods to the design of software.
3. Apply exploratory and experimental research methods in HCI.
4. Design and develop various models that suit real time interface development.
5. Design and develop real time human computer interaction (HCI) system.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	2	2	3	2	-	-	-	-	-	-	3	-	-	3	-
<b>CO5</b>	2	2	3	2	-	-	-	-	-	-	3	-	-	3	-

<b>22ITPE605</b>	<b>5G WIRELESS NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To Learn 5G Technology advances and their benefits
- To Learn the key RF, PHY, MAC and air interface changes required to support 5G
- To Learn Device to device communication and millimeter wave communication
- To Implement options for 5G
- To Understand interference management, mobility management and security issues in 5G

### **UNIT I**

Overview of 5G Broadband Wireless Communications: Evaluation of mobile technologies 1G to 4G (LTE, LTEA, LTEA Pro) , An Overview of 5G requirements, Regulations for 5G, Spectrum Analysis and Sharing for 5G.

### **UNIT II**

The 5G wireless Propagation Channels: Channel modeling requirements, propagation scenarios and challenges in the 5G modeling, Channel Models for mmWave MIMO Systems.

### **UNIT III**

Transmission and Design Techniques for 5G: Basic requirements of transmission over 5G, Modulation Techniques – Orthogonal frequency division multiplexing (OFDM), generalized frequency division multiplexing (GFDM), filter bank multi-carriers (FBMC) and universal filtered multi-carrier (UFMC), Multiple Accesses Techniques – orthogonal frequency division multiple accesses (OFDMA), generalized frequency division multiple accesses (GFDMA), nonorthogonal multiple accesses (NOMA).

### **UNIT IV**

Device-to-device (D2D) and machine-to-machine (M2M) type communications – Extension of 4G D2D standardization to 5G, radio resource management for mobile broadband D2D, multihop and multi-operator D2D communications.

### **UNIT V**

Millimeter-wave Communications – spectrum regulations, deployment scenarios, beamforming, physical layer techniques, interference and mobility management, Massive MIMO propagation channel models, Channel Estimation in Massive MIMO, Massive MIMO with Imperfect CSI, Multi-Cell Massive MIMO, Pilot Contamination, Spatial Modulation (SM)

### **TEXTBOOKS**

1. Martin Sauter, “From GSM From GSM to LTE–Advanced Pro and 5G: An Introduction to Mobile Networks and Mobile Broadband”, Wiley-Blackwell.
2. Afif Osseiran, Jose.F.Monserrat, Patrick Marsch, “Fundamentals of 5G Mobile Networks”, Cambridge University Press.
3. Athanasios G.Kanatos, Konstantina S.Nikita, Panagiotis Mathiopoulos, “New Directions in Wireless Communication Systems from Mobile to 5G”, CRC Press.
4. Theodore S.Rappaport, Robert W.Heath, Robert C.Danials, James N.Murdock “Millimeter Wave Wireless Communications”, Prentice Hall Communications.

### **REFERENCES**

1. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, John Wiley & Sons.
2. Amitabha Ghosh and Rapeepat Ratasuk “Essentials of LTE and LTE-A”, Cambridge University Press.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Learn 5G Technology advances and their benefits
2. Learn the key RF, PHY, MAC and air interface changes required to support 5G
3. Learn Device to device communication and millimeter wave communication
4. Implement options for 5G
5. Understand interference management, mobility management and security issues in 5G

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	2	-	-	-	-	-	-	-	-	-
CO5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

22ITPE605	DRONE TECHNOLOGY	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

The primary objective of this course is

- To teach students to use and be inspired by Unmanned Aerial Vehicles (UAVs), more commonly known as drones.
- To understand the working principles of Drone
- To apply engineering and scientific applications.

### UNIT I INTRODUCTION TO UNMANNED AERIAL VEHICLES

History of UAS- Introduction to fixed-wing UAVs, Introduction – Classification of UAV's Unmanned aircraft system elements. Case study of Predator C: Avenger - Advantages and Dis-advantages of UAV's - Applications of UAV's

### UNIT II DRONE PROTOCOLS

Basic drone protocols for collecting data - Collect, process, control, clean up, and import Drone and Acoustic Doppler Profiler- Classify drone imagery in ArcGIS- discerning water from other habitat and land use categories.

### UNIT III WORKING PRINCIPLE

Main controller- main sensor- electronic speed controller- receiver - motor-GPS-optical flow - ground station - safety.



## UNIT IV TYPES AND PAYLOAD

Drone Technology: Types, Payloads - Applications, Frequency Spectrum Issues and Future Development

## UNIT V BUILDING THE DRONE

Basic drone terminology - choosing the drone frame-motor -propeller - propulsion- flight controller- putting all together.

### TEXT BOOK

1. Ben Rupert, "Drones - the Ultimate Guide: How They Work, Learning to Fly, How to Fly, Building", CreateSpace Independent Publishing Platform, 2017.

### REFERENCES

1. Bart Custers, "The Future of Drone Use: Opportunities and Threats from Ethical and Legal Perspectives", 2016.
2. Douglas M. Marshall, Richard K. Barnhart, Eric Shappee, Michael Thomas Most. "Introduction to Unmanned Aircraft Systems", CRC Press, 2016.
3. Grégoire Chamayou, "Drone Theory", Penguin, 2015.
4. Michael J. Boyle, "Legal and Ethical Implications of Drone Warfare", Routledge; 2017.
5. Daisuke Nakazawa, David W. Wang, Farid Kendoul, Kenzo Nonami, and Satoshi Suzuki, "Autonomous Flying Robots: Unmanned Aerial Vehicles and Micro Aerial Vehicles", Springer, 2010.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Compare the different classes of the UAS
2. Explain the technology of Drone
3. Explain the essential foundational, design, integration and operational knowledge of drone
4. Gain knowledge about payload and its types.
5. Design the propeller and drone frame.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)																
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
CO1	3	3	3	-	-	-	1	-	-	-	-	-	3	-	-	
CO2	3	2	-	-	-	2		-	-	-	-	-	-	3	-	
CO3	3	2	3	2	-	-	1	-	-	-	-	-	3	-	-	
CO4	3	3	2	2	-	-		-	-	-	-	-	3	3	-	
CO5	3	3	2	-	3	-	-	-	-	-	-	-	3	-	-	

<b>22ITPE605</b>	<b>IMAGE AND VIDEO ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To provide a basic foundation towards digital image processing and video processing.
- To learn about image and video enhancement and restoration techniques.
- To provide Compression methods for image analytics applications.
- To Understand Compression methods for video analytics applications
- To learn about feature detection and description

### **UNIT I INTRODUCTION TO DIGITAL IMAGE AND VIDEO PROCESSING**

Digital image representation, Sampling and Quantization, Types of Images, Basic Relations between Pixels - Neighbours, Connectivity, Distance Measures between pixels, Linear and Non-Linear Operations, Introduction to Digital Video, Sampled Video, Video Transmission. Gray-Level Processing: Image Histogram, Linear and Non-linear point operations on Images, Arithmetic Operations between Images, Geometric Image Operations.

Binary Image Processing: Image Thresholding, Region labelling, Binary Image Morphology

### **UNIT II IMAGE AND VIDEO ENHANCEMENT AND RESTORATION**

Spatial domain - Linear and Non-linear Filtering, Morphological filtering, Frequency domain – Homomorphic Filtering, Blotch Detection and Removal - Blotch Detection, Motion Vector Repair and Interpolating Corrupted Intensities, Intensity Flicker Correction - Flicker Parameter Estimation, Brief introduction towards Wavelets, Wavelet based image denoising, Basic methods for image restoration using deconvolution filters

### **UNIT III IMAGE ANALYSIS**

Image Compression: Huffman coding, Run length coding, LZW coding, Lossless Coding, Wavelets based image compression

### **UNIT IV VIDEO ANALYSIS**

Video Compression: Basic Concepts and Techniques of Video Coding and the H.264 Standard, MPEG-1 and MPEG-2 Video Standards

### **UNIT V FEATURE DETECTION AND DESCRIPTION**

Introduction to feature detectors, descriptors, matching and tracking, Basic edge detectors – canny, Sobel, Prewitt etc., Image Segmentation - Region Based Segmentation – Region Growing and Region Splitting and Merging, Thresholding – Basic global thresholding, optimum global thresholding using Otsu ‘s Method

### **TEXT BOOKS**

1. Alan Bovik, “Handbook of Image and Video Processing”, Second Edition, Academic Press, 2005.
2. Rafael C. Gonzalez and Richard E. Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2008.
3. Richard Szeliski, “Computer Vision – Algorithms and Applications”, Springer, 2011

### **REFERENCES**

1. Anil K Jain, “Fundamentals of Digital Image Processing”, PHI, 2011.
2. Oge Marques, “Practical Image and Video Processing Using MatLab”, Wiley, 2011.
3. John W. Woods, “Multidimensional Signal, Image, Video Processing and Coding”, Academic Press, 2006

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the fundamental principles of image and video analysis
2. Apply different filters for enhancement of image and video
3. Investigate different coding techniques.
4. Comprehend different compression techniques for video.
5. Apply the image and video analysis approaches to solve real world problems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	1	1	1	-	-	-	-	-	-	1	-	1
CO2	1	2	2	2	1	-	-	-	-	-	-	-	-	2	-
CO3	-	2	3	2	1	1	-	-	-	-	-	2	1	1	-
CO4	2	1	2	2	3	1	-	-	-	-	-	1	-	-	3
CO5	2	2	2	3	2	2	2	1	3	-	2	2	-	3	3

22ITPE605	SOFTWARE METRICS				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To understand the fundamentals of measurement.
- To understand framework of software measurement.
- To learn the importance of data collection and analyzing data.
- To learn the art of measuring internal attributes of software.
- To understand external software attributes measures.

### UNIT-I

**Fundamentals of Measurement: Measurement:** what is it and why do it?: Measurement in Software Engineering, Scope of Software Metrics, The Basics of measurement: The representational theory of measurement, Measurement and models, Measurement scales and scale types, meaningfulness in measurement

### UNIT-II

**A Goal-Based Framework For Software Measurement:** Classifying software measures, Determining what to Measure, Applying the framework, Software measurement validation, Performing Software Measurement validation. **Empirical investigation:** Principles of Empirical Studies, Planning Experiments, Planning case studies as quasi-experiments, Relevant and Meaningful Studies

### UNIT-III

**Software Metrics Data Collection:** Defining good data ,Data collection for incident reports, How to collect data, Reliability of data collection Procedures. **Analyzing software**

**measurement data:** Statistical distributions and hypothesis testing, Classical data analysis techniques, Examples of simple analysis techniques

#### UNIT-IV

**Measuring internal product attributes:** Size Properties of Software Size, Code size, Design size, Requirements analysis and Specification size, Functional size measures and estimators, Applications of size measures. **Measuring internal product attributes:** Structure: Aspects of Structural Measures, Control flow structure of program units, Design-level Attributes, Object-oriented Structural attributes and measures

#### UNIT-V

**Measuring External Product Attributes:** Modelling software quality, Measuring aspects of quality, Usability Measures, Maintainability measures, Security Measures. **Software Reliability: Measurement and Prediction:** Basics of reliability theory, The software reliability problem, Parametric reliability growth models, Predictive accuracy

#### TEXT BOOKS

1. Norman Fenton, James Bieman. “Software Metrics A Rigorous and Practical Approach”,Third Edition, 2014

#### REFERENCES

1. Norman E, Fenton and Shari Lawrence Pfleeger, “Software metrics”,International Thomson Computer Press, 1997.
2. Stephen H.Kan, “Metric and models in software quality engineering”, Second edition, Addison-Wesley Professional, 2002.
3. William A. Florac and Areitor D. Carletow, “Measuring the Software Process”, Addison – Wesley, 1995.
4. Robert B.Grady, “Practical Software Metrics for Project Management and Process Improvement”,Prentice Hall, 1992.

#### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand various fundamentals of measurement and software metrics
2. Apply framework and analysis techniques for software measurement.
3. Analyse data collection in software metric.
4. Apply internal and external attributes of software product for effort estimation.
5. Apply reliability models for predicting software quality

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	3	-	-	-	-	-	3	3	-
CO3	2	2	2	2	-	2	2	2	2	-	-	-	3	3	-
CO4	3	3	3	3	-	3	3	1	3	3	3	3	3	3	3
CO5	3	2	-	1	3	-	1	3	3	-	1	3	3	-	3

<b>22ITPE605</b>	<b>GAME THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

- To study the rules of the game
- To know the information about the Bargaining games
- To develop the imperfect information
- To know the coalition of Game theory
- To know the stability of the game theory

## **UNIT I INTRODUCTION**

Introduction – Rules of the game- Strategic games – Introduction to zero sum games – Nash Equilibrium – Bayesian game- Mixed Strategic Nash Equilibrium.

## **UNIT II EXTENSIVE GAME WITH PERFECT INFORMATION**

Extensive game with perfect information – Bargaining games – repeated games – sub game perfect equilibrium.

## **UNIT III EXTENSIVE GAME WITH IMPERFECT INFORMATION**

Extensive game with Imperfect Information – Equivalence of Extensive games – mixed strategy – strategy as machine.

## **UNIT IV COALITION GAME THEORY**

Coalition Game with transferable payoff- Exchange economy – Stable Set Bargaining – Shapley Value.

## **UNIT V EVOLUTIONARY GAME THEORY**

Evolutionary theory – stability – Dynamic structure – Stochastic stability.

## **TEXT BOOKS**

1. Osborne Martin.J, “An Introduction to Game Theory”, Oxford University Press, 2003.
2. Martin J. Osborne, Ariel Rubinstein, “A course in Game Theory”, MIT press, 1984.

## **REFERENCES**

1. Eric Rasmusen “Games and Information: An Introduction to game theory”, MIT press.
2. Joel Watson, “Strategy: An Introduction to Game Theory” W.W. Norton & Company – 2001.

## **COURSE OUTCOMES**

At the end of the course students will be able to

1. Develop the rules of the game
2. Design the game with perfect information in repeated games.
3. Develop the game with imperfect information.
4. How to coalite the games with economy.
5. Structure the stability of the game.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2		1	1	-	-	-	-	-	2	1	-	1
CO2	1	2	1	1	1	-	-	1	-	-	-	1	-	1	-
CO3	1	3	3	2	1	-	-	-	-	1	2	1	-	2	-
CO4	1	1	2	-	-	-	2	1	2	1	-	2	-	1	-
CO5	-	1	1	-	2	1	3	2	1	-	2	1	-	-	3

22ITPE605	ENGINEERING SECURE SOFTWARE SYSTEMS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- Students will demonstrate knowledge of the distinction between critical and non-critical systems.
- Students will demonstrate the ability to manage a project including planning, scheduling and risk assessment/management.
- Students will author a software requirements document.
- Students will demonstrate an understanding of the proper contents of a software requirements document.
- Students will author a formal specification for a software system.
- Students will demonstrate an understanding of distributed system architectures and application architectures.
- Students will demonstrate an understanding of the differences between real-time and non-real time systems.
- Students will demonstrate proficiency in rapid software development techniques.
- Students will be able to identify specific components of a software design that can be targeted for reuse.
- Students will demonstrate proficiency in software development cost estimation.
- Students will author a software testing plan.

**UNIT – I : Security a software Issue:** introduction, the problem, Software Assurance and Software Security, Threats to software security, Sources of software insecurity, Benefits of Detecting Software Security What Makes Software Secure: Properties of Secure Software, Influencing the security properties of software, Asserting and specifying the desired security properties?

**UNIT – II : Requirements Engineering for secure software:** Introduction, the SQUARE process Model, Requirements elicitation and prioritization

**UNIT – III : Secure Software Architecture and Design:** Introduction, software security practices for architecture and design: architectural risk analysis, software security knowledge for architecture and design: security principles, security guidelines and attack patterns Secure coding and Testing: Code analysis, Software Security testing, Security testing considerations throughout the SDLC

**UNIT – IV : Security and Complexity:** System Assembly Challenges: introduction, security failures, functional and attacker perspectives for security analysis, system complexity drivers and security

**UNIT – V : Governance and Managing for More Secure Software:** Governance and security, Adopting an enterprise software security framework, How much security is enough?, Security and project management, Maturity of Practice

**TEXT BOOK**

1. Julia H. Allen, “Software Security Engineering”, Pearson Education

**REFERNCES**

1. Jason Grembi, “Developing Secure Software”, Cengage Learning
2. Richard Sinn, “Software Security”, Cengage Learning
3. Theodor Richardson, Charles N Thies, “Secure Software Design”, Jones & Bartlett, 2013.
4. 2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, “Enterprise Software Security: A Confluence of Disciplines”, Addison Wesley, 2014.
5. 3. William R. Simpson, “Enterprise level security: Securing Information Systems in an Uncertain world”, 1st edition, CRC Press, 2016.
6. 4. Qing Li, Gregory Clark, “Security Intelligence: A Practitioner’s Guide to Solving Enterprise Security Challenges”, Wiley, 2010.

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Differentiate various software vulnerabilities.
2. Understand software process vulnerabilities for an organization.
3. Monitor resources consumption in a software.
4. Interrelate security and software development process.
5. Manage and troubleshoot a enterprise network and to manage them.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO4</b>	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO5</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-

## PROFESSIONAL ELECTIVES - VI

22ITPE703	IoT AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

The primary objective of this course is

- To understand the key concepts in sensors and IOT
- To understand the architecture of sensors to be used in the IOT applications.
- To understand the concepts and issues involved in designing low power protocols for IOT.
- To make the students to know about the different domains of applications for IOT.

### UNIT I INTRODUCTION

Definition – phases – Foundations – Policy – Challenges and Issues – identification – security – privacy. Components in internet of things : Control UNITS – Sensors – Communication modules – Power Sources –Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

### UNIT II SENSOR ARCHITECTURE AND FABRICATION

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT–Arduino/Equivalent Microcontroller platform– Setting up the board - Programming for IOT –Reading from Sensors Communication: Connecting microcontroller with mobile devices – communication through bluetooth and USB – connection with the internet using WiFi / Ethernet

### UNIT III IOT ARCHITECTURE

IOT Architecture: M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture- Clustering Principles in an Internet of Things Architecture - The Role of Context -Design Guidelines - Software Agents for Object – Data Synchronization -Types of Network Architectures

### UNIT IV DIFFERENT PROTOCOLS IN IOT

Protocol: Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security- Design and development of Security and Privacy protocols related to IOT.

### UNIT V IOT APPLICATIONS

The Meaning of DiY in the Network Society – Sensor - actuator Technologies and Middleware as a Basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation, Case studies – Open Source e – Health sensor platform – Be Close Elderly monitoring – Other recent projects



## TEXT BOOK

1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities Press, 2015

## REFERENCES

1. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of Things", Springer, 2011.
2. Honbo Zhou, The Internet of Things in the Cloud: A Middleware Perspective, CRC Press, 2012.
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.
5. Charalampos Doukas, "Building Internet of Things with the Arduino", Create space, April 2002

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Apply the concepts of sensor for interfacing with the environment.
2. Evaluate the performance of different types of applications for performance.
3. Synthesize new IOT protocols by doing some minor changes.
4. Apply the different architectural features of Embedded systems for IOT application design.
5. Apply the concepts for sensors and IOT for health care applications.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	2	-	-	-	1	-	-	3	-	1
CO2	3	2	2	-	-	2	-	-	-	1	-	1	-	3	-
CO3	3	2	2	1	-	2	-	-	-	1	1	1	-	-	3
CO4	3	2	2	1	1	2	-	-	-	1	1	1	-	-	3
CO5	3	2	2	1	1	2	-	-	-	1	1	1	-	-	3

22ITPE703	EXPLORATORY DATA ANALYSIS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the fundamentals Exploratory Data Analysis
- To understand the theoretical foundation of working with data.

- To learn essential statistical measures
- To understand time-series data and how to perform EDA on it.
- To get knowledge about quality on data analysis.

## **UNIT I INTRODUCTION TO EXPLORATORY DATA ANALYSIS**

Exploratory Data Analysis Fundamentals - Understanding data science - The significance of EDA - Making sense of data - Comparing EDA with classical and Bayesian analysis - Software tools available for EDA - Visual aids for EDA – Types of Charts

## **UNIT II DATA TRANSFORMATION**

EDA with personal Email - Loading the dataset - Data transformation - Data Analysis - Merging database-style data frames - Transformation techniques - Benefits of Transformation

## **UNIT III DESCRIPTIVE STATISTICS, GROUPING DATASETS**

Understanding statistics - Measures of central tendency - Measures of dispersion - Grouping Datasets - Understanding groupby() - Data aggregation - Pivot tables and cross-tabulations - Correlation - Types of analysis - multivariate analysis using the Titanic dataset

## **UNIT IV TIME SERIES ANALYSIS, MODEL DEVELOPMENT AND EVALUATION**

Understanding the time series - Time Series Analysis with Open Power System - Hypothesis Testing and Regression - Hypothesis testing - p-hacking - Understanding regression - Model development and evaluation

## **UNIT V MACHINE LEARNING, EDA ON WINE QUALITY DATA ANALYSIS**

Types of machine learning - Supervised learning - Unsupervised learning - Reinforcement Learning - Unified machine learning workflow - Disclosing the wine quality dataset - Analyzing red wine - Analyzing white wine – Model Development and Evaluation

## **TEXT BOOK**

1. Suresh Kumar Mukhiya, Usman Ahmed, “Hands-On Exploratory Data Analysis with Python: Perform EDA techniques to understand, summarize, and investigate your data”, First Edition, Packt Publication, 2020.

## **REFERENCE BOOKS**

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis”, Second Edition, Oreilly Publications, 2014.
2. Glenn J. Myatt and Wayne P. Johnson, “Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining”, Second Edition, Wiley Publications, 2014.
3. Glenn J. Myatt and Wayne P. Johnson, “Making Sense of Data II: A Practical Guide to Data Visualization, Advanced Data Mining Methods and Applications”, Wiley Publications, 2009.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the fundamental concepts of exploratory data analysis using Python
2. Implement EDA with personal mail and to work with data transformation
3. Understand the variance and standard deviation of datasets
4. Describe the visualization and analysis of time series and survival calculations.
5. Understand different types of machine learning and to apply all the techniques learnt to perform EDA on a wine quality dataset.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	1	-	3	-	-	3	3	2	-	-	2	2	2
<b>CO2</b>	3	2	1	-	3	-	-	3	3	2	-	-	2	2	2
<b>CO3</b>	3	2	1	-	3	-	-	3	3	2	-	-	2	2	2
<b>CO4</b>	3	2	1	-	3	-	-	3	3	2	-	-	2	2	2
<b>CO5</b>	3	2	1	-	3	-	-	3	3	2	-	1	2	2	2

<b>22ITPE703</b>	<b>NEURAL NETWORKS AND DEEP LEARNING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
- Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
- Implement deep learning algorithms and solve real-world problems.

### UNIT-I

Basics of Artificial Neural Networks - Characteristics of Neural Networks, ANN Terminology, Models of Neuron, Topology, Basic Learning Laws.

Deep Learning Applications - Large Scale Deep Learning, Computer Vision, Speech Recognition, Natural Language Processing, Other Applications.

### UNIT-II

Activation and Synaptic Dynamics – Introduction - Activation Dynamics Models - Synaptic Dynamics Models - Learning Methods - Stability and Convergence - Recall in Neural Networks.

Functional Units of ANN for Pattern Recognition Tasks -Pattern Recognition Problem , Basic Functional Units..

### **UNIT–III**

Feedforward Neural Networks - Introduction, Analysis of Pattern Association Networks, Analysis of Pattern Classification Networks, Analysis of Pattern Mapping Networks.

Feedback Neural Networks – Introduction, Analysis of Linear AutoassociativeFF Networks, Analysis of Pattern Storage Networks, Stochastic Networks and Simulated Annealing, Boltzmann Machine Analysis.

### **UNIT–IV**

Machine Learning Basics - Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

### **UNIT–V**

Regularization for Deep Learning - Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods, Dropout, Adversarial Training, Tangent Distance, Tangent Prop, and Manifold Tangent Classifier.

### **TEXT BOOKS**

1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
2. Goodfellow, I., Bengio, Y., and Courville, A., Deep Learning, MIT Press, 2016.

### **REFERENCES**

1. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.
2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Know the different network architectures and how these are used in current applications
2. Implement, train, and evaluate neural networks using existing software libraries
3. Present and critically assess current research on neural networks and their applications
4. Relate the concepts and techniques introduced in the course to your own research
5. Plan and carry out a research project on neural networks within given time limits

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO2	2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO3	2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
CO4	1	3	3	3	3	-	-	-	-	-	-	-	1	3	-
CO5	1	3	3	3	3	-	-	-	-	-	-	-	-	3	-

22ITPE703	NEXT GENERATION NETWORKS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the fundamentals of 5G internet.
- To understand the concept of small cells in 5G mobile networks.
- To learn the mobile clouds in 5G network context.
- To understand the role of cognitive radios in 5G networks.
- To learn the security issues in 5G networks.

### UNIT I PERVASIVE CONNECTED WORLD AND 5G INTERNET

Historical Trend of Wireless Communications – Evolution of LTE Technology to Beyond 4G  
 – 5G Roadmap – Ten Pillars of 5G – Internet of Things and Context Awareness – Networking Reconfiguration and Virtualization Support – Mobility – Quality of Service Control – Emerging Approach for Resource over Provisioning.

### UNIT II SMALL CELLS FOR 5G MOBILE NETWORKS

Introduction to Small Cells – Capacity Limits and Achievable Gains with Densification – Mobile Data Demand – Demand vs. Capacity – Small Cell Challenges.

### UNIT III COOPERATION FOR NEXT GENERATION WIRELESS NETWORKS

Introduction – Cooperative Diversity and Relaying Strategies: Cooperation and Network Coding, Cooperative ARQ MAC Protocols – PHY Layer Impact on MAC Protocol Analysis: Impact of Fast Fading and Shadowing on Packet Reception for QoS Guarantee, Impact of Shadowing Spatial Correlation – Study: NCCARQ, PHY Layer Impact.

### UNIT IV MOBILE CLOUDS AND COGNITIVE RADIO

Introduction – The Mobile Cloud – Mobile Cloud Enablers – Network Coding – Overview of Cognitive Radio Technology in 5G Wireless – Spectrum Optimization using Cognitive Radio – Relevant Spectrum Optimization Literature in 5G – Cognitive Radio and Carrier Aggregation – Energy Efficient Cognitive Radio Technology.

## UNIT V SECURITY AND SELF ORGANISING NETWORKS

Overview of Potential 5G Communications System Architecture – Security Issues and Challenges in 5G Communications Systems – Self Organising Networks: Introduction, Self Organising Networks in UMTS and LTE, The Need for Self Organising Networks in 5G, Evolution towards Small Cell Dominant HetNets.

### TEXT BOOK

- Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, Wiley, 2015.

### REFERENCES

- Yin Zhang, Min Chen, “Cloud Based 5G Wireless Networks – Springer Briefs in Computer Science”, Springer, 2016.
- Athanasios G. Kanatas, Konstantina S. Nikita, Panagiotis (Takis) Mathiopoulos, “New Directions in Wireless Communications Systems: From Mobile to 5G”, CRC Press, 2017.

### COURSE OUTCOMES

At the end of this course, the students will be able to

- Compare the 5G network with older generations of networks.
- Identify suitable small cells for different applications in 5G networks.
- Simulate 5G network scenarios and Connect applications to mobile cloud.
- Design applications with 5G network support.
- Analyze the security risks in 5G networks.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	2	-	-	-	1	-	-	3	-	1
CO2	3	2	2	-	-	2	-	-	-	1	-	1	-	3	-
CO3	3	2	2	1	-	2	-	-	-	1	1	1	-	-	3
CO4	3	2	2	1	1	2	-	-	-	1	1	1	-	-	3
CO5	3	2	2	1	1	2	-	-	-	1	1	1	-	-	3

22ITPE703	GAME DEVELOPMENT	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To know the basics of 2D and 3D graphics for game development.
- To know the stages of game development.
- To understand the basics of game engine.

- To survey the gaming development environment and toolkits.
- To learn and develop simple games using Pygame environment.

### **UNIT I 3D GRAPHICS FOR GAME PROGRAMMING**

Game – Definition – Genres of Games, Basics of 2D and 3D Graphics, Game Objects Design – 2D and 3D Transformations – Projections – Colour Models – Illumination and Shader Models – Animation – Controller based Animation.

### **UNIT II GAME DESIGN PRINCIPLES**

Character Development, Storyboard Development for Gaming – Script Design – Script Narration –Game Balancing –Core Mechanics – Principles of Level Design – Proposals – Writing for Pre-production, Production and Post-Production.

### **UNIT III GAME ENGINE DESIGN**

Rendering Concept – Software Rendering – Hardware Rendering – Spatial Sorting Algorithms – Algorithms for Game Engine – Collision Detection – Game Logic – Game AI – Path Finding.

### **UNIT IV OVERVIEW OF GAMING PLATFORMS AND FRAMEWORKS**

Pygame Game development – Unity – Unity Scripts –Mobile Gaming, Game Studio, Unity – Single player and Multi-Player games.

### **UNIT V GAME DEVELOPMENT USING PYGAME**

Developing 2D and 3D Interactive Games using Pygame – Avatar Creation – 2D and 3D Graphics Programming – Incorporating Music and Sound – Asset Creations – Game Physics Algorithms Development – Device Handling in Pygame – Overview of Isometric and Tile Based Games – Overview of Puzzle Games.

### **TEXT BOOK**

1. Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison-Wesley Professional, 2013.

### **REFERENCES**

1. Will McGugan, “Beginning Game Development with Python and Pygame: From Novice to Professional”, Apress Publishers, 2007.
2. Paul Craven, “Python Arcade games”, Apress Publishers, 2016.
3. David H. Eberly, “3D Game Engine Design: A Practical Approach to Real-Time Computer Graphics”, Second Edition, CRC Press, 2006.
4. Jung Hyun Han, “3D Graphics for Game Programming”, Chapman and Hall/CRC, 2011.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Have knowledge on the concepts of 2D and 3D graphics.
2. Know about games and their genres with their origin and history.
3. Understand the implementation of gaming engines.
4. Survey gaming environments and frameworks.
5. Implement a simple game in Pygame.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	-	-	-	-	3	2	2	2	2	-	-
CO2	2	-	2	-	-	-	-	-	2	2	2	2	3	-	-
CO3	3	-	2	-	-	-	-	-	2	2	2	-	2	2	-
CO4	2	-	3	2	-	-	-	-	2	-	-	-	2	2	-
CO5	2	-	2	-	-	-	-	2	3	-	3	-	2	2	-

22ITPE703	SECURITY AND PRIVACY IN CLOUD	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To appraise the students with basic knowledge on security issues from the cloud providers and users perspective.
- To teach a student how to secure private and public cloud.
- To explain students how to develop a prototype for cloud security
- To analyze the risk factors in cloud
- To understand security management in cloud

### UNIT-I INTRODUCTION

Review of cloud platforms and architectures Security issues from the cloud providers perspective, users perspective Understanding security and privacy - Cloud Computing risk issues.

### UNIT-II SECURING THE CLOUD

Security challenges Security requirements for the architecture - Securing private and public clouds Security patterns Cloud security architecture Infrastructure security.

### UNIT-III SECURITY PROTOCOLS AND STANDARDS

Host security, Compromise response, Security standards Message Level Security (MLS), Transport Level Security, OAuth, OpenID, eXtensible Access Control Markup Language (XACML), and Security Assertion Markup Language (SAML).

### UNIT-IV STRATEGIES AND PRACTICES

Strategies and best practices Security controls: limits, best practices, monitoring Security criteria - assessing risk factors in Clouds.

### UNIT-V SECURITY MANAGEMENT IN THE CLOUD

Security management in the cloud: SaaS, PaaS, IaaS availability management Security as a service-Trust Management for Security - Data Security and Storage, Privacy in Cloud

### TEXT BOOKS

1. Ronald L. Krutz, Russell Dean Vines, "Cloud Security: A Comprehensive Guide to Secure Cloud computing", Wiley 2010.



- Vic J R, “Securing the Cloud: Cloud Computer Security Techniques and Tactics”, Winkler, Elsevier 2011

## REFERENCES

- Ben Halpert, “Auditing Cloud Computing: A Security and Privacy Guide”, JohnWiley Sons, 2011.
- Ianlim, E.Coleen Coolidge, Paul Hourani, “Securing Cloud and Mobility: APractitioners Guide”, Auerbach Publications, Feb 2013.
- Pethuru Raj, “Cloud Enterprise Architecture”, CRC Press, 2013

## COURSE OUTCOMES

At the end of this course, the students will be able to

- Comprehend the basics of cloud platforms and risk issues in cloud computing.
- Know cloud security architecture, challenges and requirements.
- Understand the functionalities of security protocols.
- Identifying best practices and strategies for a secure cloud environment.
- Understand the Security management in cloud.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	-	-	1	-	-	-	1	-	-	3	-	-
CO2	3	2	2	-	-	1	-	-	-	1	1	1	1	2	-
CO3	3	2	2	1	1	1	-	-	-	1	-	-	-	-	3
CO4	3	2	2	1	1	1	-	-	-	1	1	-	-	-	3
CO5	3	2	2	1	-	1	-	-	-	1	-	1	1	2	-

22ITPE703	E-LEARNING TECHNIQUES				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To learn the various E-learning approaches and Components.
- To explore Design Thinking.
- To understand the types of design models of E-learning.
- To learn about E-learning Authoring tools.
- To know about evaluation and management of E-learning solutions.

## UNIT I INTRODUCTION

Need for E-Learning – Approaches of E-Learning – Components of E-Learning – Synchronous and Asynchronous Modes of Learning – Quality of E-Learning – Blended Learning: Activities, Team and Technology – Work Flow to Produce and Deliver E-

Learning Content – Design Thinking: Introduction – Actionable Strategy – Act to Learn – Leading Teams to Win.

## **UNIT II DESIGNING E-LEARNING COURSE CONTENT**

Design Models of E-Learning – Identifying and Organizing E-Learning Course Content: Needs Analysis – Analyzing the Target Audience – Identifying Course Content – Defining Learning Objectives – Defining the Course Sequence – Defining Instructional Methods – Defining Evaluation and Delivery Strategies – Case Study.

## **UNIT III CREATING INTERACTIVE CONTENT**

Preparing Content: Tips for Content Development and Language Style – Creating Storyboards: Structure of an Interactive E-Lesson – Techniques for Presenting Content – Adding Examples – Integrating Multimedia Elements – Adding Examples – Developing Practice and Assessment Tests – Adding Additional Resources– Courseware Development – Authoring Tools – Types of Authoring Tools – Selecting an Authoring Tool.

## **UNIT IV LEARNING PLATFORMS**

Types of Learning Platforms – Proprietary Vs. Open – Source LMS – LMS Vs LCMS – Internally Handled and Hosted LMS – LMS Solutions – Functional Areas of LMS.

## **UNIT V COURSE DELIVERY AND EVALUATION**

Components of an Instructor-Led or Facilitated Course – Planning and Documenting Activities – Facilitating Learners Activities – E-Learning Methods and Delivery Formats – Using Communication Tools for E-Learning – Course Evaluation.

### **TEXT BOOK**

1. Clark, R. C., Mayer, R. E., “E-Learning and the Science of Instruction”, Third Edition, 2011.

### **REFERENCES**

1. Crews, T. B., Sheth, S. N., Horne, T. M., “Understanding the Learning Personalities of Successful Online Students”, Educause Review, 2014.
2. Johnny Schneider, “Understanding Design Thinking, Lean and Agile”, O'Reilly Media, 2017.
3. Madhuri Dubey, “Effective E-learning Design, Development and Delivery”, University Press, 2011.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Distinguish the phases of activities in models of E-learning.
2. Identify appropriate instructional methods and delivery strategies.
3. Choose appropriate E-learning Authoring tools.
4. Create interactive E-learning courseware.
5. Evaluate and manage the E-learning courseware.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	3	3	1	-	-	1	-	-	-	3	3	3
<b>CO2</b>	3	3	3	3	3	2	2	-	2	-	-	-	3	3	1
<b>CO3</b>	3	3	3	3	3	2	3	1	-	-	1	-	3	2	1
<b>CO4</b>	3	3	3	3	3	-	2	-	1	3	1	2	3	2	1
<b>CO5</b>	3	3	3	3	3	-	-	-	1	3	1	2	3	2	1

<b>22ITPE703</b>	<b>OPTICAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration
- To learn fiber slicing and connectors, noise effects on system performance, operational principles of WDM and solutions

### **UNIT-I**

Motivation –optical spectral bands –key elements of optical fiber systems – optical fibers –basic optical laws and definition –optical fiber modes and configurations –mode theory for circular wave guides –single mode fibers –graded–index fiber structure –fiber materials – photonic crystal fibers – fiber fabrication –fiber optic cables.

### **UNIT-II**

Light emitting diodes(LED) : structures –materials –quantum efficiency –LED power – modulation of an LED –Laser diodes: modes –threshold conditions –laser diode rate equations –external quantum efficiency –resonant frequencies –structure and radiation patterns –single mode lasers –modulation of laser diodes – power launching and coupling –source to fiber power launching –fiber of fiber joints –LED coupling to single mode fibers –fiber splicing – optical fiber connectors.

### **UNIT-III**

pin photo detector – avalanche photodiodes – photo detector noise –detector response time-avalanche multiplication noise-signal degradation in optical fibers –attenuation –UNIT s –absorption –scattering losses –bending losses – core and cladding losses –signal distortion in fibers –overview of distortion origin –modal delay –factors contributing to delay –group delay

– material dispersion – wave guide dispersion –polarization – mode dispersion – characteristics of single mode fibers.

#### **UNIT–IV**

Fundamental receiver operation – digital receiver performance–eye diagrams –coherent detection – homo dyne and heterodyne-burst mode receiver – analog receivers. Digital links – point to point links – link power budget – rise time budget –power penalties – Analog links – overview of analog links – carrier to noise ratio – multichannel transmission techniques.

#### **UNIT–V**

Wavelength division multiplexing (WDM) concepts – operational principles of WDM – passive optical star coupler – isolators – circulators –active optical components – MEM Stechnology – variable optical attenuators – tunable optical filters – dynamic gain equalizers – polarization controller – chromatic dispersion compensators – Optical amplifiers – basic applications and types of optical amplifiers – Erbium Doped Fiber Amplifiers(EDFA) – amplification mechanism – architecture–power conversion efficiency and gain – Amplifier noise–optical SNR – system applications.

#### **TEXT BOOKS**

1. Gerd Keiser, “Optical Fiber Communication”, McGraw Hill International, Singapore, 3rd ed., 2000.
2. Govind P. Agrawal, “Fiber–optic communication Systems”, Third Edition, John Wiley & Sons, 2004.

#### **REFERENCES**

1. J. Senior, “Optical Communication, Principles and Practice”, Prentice Hall of India, - 994.
2. J. Gower, “Optical Communication System”, Prentice Hall of India, 200-.
3. R.P. Khare, “Fiber Optics and Optoelectronics”, Oxford University Press, 2007.

#### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Comprehend the basic elements of optical fiber transmission link, fiber modes and structure configurations.
2. Visualize the significance of the different kind of losses, signal distortion in optical wave guides, signal degradation factors and dispersion management techniques in optical system performance.
3. Compare the various optical source materials, LED structures, quantum efficiency as well as structures and figure of merit of Laser diodes.
4. Analyze the fiber optic receiver operation and configuration.
5. Apply the components for different applications and Identify and integrate fiber optical components in variety of schemes and operational principles WDM.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	1	1	2	-	-	-	-	-	-	-	-	1	1	-	-
<b>CO2</b>	1	2	-	-	1	-	-	-	-	-	-	1	1	-	-
<b>CO3</b>	2	-	1	2	1	1	1	-	-	1	2	-	1	-	-
<b>CO4</b>	-	1	2	-	-	1	-	-	2	1	-	-	-	1	-
<b>CO5</b>	-	-	3	2	1	1	1	-	2	-	2	2	-	-	3

<b>22ITPE703</b>	<b>EDGE AND MOBILITY NETWORK SECURITY SOLUTIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand the attacks, risks, countermeasures and threats of the given Network.
- To know Configure the Firewall to implement security on network perimeter edge and mobility devices.
- To Configure the IPS and VPN for securing communications with the network perimeter edge and mobility devices.
- Describe the given network to identify the possible attacks and appropriate configuration of network edge and mobility.
- Co5 To Know the secure communication in web and email.

### **UNIT - I**

Networking: Ethernet Technologies, TCP/IP and IP addressing, Configuring routers, Routing Protocols, Access control lists, Switch configuration, VLANs, VTP, ISDN, DDR, Frame Relay, PPP, WAN Technologies, NAT, PAT, DHCP, Internet Protocols - TCP/IP, DNS, Routing, Security Issues.

### **UNIT - II**

Network attacks: Denial of Services, Smurf Attacks, Packet Replay, Fragmentation attack, Unauthorized Access, Remote Code Execution, Attacks on Protocols, MITM Attacks, Internal v/s External Threats.

### **UNIT - III**

Implementing and configuring Firewalls: Basic Firewall Concepts - Security zoning, Transparent & Routed Modes, Security Contexts. Implement firewall ASA - ACLs, static/dynamic NAT/PAT, object groups, threat detection features, botnet traffic filtering, application filtering and protocol inspection, ASA security contexts. Cisco Security Devices GUIs and Secured CLI Management - SSHv2, HTTPS, and SNMPv3 access on the network devices, ASA firewall features using ASDM. Monitor firewall - Packet tracer, Packet capture, Syslog.

### **UNIT - IV**

Next-Generation IPS (NGIPS): Configurations - traffic redirection and capture methods, preprocessors and detection engines, event actions and suppression thresholds, correlation

policies, SNORT rules, SSL decryption policies. Deployments - inline or passive modes, inline modes: inline interface pair and inline tap mode.

### UNIT - V

Secure Communications: Site-to-site VPNs - IPsec (with IKEv1 and IKEv2 for both IPV4 & IPV6). Remote access VPNs - AnyConnect IKEv2 VPNs on ASA, AnyConnect SSLVPN, clientless SSLVPN. Traffic Analysis - Wireshark, TCPDump. Content Filtering - Web and Email Filtering.

### TEXT BOOKS

- 1.Catherine Paquet, "Implementing Cisco Threat Control Solutions (SITCS) Foundation Learning Guide: (CCNP Security 300-207)", Cisco Press, 2015
2. Mark Bernard, David Burns, "CCNP Security SENSS 300-206 Official Cert Guide (Certification Guide)", Cisco Press, 2015
- 3.Natalie Timms, "CCNP Security SIMOS 300-209 Official Cert Guide (Certification Guide)", Cisco Press, 2015
- 4.William Stallings, "Network Security Essentials Applications and Standards", Pearson Education, Fourth Edition, 2011
- 5.John R. Vacca, "Network and System Security", Syngress Media,U.S., 2010.
- 6."VPN Security", The Government of the Hong Kong Special Administrative Region 2008.
- 7.Douglas R. Stinson, "Cryptography Theory and Practice", Third Edition, Chapman & Hall/CRC, 2006

### REFERENCES

1. Joseph Migga Kizza, "Computer Network Security", Springer, 2005.
2. Jan L. Harrington, " Network Security: A Practical Approach", Morgan Kaufmann, 2005

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Outline the vulnerabilities, attacks, risks, countermeasures and threats of the given Network.
2. Configure the Firewall to implement security on network perimeter edge and mobility devices.
3. Configure the IPS and VPN for securing communications with the network perimeter edge and mobility devices.
4. Examine the given network to identify the possible attacks and appropriate configuration of network edge and mobility.
5. Know the secure communication in web and email.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	1	-	-	1	-	-	-	1	-	-	3	-	-
<b>CO2</b>	2	2	2	-	-	1	-	-	-	1	1	1	1	2	-
<b>CO3</b>	2	2	2	1	1	1	-	-	-	1	-	-	-	-	3
<b>CO4</b>	3	2	2	1	1	1	-	-	-	1	1	-	-	-	3
<b>CO5</b>	3	2	2	1	-	1	-	-	-	1	-	1	1	2	-

## PROFESSIONAL ELECTIVES – VII

22ITPE704	E-BUSINESS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To explore both the technical and business related implications of electronically mediated commerce.
- To enable the students to trace the development of E-Business from its origins in electronic data interchange to its current growing importance.
- To explore the potential of electronic business for future development and the development of the information society.
- To explore the authentication and authorization of online transactions.
- To introduce the strategy, culture, legal methods of establishing websites for business organizations.

### UNIT I ELECTRONIC COMMERCE ENVIRONMENT AND OPPORTUNITIES

Background – The Electronic commerce environment – Electronic marketplace technologies – Modes of Electronic Commerce: Overview – Electronic Data Interchange – Migration to open EDI – Electronic commerce with WWW / Internet – Commerce net advocacy – Web commerce going forward.

### UNIT II APPROACHES TO SAFE ELECTRONIC COMMERCE

Overview – Secure Transport Protocols – Secure transactions – Secure Electronic Payment Protocol (SEPP) – Secure Electronic Transaction (SET) – Certificates for authentication – Security on Web Servers and enterprise networks – Electronic cash and electronic payment schemes: Internet Monetary payment and security requirements – Payment and purchase order process - Online electronic cash.

### UNIT III INTERNET / INTRANET SECURITY ISSUES AND SOLUTIONS

The need for computer security – Specific intruder approaches – Security strategies – Security tools – Encryption – Enterprise networking and Access to the Internet – Antivirus programs – Security Teams.

### UNIT IV MASTERCARD/VISA SECURE ELECTRONIC TRANSACTION

Introduction – Business requirements – Concepts – Payment processing – E-mail and secure e-mail technologies for electronic commerce. Introduction – The Mean of Distribution – A model for message handling – Working of email. MIME: Multipurpose Internet Mail Extensions. S/MIME: Secure Multipurpose Internet Mail Extensions – MOSS: Message Object Security Services.

### UNIT V INTERNET AND WEBSITE ESTABLISHMENT

Introduction – Technologies for web servers – Internet tools relevant to commerce – Internet applications for commerce – Internet charges – Internet access and architecture – Searching the Internet – Case study.

## TEXT BOOKS

1. Daniel Minoli and Emma Minoli, “Web Commerce Technology Handbook”, Tata McGraw-Hill, 2017.
2. Elias M. Awad, “Electronic Commerce from Vision to Fulfillment”, PHI, Feb-2003.
3. Bharat Bhaskar, “Electronic Commerce – Framework, Technology and Application”, TMH, 2003.

## REFERENCES

1. Bruce C. Brown, “How to Use the Internet to Advertise, Promote and Market Your Business or Website nd with Little or No Money”, Atlantic Publishing Company, 2 Edition, 2011.
2. Andrew B. Whinston, Ravi Kalakota, K. Bajaj and D. Nag, “Frontiers of Electronic Commerce”, Tata McGraw-Hill, 2004.
3. Kamalesh K. Bajaj, “E-Commerce: The Cutting Edge & Business”, Tata McGraw-Hill, 2003.
4. Brenda Kennan, “Managing your E-Commerce Business”, PHI, 2001.
5. Jim A Carter, “Developing E-Commerce Systems”, PHI, 2001.

## Web Resources

1. <https://nptel.ac.in/courses/110/105/110105083/>
2. <https://www.tutorialspoint.com/listtutorial/INTRODUCTION-TO-E-BUSINESS/6549>.
3. [https://en.wikipedia.org/wiki/Electronic\\_business](https://en.wikipedia.org/wiki/Electronic_business)

## COURSE OUTCOMES

After completion of the course, the students will be able to

1. Demonstrate advanced knowledge of technical and business strategies related to E-Business and E-Commerce.
2. Describe about the available secure electronic protocols.
3. Identify the security issues and provide appropriate solutions to overcome.
4. Evaluate Mobile Business and related technologies.
5. Discuss contemporary technologies for globally distributed teams.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	-	-	-	-	2	3	-	2	-	-	-	-
CO2	2	-	-	-	2	-	-	-	-	-	-	-	3	-	-
CO3	2	-	2	-	2	-	-	-	-	-	-	-	2	-	-
CO4	2	-	3	-	2	-	-	2	2	-	-	-	2	-	-
CO5	2	-	-	-	2	-	-	2	2	-	-	-	2	-	-



22ITPE704	FUNDAMENTALS OF VR / AR / MR	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- Explore the history of spatial computing and design interactions
- Understand the foundational principles describing how hardware, computer vision algorithms function
- Learn Virtual reality animation and 3D Art optimization
- Demonstrate Virtual reality
- Introduce to the design of visualization tools

### UNIT-I

**How Humans interact with Computers :** Common term definition, introduction, modalities through the ages (pre- 20<sup>th</sup> century, through world war-II, post world war-II, the rise of personal computing, computer miniaturization), why did we just go over all of this?, types of common HCI modalities, new modalities, the current state of modalities for spatial computing devices, current controllers for immersive computing systems, a note on hand tracking and hand pose recognition.

**Designing for our Senses, Not our Devices:** Envisioning a future, sensory technology explained, who are we building this future for?, sensory design, five sensory principles, Adobe's AR story.

### UNIT-II

**Virtual Reality for Art :** A more natural way of making 3D art, VR for animation.

**3D art optimization:** Introduction, draw calls, using VR tools for creating 3D art, acquiring 3D models vs making them from scratch.

**How the computer vision that makes augmented reality possible works:** Who are we?, a brief history of AR, how and why to select an AR platform, mapping, platforms, other development considerations, the AR cloud.

### UNIT-III

**Virtual reality and augmented reality:** cross platform theory: Why cross platform? The role of game engines, understanding 3D graphics, portability lessons from video game design, simplifying the controller input.

**Virtual reality toolkit:** open source framework for the community: What is VRTK and why people use it?, the history of VRTK, welcome to the steam VR unity toolkit, VRTK v4, the future of VRTK, success of VRTK.

**Three virtual reality and augmented reality development practices:** Developing for virtual reality and augmented reality, handling locomotion, effective use of audio, common interaction paradigms.

### UNIT-IV

**Data and machine learning visualization design and development in spatial computing:** Introduction, understanding data visualization, principles for data and machine learning visualization design and development in spatial computing, why data and machine learning visualization works in spatial computing, 2D data visualization vs 3D data visualization in spatial computing, interactivity in data visualizations and in spatial computing, animation, failures in data visualization, good data visualization design optimize 3D spaces, data representations, info graphics, and interactions, defining distinctions in data visualization and big data for machine, how to create data visualization: data visualization creation pipeline, webXR, data visualization challenges in XR, data visualization industry use case examples of

data visualization, 3D reconstruction and direct manipulation of real world data, data visualization is for everyone, hands on tutorials, how to create data visualization, resources.

## UNIT-V

**Character AI and Behaviors:** Introduction, behaviors, current practice: Reactive AI, more intelligence in the system, Deliberative AI, machine learning.

**The virtual and augmented reality health technology ecosystem:** VR/AR health technology application design, standard UX isn't intuitive, tutorial: insight Parkinson's experiment, companies, case studies from leading Academic institutions.

## TEXT BOOK

1. Erin Pangilinan, Steve lukas, and Vasanth Mohan, "Creating Augmented & Virtual Realities", 1<sup>st</sup> edition, O'REILLY, 2019.

## REFERENCE

1. Steve Aukstakalnis, "Practical Augmented Reality", Pearson Education, 2017.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Explain how the humans interact with computers
2. Apply technical and creative approaches to make successful applications and experiences.
3. Design audio and video interaction paradigms
4. Design Data visualization tools
5. Apply VR/MR/AR in various fields in industry

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	2	3	-	-	-	-	-	3	3	2
CO2	3	3	3	3	3	2	3	2	-	-	-	-	3	3	2
CO3	3	3	3	3	3	2	2	2	2	-	-	-	3	3	1
CO4	3	3	3	3	3	3	2	2	2	-	-	-	3	3	1
CO5	3	3	3	3	3	3	2	3	2	3	2	2	3	3	1

22ITPE704	CLOUD SERVICES MANAGEMENT	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the concept of cloud computing.
- To understand the trade-off between deploying applications in the cloud over local infrastructure.
- To identify different storage virtualization technologies and their benefits.

- To understand and articulate business continuity solutions including backup and recovery technologies, local and remote replication solutions.

## **UNIT I**

Introduction: Distributed Computing and Enabling Technologies, Cloud Fundamentals: Cloud Definition, Evolution, Architecture, Applications, Deployment models and service models.

Virtualization: Issues with virtualization, Virtualization technologies and architectures, Internals of virtual machine monitors/hypervisors, Virtualization of data centers and Issues with Multi-tenancy.

## **UNIT II**

Implementation: Study of Cloud computing Systems like Amazon EC2 and S3, Google App Engine and Microsoft Azure, Build Private/Hybrid Cloud using open source tools, Deployment of Web Services from inside and outside a Cloud Architecture, MapReduce and its extensions to Cloud Computing, HDFS and GFS.

## **UNIT III**

Storage virtualization: Fixed Content and Archives, Types, Features, Benefits, CAS Architecture, Object storage and retrieval, Examples: Storage Virtualization-forms of virtualization, SNIA Taxonomy – Storage virtualization configurations, Challenges, Types of storage virtualization – Business Continuity- Overview of emerging technologies such as Cloud storage, Virtual provisioning, Unified Storage, FCOE, FAST.

## **UNIT IV**

Business Continuity and Recovery: Information Availability, BC Terminology, Life cycle, Failure analysis: Backup and Recovery- Backup purpose, considerations, Backup Granularity, Recovery considerations- Backup methods, Process, backup and restore operations, Overview of emerging technologies: Duplication, Off site backup..

## **UNIT V**

Storage security and Management: Storage security framework, Securing the Storage infrastructure, Risk triad: Managing the storage infrastructure, Monitoring the storage infrastructure, identify key parameters and components to monitor in a storage infrastructure, List key management activities and examples, Define storage management standards and initiative/Industry trend.

## **TEXT BOOKS**

1. Rajkumar Buyya, James Broberg, Andrzej Goscinski, Cloud Computing Principles and Paradigms, Wiley Publishers, 2011.
2. Barrie Sosinsky, Cloud Computing Bible, Wiley Publishers 2010.
3. Tim Mather, Subra Kumaraswamy, Shahed Latif, Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, OReilly 2010.
4. EMC Corporation, Information Storage and Management, 1st Edition, Wiley India 2009.

## **REFERENCES**

1. Rajkumar Buyya, Christian Vacchiola, S Thamarai Selvi, Mastering Cloud Computing, McGraw Hill, 2013
2. Michael Miller, Cloud Computing : Web-based Applications that change the way you work and collaborate online, Pearson Education, 2008
3. IBM, Introduction to Storage Area Networks and System Networking, 5th Edition, November 2012.

4. Robert Spalding, Storage Networks: The Complete Reference, Tata McGraw Hill, Osborne, 6th reprint 2003.
5. Marc Farley, Building Storage Networks, Tata McGraw Hill, Osborne, 1st Edition, 2001.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. To understand the key dimensions of the challenge of Cloud Computing.
2. To assess the economics, financial and technological implications for selecting cloud computing for organization.
3. To describe and apply storage technologies.
4. To identify leading storage technologies that provide cost-effective IT solutions for medium to large scale businesses and data centers.
5. To describe important storage technology features such as availability, replication, scalability and performance.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	-	2	-	-	1	-	-	-	-	-	-	2	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	3	-	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	-	2	1	3	-	1	-	1	-	-	-	-	-	1	-

22ITPE704	CYBER FORENSICS AND INFORMATION SECURITY	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn the security issues network layer and transport layer.
- To get exposed to security issues of the application layer.
- To learn computer forensics.
- To be familiar with forensics tools.
- To learn to model and interpret forensics data.

### UNIT I NETWORK LAYER AND TRANSPORT LAYER SECURITY

Introduction, Network layer security: IPSec protocol – Authentication header – Key management protocol, Transport layer security: SSL and TLS, Introduction to E-mail security, Introduction to firewalls: Terminology – Types of firewalls.

### UNIT II UNDERSTANDING DIGITAL FORENSICS AND INVESTIGATION

Overview of digital forensics, Preparation for digital investigation, Professional conduct, preparing digital forensics investigation, Conducting an investigation, Procedures for private sector investigations.

### UNIT III DATA ACQUISITION AND PROCESSING

Understanding storage formats, determining acquisition methods, Contingency planning, using acquisition tools and validating, Identifying and collecting digital evidence, preparing for a search, Storing digital evidence.

### UNIT IV DIGITAL FORENSICS ANALYSIS AND VALIDATION

Determining the data to collect and analyze, Validating forensics data, addressing data hiding techniques, Performing live acquisition.

### UNIT V E-MAIL AND SOCIAL MEDIA INVESTIGATION

Introduction, Role of client and server in E-Mail, Investigating E-mail crimes: Understanding forensics linguistics – Examining E-mail headers and messages – Tracing E-mail files, Social media forensics on mobile devices: Forensics tools for social media investigations.

### TEXT BOOK

1. Man Young Rhee, Internet Security: Cryptographic Principles, Algorithms and Protocols, Wiley Publications, 2003.

### REFERENCES

1. Nelson, Phillips, Enfinger, Stuart, “Computer Forensics and Investigations”, Cengage Learning, India Edition, 2008.
2. John R.Vacca, “Computer Forensics”, Cengage Learning, 2005.
3. Richard E.Smith, “Internet Cryptography”, 3rd Edition Pearson Education, 2008.
4. MarjieT.Britz, “Computer Forensics and Cyber Crime: An Introduction”, 3rd Edition, Prentice Hall, 2013.
5. Peterson, Gilbert, and Sujeet Sheno, “Advances in Digital Forensics”, IX, Vol. 410, Springer, 2013.

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Explain the security issues network layer and transport layer
2. Understand computer forensics and carry out investigation procedures
3. Identify and collect digital evidence using data acquisition tools
4. Analyse and validate forensics data
5. Make use of forensics tools

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	1	-	-	-	-	-	1	2	-	-
CO2	3	2	2	3	-	1	-	-	-	-	-	1	2	-	-
CO3	3	2	3	3	3	2	1	-	-	-	-	1	3	2	1
CO4	3	3	2	2	-	2	-	-	-	-	-	1	3	2	1
CO5	3	3	3	3	3	2	1	-	-	-	-	1	3	2	1

<b>22ITPE704</b>	<b>SATELLITE COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand the basics of satellite orbits.
- To understand satellite segment and earth segment.
- To analyze various methods of satellite access.
- To understand the applications of satellites.

### **UNIT-I**

**INTRODUCTION TO SATELLITE COMMUNICATION** : Historical background, Basic concepts of Satellite Communications, Communication Networks and Services, Comparison of Network Transmission technologies, Orbital and Spacecraft problems, Growth of Satellite communications.

### **UNIT-II**

**SATELLITE ORBITS** :Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures – launch vehicles and propulsion.

### **UNIT-III**

**THE SPACE LINK** : Introduction, Equivalent Isotropic Radiated Power, Transmission Losses, Free-space transmission, Feeder losses, Antenna misalignment losses, Fixed atmospheric and ionospheric losses, The Link-Power Budget Equation, System Noise, Carrier-to-Noise Ratio, The Uplink, Saturation flux density, Input backoff, Downlink, Output back-off, Combined Uplink and Downlink C/N Ratio.

### **UNIT-IV**

**EARTH SEGMENT** : Introduction – Receive – Only home TV systems – Outdoor unit – Indoor unit for analog (FM) TV – Master antenna TV system – Community antenna TV system – Transmit – Receive earth stations – Problems – Equivalent isotropic radiated power – Transmission losses – Free-space transmission – Feeder losses – Antenna misalignment losses – Fixed atmospheric and ionospheric losses – Link power budget equation – System noise – Antenna noise – Amplifier noise temperature – Amplifiers in cascade – Noise factor – Noise temperature of absorptive networks – Overall system noise temperature – Carrier to- Noise ratio – Uplink – Saturation flux density – Input back off – The earth station – HPA – Downlink – Output back off – Satellite TWTA output – Effects of rain – Uplink rain – Fade margin – Downlink rain – Fade margin – Combined uplink and downlink C/N ratio – Inter modulation noise.

### **UNIT-V**

**SATELLITE APPLICATIONS** : INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB) - World space services, Business TV(BTV), GRAMSAT, Specialized services – E-mail, Video conferencing, Internet.



<b>22ITPE704</b>	<b>FUNDAMENTALS OF REVERSIBLE AND QUANTUM COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

1. To understand basics of Boolean algebra.
2. To understand reversible logic and reversible circuits.
3. To understand principles of basic linear algebra.
4. To understand quantum computing.
5. To understand quantum algorithms.

### **UNIT I      BOOLEAN ALGEBRA AND GROUP THEORY**

Boolean Functions of One, two Variables,  $n$  Variables, Minterm and Maxterm Expansion, Reed–Muller Expansion, Minimal ESOP Expansion, Linear Functions, Affine Linear Functions, Monotonic Functions, Boolean Derivative, Boolean Decompositions.

### **UNIT II      REVERSIBLE CIRCUITS**

Conservative Circuits, Monotonic Circuits, Linear Circuits, Affine Linear Circuits, Exchange Gates, SWAP Gates, Affine Exchange Gates, Control Gates, Sylow Circuits, Gate Cost and Logic Depth, Methods of Synthesis, Cosets, Double Cosets, The Synthesis Algorithm, Variable Ordering, Linear Synthesis Algorithm, Preset Bits and Garbage Bits, Duplicating Circuit, Controlled NOT, Full Adder.

### **UNIT III     BASIC LINEAR ALGEBRA**

Vector spaces, Basis and dimension, Inner products, Ortho normality, Gram-Schmidt orthogonalization, Bra-Ket formalization, Hilbert spaces, Products, Tensor products, Matrices, Complex spaces, Hadamard Matrices, Fourier matrices, Pauli matrices, Hermitian, Unitary, and normal operators.

### **UNIT IV     INTRODUCTION TO QUANTUM COMPUTING**

Doubly Stochastic Matrices, System of Qubits, Qubits and measurement, Entanglement, Single Qubit gates, controlled gates, Gate decomposition.

### **UNIT V      QUANTUM ALGORITHMS**

Deutsch algorithm, Deutsch - Jozsa algorithm, Simon algorithm, Shor algorithm, Grover algorithm.

### **TEXT BOOK**

1. Alexis De Vos, Reversible Computing: Fundamentals, Quantum computing with applications, Wiley-VCH VerlagGmbH& Co. KGaA, 2010.

### **REFERENCES**

1. David McMahon, Quantum computing explained, Wiley-Interscience, John Wiley & Sons, Inc., 2008.
2. Vincent Moret-Bonillo, Adventures in computer science: From classical bits to quantum bits, Springer, 2017.



- Richard Lipton, and Kenneth W Regan, Quantum algorithms via linear algebra, MIT Press, 2014.
- Scott Anderson, Quantum computing since Democritus, Cambridge university press, 2013.
- Kalyan S. Perumalla, Introduction to Reversible Computing, CRC Press, 2014.

## COURSE OUTCOMES

At the end of this course, the students will be able to

- Understand Boolean algebra and graph theory.
- Explain the reversible computing systems.
- Understand principles of Basic linear algebra.
- Explain the quantum computing areas.
- Design quantum algorithm.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	-	-	-	-	-	-	2	-	-	3	-	-
CO3	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	3	2	2	-	-	-	-	-	-	2	-	-	3	-	-
CO5	2	2	3	2	-	-	-	-	-	2	2	-	-	3	-

22ITPE704	STORAGE TECHNOLOGIES	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To provide better understanding of storage system environment.
- To provide an insight data protection and intelligent storage system.
- To impart the knowledge in direct attached storage.
- To understand about storage area networks.
- To understand the concept of network attached storage.

### UNIT- I Introduction to Information Storage and Management

Information storage, Evolution of storage technology and architecture, Data center infrastructure, Key challenges in managing information, Information lifecycle

#### Storage System Environment

Components of a storage system environment, Disk drive components, Disk drive performance and fundamental laws of governing disk performance, Logical components of the Host, Application requirements and disk performance

## **UNIT- II Data Protection using RAID**

RAID and its implementation aspects, RAID array components, RAID levels and comparison, RAIP impact of disk performance, Hot spares

### **Intelligent Storage System**

Components of an intelligent storage system, intelligent storage array, Concepts in practice

## **UNIT- III Direct-attached storage and introduction to SCSI**

Benefits, limitations and types of direct-attached storage (DAS), Disk drive interfaces, Introduction to SCSI and its command model.

## **UNIT- IV Storage Area Networks**

Fiber channel, Evolution and components of SAN, Fiber channel (FC), connectivity, FC ports and architecture, Zoning, FC login types, FC topologies.

## **UNIT- V Network-attached storage**

General purpose servers versus network attached storage (NAS) devices, NAS file I/O, NAS components and implementation, NAS file-sharing protocols and I/O operations, Factors affecting NAS performance and availability

### **Contemporary issues**

## **TEXT BOOK**

1. SomasundaramGnanasundaram, AlokShrivastava, “Information Storage and Management”, Wiley Publishing Inc, 2nd Edition, 2012.

## **REFERENCES**

1. Nigel Poulton, “Data Storage Networking: Real World Skills for the CompTIA Storage and Certification and Beyond”, John Wiley & Sons, 2014.
2. Ulf Troppens, Rainer Erkens, Wolfgang Muller-Friedt, RainerWolafka, Nils Haustein, “Storage Networks Explained”, John Wiley & Sons, 24-Aug-2011
3. HimanshuDwivedi, “Securing Storage: A Practical Guide to SAN and NAS Security”, Prentice Hall, 2012.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. To comprehend various concepts of information storage systems and environment.
2. Understand the logic in usage of RAID for data protection and intelligent storage systems.
3. Comprehend the direct attached storage for SCSI systems.
4. Analyze the usage of storage area network for effective storage.
5. Use the network storage for effective information storage.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO2	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	3	2	2	-	-	-	-	-	-	-	-	3	-	-
CO5	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-

22ITPE704	PATTERN RECOGNITION AND VISUAL RECOGNITION	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To help students understand basic mathematical and statistical techniques commonly used in pattern recognition.
- To introduce students to a variety of pattern recognition algorithms.
- To understand the concepts of visual recognition.
- To develop real world applications with pattern recognition and visual recognition algorithms.

### UNIT – I Introduction and mathematical Preliminaries

Principles of pattern recognition: Uses, mathematics, Classification and Bayesian rules, Clustering vs classification, Basics of linear algebra and vector spaces, Eigen values and eigen vectors, Rank of matrix and SVD

### UNIT – II Pattern Recognition basics

Bayesian decision theory, Classifiers, Discriminant functions, Decision surfaces, Parameter estimation methods, Hidden Markov models, dimension reduction methods, Fisher discriminant analysis, Principal component analysis, non-parametric techniques for density estimation, nonmetric methods for pattern classification, unsupervised learning, algorithms for clustering: Kmeans, Hierarchical and other methods

### UNIT - III Feature Selection and extraction

Problem statement and uses, Branch and bound algorithm, Sequential forward and backward selection, Cauchy Schwartz inequality, Feature selection criteria function: Probabilistic separability based and Interclass distance based, Feature Extraction: principles

### UNIT – IV Visual Recognition

Human visual recognition system, Recognition methods: Low-level modelling (e.g. features), Midlevel abstraction (e.g. segmentation), High-level reasoning (e.g. scene understanding); Detection/Segmentation methods; Context and scenes, Importance and



22ITPE704	RECOMMENDER SYSTEMS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

To impart knowledge on

- To know about Neighbourhood model and collaborative filtering
- To study about content based recommender systems
- To understand evaluation of recommender systems
- To study time aware recommender systems
- To know about structural recommender systems in networks

## UNIT I NEIGHBOURHOOD AND MODEL BASED COLLABORATIVE FILTERING

Introduction to Recommender Systems – NEIGHBOURHOOD BASED – Cluster based Model – Regression based Model – Graph Model –Model based collaborative filtering – Decision – Regression tree – Rule based – Latent factor models – Matrix Factorization – Singular Vector Decomposition

## UNIT II CONTENT BASED AND HYBRID SYSTEMS

CONTENT BASED – Components of Content based –Pre-processing and Feature Extraction – Learning user profiles and filtering – Nearest neighbour – Bayes – Rule based – Regression based–ENSEMBLE AND HYBRID – Weighted – Switching – Cascade – Feature augmentation – Feature combination– Metal level hybrids – CONTEXT SENSITIVE recommender systems – Contextual modelling

## UNIT III EVALUATING RECOMMENDER SYSTEMS

Measuring accuracy and rating prediction – Evaluation paradigms – Evaluation design – Accuracy – coverage – confidence – trust – novelty – serendipity – diversity

## UNIT IV TIME AND LOCATION SENSITIVE SYSTEMS

Temporal collaborative filtering – recency based – handling periodic context – Time-SVD++ model–Discrete Temporal Model – Markovian–Sequential pattern mining – Location aware – Preference and travel locality– Measuring accuracy and rating prediction – Evaluation paradigms – Evaluation design – Accuracy – coverage – confidence – trust – novelty – serendipity – diversity

## UNIT V STRUCTURAL RECOMMENDATIONS IN NETWORKS

Ranking algorithm – Page rank; Recommending Friends – link prediction – Neighbourhood – Katz measure – random walk based – Matrix factorization; Social Influence analysis – Linear Threshold – Independent cascade –Influence function evaluation – Recommendation using Deep Neural Networks – SoftMax model – Soft max Training – Case Studies

## TEXT BOOK

- 1.Charu C. Aggarwal, “Recommender Systems”, Springer, 2016

## REFERENCES

1. Ricci, F,Rokach, L. Shapira, B.Kantor, “Recommender Systems Handbook”, Springer, First Edition, 2011

2. C. Manning, P. Raghavan, and H. Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2008
3. StefanBuettcher, Charles L. A. Clarke and Gordon V. Cormack, “Information Retrieval: Implementing and Evaluating Search Engines”, The MIT Press, 2010
4. Bing Liu, “ Web Data Mining: Exploring Hyperlinks, Contents, and Usage Data (Data-Centric Systems and Applications)”, Springer, 2nd Edition 2009

**Extensive Reading:**

- <https://developers.google.com/machine-learning/recommendation/dnn/softmax>
- <https://www.analyticssteps.com/blogs/what-are-recommendation-systems-machine-learning>
- <https://www.kdnuggets.com/2019/09/machine-learning-recommender-systems.html>
- <https://medium.com/recombee-blog/machine-learning-for-recommender-systems-part-1-algorithmsevaluation-and-cold-start-6f696683d0ed>

**COURSE OUTCOMES**

At the end of the course, the students will be able to

1. Apply collaborative filtering to arrive at conclusions
2. Design content based recommender systems
3. Compare and evaluate various recommender systems
4. Design time and location based recommender systems
5. Apply network structural knowledge to design recommender systems

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	2	-	-	-	-
CO2	2	2	3	-	2	-	-	-	3	-	2	2	3	-	2
CO3	2	-	2	2	-	-	-	-	-	-	2	-	-	2	-
CO4	2	2	3	-	2	-	-	-	2	-	-	2	3	-	2
CO5	2	-	-	-	-	-	-	2	-	2	3	-	-	-	-

22ITPE704	PENETRATION TESTING METHODOLOGIES	L	T	P	C
		3	0	0	3

**COURSE OBJECTIVES**

- To understand the Linux fundamentals.
- To understand the phases of penetration testing.
- To understand the web application security.
- To learn the art of exploit writing and analysis.

- To know about hardware based attacks.

### **UNIT-I**

Kali Linux Fundamentals: History, Tool Categories, Linux Fundamentals, Installing, Configuring and Updating services, Types of Penetration testing, Security testing methodologies, Penetration Testing Execution Standard, General penetration testing framework

### **UNIT-II**

Phases of Penetration Testing: Target Scoping, Information Gathering, Target Discovery, Enumerating Target, Vulnerability Mapping, Social Engineering, Target Exploitation, Privilege Escalation, Maintaining Access, Documentation and Reporting, Enumeration Techniques.

### **UNIT-III**

Web Application Security: Core Defense Mechanisms - Handling User Access, Handling User Input, Handling Attackers, Managing the Application.

Web Application Hacker's Methodology: Map the Application's Content, Analyze the Application, Client-Side Controls, Authentication Mechanism, Session Management Mechanism, Access Controls, Input-Based Vulnerabilities, Function-Specific Input Vulnerabilities, Logic Flaws, Shared Hosting Vulnerabilities, Application Server Vulnerabilities.

### **UNIT-IV**

Exploit writing/analysis: Basics of exploit writing, Buffer overflow attacks, Generating a shell code with Metasploit, shell code analysis, working with public exploits, bypassing antivirus software's, File transfers with netcat, working with exploit writing.

### **UNIT-V**

Hardware based attacks: Hardware based malware, Ducky scripts-Throwstar lantap pro, LAN turtle, Bash bunny, Wifi pineapple.

Tools essential: Website Copier, The Harvester, Google-fu, Whois, SET, netcat, ncat, Wireshark, Tcpdump, Email harvesting, DNS, SMTP, SNMP, SMB, Metasploit, Shodan, Exploit-db, Nmap, Nikto, Password attacks.

### **REFERENCES**

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2. Lee Allen, Tedi Heriyanto, Shakeel Ali, “Kali Linux – Assuring Security by Penetration Testing”, PACT Publishers, Second Edition, 2014.
3. Patrick Engebretson, The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress; 2 edition, 2013
4. Dafydd Stuttard, Marcus Pinto, "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley, Second edition, 2011.
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9. Basic Linux Privilege Escalation, Url: <http://blog.g0tmi1k.com/2011/08/basic-linuxprivilege-escalation/>

10. Windows Privilege Escalation Fundamentals,  
 Url: <http://www.fuzzysecurity.com/tutorials/16.html>  
 11. Capture the flag, Url: <https://ctftime.org/>

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Demonstrate the tools and techniques used to perform penetration testing in Kali Linux.
2. Usage of penetration testing.
3. Examine the given web application to perform attacks using Web application Hacking methodologies.
4. Utilize the appropriate tools to perform Exploit analysis.
5. Make use of appropriate tools to perform and detect Hardware based attacks.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	-	3	-	3	-	3	-	-	-	-	-	3	-	-
<b>CO2</b>	-	-	-	-	3	-	-	-	-	-	-	3	-	1	-
<b>CO3</b>	2	2	2	3	2	2	3	3	3	3	3	3	3	3	3
<b>CO4</b>	3	3	3	3	3	3	3	3	3	1	-	2	-	3	3
<b>CO5</b>	3	2	-	2	3	-	3	3	3	3	2	3	3	3	3



## PROFESSIONAL ELECTIVE PRACTICAL – II

22ITEP706	IoT AND ITS APPLICATIONS LABORATORY	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To know the different real time sensors used to measure the different electrical parameters
- To control the different electrical devices from anywhere through IoT
- To understand the architectural features of Embedded systems for IoT applications

### LIST OF EXERCISES

1. Design of digital dc voltmeter and ammeter
2. Design of digital ac voltmeter and ammeter
3. Direction control of three phase induction motor
4. Design of digital frequency meter
5. Measurement of power and energy
6. Measurement of phase shift and power factor
7. Implementation of over current relay
8. Over/under voltage protection of home appliances
9. Protection of three phase induction motor
10. Traffic signal control
11. Railway gate control by stepper motors
12. Direction and Speed control of DC motor
13. Define and Explain Eclipse IoT Project.
14. List and summarize few Eclipse IoT Projects.
15. Sketch the architecture of IoT Toolkit and explain each entity in brief.
16. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
17. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit
18. Describe gateway-as-a-service deployment in IoT toolkit.
19. Explain application framework and embedded software agents for IoT toolkit.
20. Explain working of Raspberry Pi.
21. Connect Raspberry Pi with your existing system components.
22. Give overview of Zetta.

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Synthesize new IOT protocols by doing some minor changes.
2. Apply the different architectural features of Embedded systems for IOT application design.
3. Apply the concepts for sensors and IOT for health care applications

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2	2	-	3	2	2	2	-	2	2	3	3	2
<b>CO2</b>	3	3	2	2	-	2	3	2	2	-	3	2	3	3	2
<b>CO3</b>	2	2	3	2	-	2	2	2	2	-	2	3	2	2	2

<b>22ITEP706</b>	<b>AUGMENTED REALITY / VIRTUALITY LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### **COURSE OBJECTIVES**

- To learn the fundamentals of sensation, perception, and perceptual training.
- To have the scientific, technical, and engineering aspects of augmented and virtual reality systems.
- To learn the Evaluation of virtual reality from the lens of design.

### **LIST OF EXERCISES**

- 1 Study of different game engines
- 2 Implementation on Video/ Feature Viewing
- 3 Implementation on Virtual tour
- 4 Implementation on material animation
- 5 Implementation to show portal planets
- 6 Explore projects in Unity 2D and 3D
- 7 Mini Project on Augmented Reality or Virtual Reality

### **COURSE OUTCOMES**

At the end of the course, the students will be able to

1. Implement video and feature viewing
2. Develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.
3. Apply particular designs for AR and VR experiences.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	3	3	2	1	2	-	1	-	-	3	3	1
<b>CO2</b>	3	3	3	3	3	2	1	1	-	-	1	-	3	3	2
<b>CO3</b>	3	3	3	3	3	3	1	-	-	1	1	1	3	3	3

22ITEP706	DEV-OPS LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To learn about Git tool
- To learn about Docker
- To learn about Jenkins

### LIST OF EXERCISES

- 1) Creating a new Git repository
- 2) Cloning existing repository
- 3) Checking changes into a Git repository
- 4) Pushing changes to a Git remote
- 5) Creating a Git branch
- 6) Installing Docker container on windows/Linux, issuing docker commands
- 7) Building Docker Images for Python Application
- 8) Setting up Docker and Maven in Jenkins and First Pipeline Run
- 9) Running Unit Tests and Integration Tests in Jenkins Pipelines

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Define and design purpose of DevOps
2. Understand the traditional toolkit for DevOps and Learn the Control systems of DevOps.
3. Understand containers and testing in DevOps.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	-	3	-	-	-	-	-	-	-	1	1	1
CO2	-	2	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	1	3	-	2	3	-	-	-	2	-	-	3	3	3	-

22ITEP706	5G WIRELESS NETWORKS LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- Understand how different 5G NR Air Interface configurations affect end-to-end connectivity.
- Understand the 5G protocol stack, RAN and CN through deep packet inspection.
- Understand the 3GPP standard in a real over-the-air environment.

- Understand how to change the open-source OAI code base to implement and test advanced wireless algorithms.

### LIST OF EXERCISES

1. 5G Communications Link Analysis with Ray Tracing using MATLAB
2. Wireless Connectivity in the 5G Era for WLAN using MATLAB
3. MIMO Wireless System Design for 5G using MATLAB
4. 5G Waveforms generation using MATLAB
5. 5G Beamforming Design
6. Frame Structure of 5G technology
7. Numerology in 5G
8. Spatial Multiplexing and Hybrid Beamforming for 5G Wireless Communications
9. Understanding 5G technologies
10. MATLAB Project on Massive MIMO System Implementation with Perfect CSI

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Link 5G communication with ray tracing
2. Connect Wireless for WAN
3. Learn spatial multiplexing and hybrid beamforming

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	-	2	-	-	-	-	-	-	-	-	-	-	-
CO2	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	-	-	2	-	3	-	-	-	-	-	-	-	-

22ITEP706	GAME DEVELOPMENT LAB	L	T	P	C
		0	0	3	1.5

### COURSE OBJECTIVES

- To gained an understanding of core game systems (incl. rendering, input, sound, and collision/physics)
- To develop a strong understanding of essential mathematics for games
- To write several functional games in C++ individually
- To learn critical thinking skills required to continue further study in the field

### LIST OF EXERCISES

1. Setup DirectX 11, Window Framework and Initialize Direct3D Device.
2. Buffers, Shaders and HLSL (Draw a triangle using Direct3D 11).
3. Texturing (Texture the Triangle using Direct 3D 11).
4. Lightning (Programmable Diffuse Lightning using Direct3D 11).
5. Specular Lightning (Programmable Spot Lightning using Direct3D 11).

6. Loading models into DirectX 11 and rendering. Perform following Practical using online content from the Unity Tutorials.
7. Using a unity3d software and making a 2d ufo game.
8. Using a unity3d software and creating space shooter.
9. Create a simple rolling ball game that teaches you many of the principles of working with Unity.

## COURSE OUTCOMES

At the end of the course, the students will be able to

1. Develop core game systems
2. Use Direct 3D devices and perform texturing, lightining and spot learning.
3. Understand the principles to work with Unity

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	3	-	3	-	-	-	-	-	-	-	1	1	1
CO2	-	2	-	-	2	-	-	-	-	-	-	-	-	-	-
CO3	1	3	-	2	3	-	-	-	2	-	-	3	3	3	-

22ITEP706	<b>PATTERN RECOGNITION &amp; VISUAL RECOGNITION LAB</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## COURSE OBJECTIVES

- To apply the concepts of pattern recognition to solve real-world problems
- To implement basic classification and clustering algorithms to data of various domains
- To implement algorithms emphasizing the importance of bagging and boosting in classification and regression
- To implement computer vision techniques behind a wide variety of real-world applications

## LIST OF EXERCISES

1. Implement k- Nearest Neighbour algorithm to classify Iris dataset
2. Solve real world regression and classification problems using Decision Trees
3. Implement random forest method of Bagging technique
4. Design an application using Gradient Boosting algorithm
5. Construct Bayes Classifier for medical data
6. Implement Linear and Logistic regression for any suitable dataset
7. Reduce the dimensionality of the given data using Principal Component Analysis and prove curse of dimensionality
8. Design a classifier using Artificial Neural Networks

9. Implement binary classification and regression using Support Vector Machine
10. Design a multi class classifier using Gaussian Mixture Model
11. Perform clustering using K-Means algorithm
12. Perform basic image handling and processing operations on the image.
13. Perform geometric transformations
14. Remove the projective distortion in the image using Direct Linear Transformation
15. Perform the camera calibration and compute the intrinsic and extrinsic parameters of the camera. Use the camera calibration parameters to undistort the image.
16. Detect edges, lines, and corners in the image
17. Extract SIFT feature descriptor
18. Extract SURF and HoG feature descriptor
19. Implement Segmentation algorithms
20. Search the databases for images
21. Recognize objects in the given scene and perform scene understanding

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Implement and apply different classification algorithms on various data sets.
2. Implement and apply different clustering and regression techniques on various data sets.
3. Use fundamental and advanced computer vision algorithms for solving real-world data.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO2</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO3</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-

<b>22ITEP706</b>	<b>PENETRATION TESTING METHODOLOGIES LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### COURSE OBJECTIVES

- To learn how to protect users from cyber attackers by becoming an ethical hacker.
- To be able to launch attacks and test the security of computers.
- To discover and exploit large number of vulnerabilities to gain access and ways to maintain that access.

### LIST OF EXERCISES

- 1) Perform reconnaissance to find all the relevant information on selected website using 10 network information gathering tools.
- 2) Gather information using Social Networking sites and google Dorks

- 3) Perform Network Scanning using NMAP in windows and ZENMAP in kali Linux
- 4) Install Wireshark and apply filters to gather different information and find the link accessed by the victim using Wireshark
- 5) Perform Session hijacking/ find credentials of unsecure real time website using Wireshark
- 6) Use Nessus and NIKTO tool to find all the vulnerabilities with its level and generate a report for an organization
- 7) Perform windows Login Bypass using net user and join the ripper
- 8) Perform Kali Linux Login Bypass in virtual machine
- 9) Create Trojan and Exploit victim's machine by taking its complete access
- 10) Use CHMOD command to change the privileges and permissions
- 11) Generate Word list from using wordlist generator Crunch
- 12) Exploit windows to gain access of victim's machine using Metasploit framework
- 13) Exploit Windows XP using Metasploit
- 14) Exploit Windows 7 using Metasploit
- 15) Perform steps to remove the tracks in windows and kali Linux

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Conduct detailed reconnaissance using document metadata, search engines, and other publicly available information sources to build a technical and organizational understanding of the target environment.
2. Utilize scanning tools to conduct comprehensive network sweeps, port scans, OS fingerprinting, and version scanning to develop a map of target environments and Recognize security vulnerabilities, such as weak configurations, unpatched systems.
3. Apply penetration testing tools to exploit, investigate vulnerable systems and Implementing on web application-based attacks.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
<b>CO2</b>	-	3	-	3	3	-	3	1	3	3	3	3	-	3	3
<b>CO3</b>	3	3	2	3	3	2	3	1	3	1	1	3	3	3	2

<b>22ITEP706</b>	<b>EXPLORATORY DATA ANALYSIS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### COURSE OBJECTIVES

- To Learn pre-processing method for multi-dimensional data
- To Practice on data cleaning mechanisms
- To Learn various data exploratory analysis
- To Develop the visualizations for clusters or partitions

### LIST OF EXERCISES

1. DATA PRE-PROCESSING AND DATA CUBE - Data preprocessing methods on student and labor datasets Implement data cube for data warehouse on 3-dimensional data
2. DATA CLEANING - Implement various missing handling mechanisms, Implement various noisy handling mechanisms
3. EXPLORATORY ANALYSIS - Develop k-means and MST based clustering techniques, Develop the methodology for assessment of clusters for given dataset
4. ASSOCIATION ANALYSIS - Design algorithms for association rule mining algorithms
5. HYPOTHESIS GENERATION - Derive the hypothesis for association rules to discovery of strong association rules; Use confidence and support thresholds.
6. TRANSFORMATION TECHNIQUES - Construct Haar wavelet transformation for numerical data, Construct principal component analysis (PCA) for 5-dimensional data.
7. DATA VISUALIZATION - Implement binning visualizations for any real time dataset, Implement linear regression techniques
8. CLUSTERS ASSESSMENT - Visualize the clusters for any synthetic dataset, Implement the program for converting the clusters into histograms
9. HIERARCHICAL CLUSTERING - Write a program to implement agglomerative clustering technique, Write a program to implement divisive hierarchical clustering technique
10. SCALABILITY ALGORITHMS - Develop scalable clustering algorithms ,Develop scalable a priori algorithm

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Practice on data cleaning mechanisms
2. Learn various data exploratory analysis
3. Develop the visualizations for clusters or partitions

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2
<b>CO2</b>	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2
<b>CO3</b>	3	3	1	2	2	1	-	-	2	2	2	3	3	2	2



22ITEP706	<b>DEEP LEARNING LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## COURSE OBJECTIVES

- To understand the concepts of neural network by implementing its basic functionalities
- To implement various deep learning networks
- To develop a wide variety of real-world applications using deep learning networks

## LIST OF EXERCISES

1. Read a dataset and display it
2. Read an image dataset
3. Create a perceptron
4. Implement multi-layer perceptron
5. Apply multi-layer perceptron (MLP) on the Iris dataset
6. Perform digit classification using the MNIST dataset
7. Implement a backpropagation network
8. Demonstrate different activation functions
9. Demonstrate Loss functions
10. Implement a Convolution Neural Network (CNN)
11. Perform predictions using 1D CNN
12. Using CNN build an Image Classifier with CIFAR-10 Data
13. Implement a Recurrent Neural Network
14. Implement LSTM
15. Perform time series analysis using LSTM
16. Demonstrate Transfer Learning
17. Develop a deep learning-based application with text dataset
18. Perform object detection in images using deep learning
19. Develop a deep learning-based application with speech dataset
20. Develop a deep learning-based application with video dataset
21. Develop an application using any pre-trained model

## COURSE OUTCOMES

At the end of the course, the students will be able to

1. Develop basic neural networks and handle varieties of datasets
2. Implement and apply different deep learning networks on various data sets.
3. Choose and apply deep learning networks for solving real-world problems

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO2</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-
<b>CO3</b>	2	3	3	3	3	-	-	-	-	-	-	-	2	3	-

<b>22ITEP706</b>	<b>STORAGE TECHNOLOGIES LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

## **COURSE OBJECTIVES**

- Understand the functionalities of storage network administration.
- Set up a NAS server to support file level data access via the NSF and the CIFS protocols.
- Set up a SAN server to support the iSCSI protocol for block level data access.
- Demonstrate ability to design and build a small-scale data center and a small-scale cloud computing environment.
- Be hand-on with data and network management software.

## **LIST OF EXERCISES**

1. Install a hard disk on a Linux machine covering all the below activities:
  - a) Connecting the disk to an HBA (Host Bus Adapter) and BIOS setup for the disk;
  - b) Partitioning the disk;
  - c) Creating file systems within disk partitions;
  - d) Mounting the files systems;
  - e) Setting up automatic mounting;
  - f) Labeling disk partitions;
  - g) Setting up swapping on swap partitions.
  
2. Use “smartmontools” to monitor the disk performance monitoring and testing:
  - a) Use “smartctl” to enable S.M.A.R.T. support and offline data collection on the disk;
  - b) Check the overall health of the disk;
  - c) Run a self-test on the disk;
  - d) Set up “smartd” to do tests automatically.
  
3. Use “hdparm”, “iostat”, and “iometer” tools to measure the performance of different storage devices, such as SATA drive, SCSI drive, and USB drives.
  - a) Plot graphs to compare read/write and sequential/random access rates among different storagedevices.
  
4. Use Navisphere Manager Simulator to perform management on SAN disk array systems:
  - a) Configure storage pools and LUNs (Logical Unit Number) for storage groups;
  - b) Configure snapshots and clones;
  - c) Create SANCOPY full and incremental sessions;
  - d) Create MirrorView synchronous and asynchronous images;
  - e) Expand a LUN to create metaLUNs;
  - f) Migrate a LUN to another LUN.
  
5. Use Openfiler for network storage configuration management:
  - a) Configure the Openfiler to support locally attached USB drives;
  - b) Set up a NAS server to support NSF and CIFS protocols;
  - c) Set up a SAN server to support an iSCSI protocol.
  
6. Configure Openfiler as a NAS Server:
  - a) Configure access control rules and NFS/CIFS shares for the NAS server;
  - b) Configure the Linux client machine to access the NFS shares on the NAS server;

- c) Configure a Windows VM on the Linux client machine to access the CIFS shares on the NASserver;
- d) Use Openfiler to set up a SAN server, to supports iSCSI protocol for the block level data access;
- e) Configure access control rules for the SAN server and configure iSCSI targets on the server.

7.

- a) Use VMware to create virtual disks, Virtual Machine File Systems and provisioning.
- b) Use thin and thick provisioning concepts.

### **COURSE OUTCOMES**

At the end of the course, the students will be able to

1. Understand the logic in usage of RAID for data protection for effective storage management.
2. Apply the concepts of intelligent storage in real-time information systems
3. Comprehend the direct attached storage for SCSI systems.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO2</b>	3	2	2	2	-	-	-	-	-	-	-	-	3	-	-
<b>CO3</b>	3	3	2	2	-	-	-	-	-	-	-	-	3	-	-

## OPEN ELECTIVES – I

22ITOE507	MACHINE LEARNING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce the basic concepts of Machine Learning.
- To become familiar with regression, classification and clustering algorithms, and probabilistic graphical models.
- To introduce sampling, reinforcement learning, and semi supervised learning techniques
- To apply machine learning techniques to a range of real world problems.

### Unit–I

Machine Learning: Machine Learning Foundations - Overview - applications - Types of machine learning - basic concepts in machine learning - Examples of Machine Learning – Applications. Linear Models for Regression: Linear Basis Function Models - The Bias-Variance Decomposition - Bayesian Linear Regression - Bayesian Model Comparison.

### Unit–II

Supervised Learning: Linear Models for Classification - Discriminate Functions - Probabilistic Generative Models - Probabilistic Discriminative Models - Bayesian Logistic Regression - Decision Trees - Classification Trees- Regression Trees - Pruning. Neural Networks - Feed-forward Network Functions - Error Back propagation Regularization - Mixture Density and Bayesian Neural Networks - Kernel Methods - Dual Representations - Radial Basis Function Networks - Ensemble methods - Bagging - Boosting.

### Unit–III

Unsupervised Learning: Clustering - K-means - EM - Mixtures of Gaussians - The EM Algorithm in General - Model selection for latent variable models - high-dimensional spaces - The Curse of Dimensionality - Dimensionality Reduction - Factor analysis - Principal Component Analysis - Probabilistic PCA - Independent components analysis.

### Unit–IV

Probabilistic graphical models: Directed Graphical Models - Bayesian Networks - Exploiting Independence Properties - From Distributions to Graphs - Examples - Markov Random Fields - Inference in Graphical Models - Learning - Naive Bayes classifiers - Markov Models - Hidden Markov Models - Inference - Learning - Generalization - Undirected graphical models - Markov random fields - Conditional independence properties - Parameterization of MRFs - Examples - Learning - Conditional random fields (CRFs) - Structural SVMs.

### Unit–V

Advanced learning: Sampling - Basic sampling methods - Monte Carlo - Reinforcement Learning - K-Armed Bandit Elements - Model Based Learning - Value Iteration - Policy Iteration. Temporal Difference Learning - Exploration Strategies - Deterministic and Non-deterministic Rewards and Actions - Eligibility Traces - Generalization- Partially Observable States - The Setting - Example - Semi Supervised Learning - Computational Learning Theory - Mistake bound analysis - Sample complexity analysis - VC dimension-Occam learning - Accuracy and confidence boosting .

## TEXT BOOKS

1. Kevin P. Murphy, Machine Learning: A Probabilistic Perspective, MIT Press, 2012.
2. Christopher Bishop, Pattern Recognition and Machine Learning, Springer, 2006.

## REFERENCES

1. Ethem Alpaydin, "Introduction to Machine Learning", Prentice Hall of India, 2005.
2. Tom Mitchell, "Machine Learning", McGraw-Hill, 1997.
3. Hastie, Tibshirani, Friedman, "The Elements of Statistical Learning", (2nd ed), Springer, 2008.
4. Stephen Marsland, "Machine Learning –An Algorithmic Perspective", CRC Press, 2009.

## COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Have a good understanding of the fundamental concepts and challenges of machine learning, and linear models for regression.
2. Understand a wide variety of supervised learning algorithms, and be able to design and implement machine learning solutions to classification problems.
3. Be familiar with various unsupervised learning algorithms, and able to design and implement machine learning solutions to clustering problems.
4. Be able to design and implement various probabilistic graphical models in a range of real-world applications.
5. Understand the advanced learning concepts such as sampling, reinforcement and semi supervised learning.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	2	2	-	-	-	-	-	-	3	-
CO2	3	3	3	3	3	2	2	-	-	-	-	-	-	3	-
CO3	3	3	3	3	3	2	2	-	-	-	-	-	-	-	3
CO4	3	3	3	3	3	2	2	-	-	-	-	-	-	-	3
CO5	3	3	3	3	3	2	2	-	-	-	-	-	-	-	3

22ITOE507	BIG DATA	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand Big Data Platform like Hadoop, MapReduce and eco system tools like Pig, Hive, Jaql using IBM's BigInsights.
- To gain confidence and learn how to make Big Data projects for real world applications.



22ITOE507	BIG DATA ANALYTICS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To learn the characteristics of big data and introduce the technologies for big data analytics.
- To recognize the key concepts of Hadoop framework and develop MapReduce applications using Hadoop.
- To understand Hadoop Ecosystem components for storage, analysis and manipulation of data.
- To analyze various big data-based case studies and prepare a sample big data project.

### UNIT-I

Fundamentals of Big Data – Big Data Types – Basics of Distributed Computing – Big Data Technology Components – MapReduce Fundamentals - Defining Big Data Analytics – A Brief History of Hadoop - The Hadoop Foundation and Ecosystem.

### UNIT-II

The Hadoop Distributed File system: The Design of HDFS - HDFS Concepts - The Command-Line Interface - Hadoop Filesystems - The Java Interface - Data Flow. Setting Up a Hadoop Cluster: Cluster Specification - Cluster Setup and Installation - SSH Configuration - Hadoop Configuration - YARN Configuration

### UNIT-III

MapReduce: Analyzing the Data with Hadoop - Scaling Out - Hadoop Streaming - Hadoop Pipes. Developing a MapReduce Application: The Configuration API - Configuring the Development Environment - Writing a Unit Test - Running Locally on Test Data - Running on a Cluster - Tuning a Job - MapReduce Workflow - Anatomy of a MapReduce Job Run - Failures - Job Scheduling - Shuffle and Sort -Task Execution

### UNIT-IV

Pig: Installing and Running - An Example - Pig Latin - User-Defined Functions - Pig in Practice

Hive - Installing Hive - An Example - Running Hive - Comparison with Traditional Databases - HiveQL - Tables - Querying Data - User-Defined Functions

Hbase: Hbasics - Concepts - Installation - Clients – Example

### UNIT-V

ZooKeeper: Installing and Running ZooKeeper - An Example - The ZooKeeper Service - Building Applications with ZooKeeper

Sqoop: Getting Sqoop - A Sample Import - Generated Code - Database Imports - Working with Imported Data - Importing Large Objects - Performing an Export.

Case Studies: Hadoop Usage at Last.fm - Hadoop and Hive at Facebook - Nutch Search Engine - Log Processing at Rackspace

## TEXT BOOKS

1. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
2. Judith Hurwitz, Alan Nugent, Fern Halper, and Marcia Kaufman, “Big Data for Dummies”, First Edition, For Dummies, 2013.

## REFERENCES

2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015.
3. Borko Furht and Flavio Villanustre, “Big Data Technologies and Applications”, First Edition, Springer Publishing Company, Incorporated, 2016

## COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Categorize and summarize big data and its importance.
2. Set up Hadoop cluster by understanding the architecture of Hadoop framework.
3. Develop Map Reduce based applications on Hadoop framework.
4. Recognize and apply various tools available with Hadoop Ecosystem for big data storage and management.
5. Be familiar with Hadoop Ecosystem technologies for data transformation and distributed components management, and develop applications with the technologies learnt so far.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	2	2	1	-	-	-	-	-	-	-	-	3	-
<b>CO2</b>	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	3	3	3	3	3	-	-	-	-	-	-	-	-	-	3
<b>CO4</b>	3	3	3	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO5</b>	3	3	3	3	3	2	2	-	-	-	-	-	-	-	3

<b>22ITOE507</b>	<b>DATA SCIENCE FOR ENGINEERS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To provide students with a framework that will help them choose the appropriate descriptive methods in various data analysis situations.
- To analyse distributions and relationship of real-time data.
- To apply estimation and testing methods to make inference and modelling techniques for decision making.

## UNIT I Introduction to Statistics

Introduction to statistics and data analysis-Measures of central tendency –Measures of variability-[Moments-Skewness-Kurtosis (Concepts only)].

### Random variables

Introduction -random variables-Probability mass Function, distribution and density functions - joint Probability distribution and joint density functions- Marginal, conditional distribution



and density functions- Mathematical expectation, and its properties Covariance , moment generating function – characteristic function.

## **UNIT II Correlation and regression**

Correlation and Regression – Rank Correlation- Partial and Multiple correlation- Multiple regression.

### **Probability Distributions**

Binomial and Poisson distributions – Normal distribution – Gamma distribution – Exponential distribution – Weibull distribution.

## **UNIT III Hypothesis Testing I**

Testing of hypothesis – Introduction-Types of errors, critical region, procedure of testing hypothesis-Large sample tests- Z test for Single Proportion, Difference of Proportion, mean and difference of means.

## **UNIT IV Hypothesis Testing II**

Small sample tests- Student's t-test, F-test- chi-square test- goodness of fit - independence of attributes- Design of Experiments - Analysis of variance – one and two way classifications - CRD-RBD- LSD.

## **UNIT V Reliability**

Basic concepts- Hazard function-Reliabilities of series and parallel systems- System Reliability - Maintainability-Preventive and repair maintenance- Availability.  
Contemporary Issues

## **TEXT BOOKS**

1. R.E. Walpole, R.H. Myers, S.L. Mayers and K.Ye, “Probability and Statistics for engineers and scientists”, 9th Edition, Pearson Education (2012).
2. Douglas C. Montgomery, George C. Runger, “Applied Statistics and Probability for Engineers”, 6th Edition, John Wiley & Sons (2016).

## **REFERENCES**

1. E.Balagurusamy, “Reliability Engineering”, Tata McGraw Hill, Tenth reprint 2017.
2. J.L.Devore, “Probability and Statistics”, 8th Edition, Brooks/Cole, Cengage Learning (2012).
3. R.A.Johnson, Miller Freund's, “Probability and Statistics for Engineers”, 8th edition, Prentice Hall India (2011).
4. Bilal M. Ayyub and Richard H. McCuen, “Probability, Statistics and Reliability for Engineers and Scientists”, 3rd edition, CRC press (2011).

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Compute and interpret descriptive statistics using numerical and graphical techniques.
2. Understand the basic concepts of random variables and find an appropriate distribution for analysing data specific to an experiment.
3. Apply statistical methods like correlation, regression analysis in analysing, interpreting experimental data.
4. Make appropriate decisions using statistical inference that is the central to experimental research.
5. Use statistical methodology and tools in reliability engineering problems and demonstrate R programming for statistical data

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO4	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3
CO5	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3

22ITOE507	DATA ENGINEERING				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To learn how to extract raw data, clean the data
- To perform transformations on data, load data and visualize the data

### UNIT – I

**Data Science:** Data Analysis Sequence, Data Acquisition Pipeline, Report Structure

**Files and Working with Text Data:** Types of Files, Creating and Reading Text Data, File Methods to Read and Write Data, Reading and Writing Binary Files, The Pickle Module, Reading and Writing CSV Files, Python os and os. Path Modules.

**Working with Text Data:** JSON and XML in Python

### UNIT – II

**Working with Text Data:** Processing HTML Files, Processing Texts in Natural Languages

**Regular Expression Operations:** Using Special Characters, Regular Expression Methods, Named Groups in Python Regular Expressions, Regular Expression with *glob* Module

### UNIT – III

**Working with Databases:** Setting Up a MySQL Database, Using a MySQL Database: Command Line, Using a MySQL Database, Taming Document Stores: MongoDB

**Working with Tabular Numeric Data(Numpy with Python):** NumPy Arrays Creation Using *array()* Function, Array Attributes, NumPy Arrays Creation with Initial Placeholder Content, Integer Indexing, Array Indexing, Boolean Array Indexing, Slicing and Iterating in Arrays, Basic Arithmetic Operations on NumPy Arrays, Mathematical Functions in NumPy, Changing the Shape of an Array, Stacking and Splitting of Arrays, Broadcasting in Arrays.

### UNIT – IV

**Working with Data Series and Frames:** Pandas Data Structures, Reshaping Data, Handling Missing Data, Combining Data, Ordering and Describing Data, Transforming Data, Taming Pandas File I/O

### UNIT – V

**Plotting:** Basic Plotting with PyPlot, Getting to Know Other Plot Types, Mastering Embellishments, Plotting with Pandas

## TEXTBOOKS

1. Data Science Essentials in Python: Collect, Organize, Explore, Predict, Value. Dmitry Zinoriev, The Pragmatic Programmers LLC, 2016
2. Introduction to Python Programming. Gowrishankar S., Veena A. CRC Press, Taylor & Francis Group, 2019

## REFERENCES

1. Python for Everybody: Exploring Data Using Python 3. Charles R Severance, 2016
2. Python Data Analytics – Data Analysis and Science using Pandas, matplotlib and the Python Programming Language. Fabio Nelli, Apress, 2015
3. Website Scraping with Python. Using BeautifulSoup and Scrapy. Apress, 2018
4. Machine Learning with Python Cookbook: Practical Solutions from Preprocessing to Deep Learning. Chris Albon, O'Reilly 2018

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Handle different types of files and work with text data
2. Use regular expression operations and relational databases via SQL
3. Use tabular numeric data
4. Use the data structures: data series and frames
5. Use PyPlot for visualization

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	3	-	3	-	3	-	-	-	-	-	3	-	-
CO2	-	-	-	-	3	-	-	-	-	-	-	3	-	1	-
CO3	2	2	2	3	2	2	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	3	1	-	2	-	3	3
CO5	3	2	-	2	3	-	3	3	3	3	2	3	3	3	3

## OPEN ELECTIVES – II

22ITOE606	CYBER SECURITY	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the crucial necessity of cyber security in computer systems, networks and enlighten numerous threat scenarios.
- To understand the well-known cyber-attack events, clarify the attack scenarios, and enlighten mitigation techniques.
- To understand the variance between Systems Cyber Security, Network Cyber Security, and cryptography, crypto-protocols etc.
- To analyse the cyber threats to critical structures.

### UNIT I: INTRODUCTION TO CYBER SECURITY

Overview of Cyber Security, Cyber Threats & Crime, Cyber Espionage, Internet Governance, Challenges and Constraints, necessity for a Comprehensive Cyber Security Policy, necessity for a Nodal Authority, necessity for an International convention on Cyberspace.

### UNIT II: SECURITY THREATS AND VULNERABILITIES

Overview, vulnerabilities in software, Intrusion, Physical Theft, Abuse of Privileges, Malware infection, System administration, Complex Network Architectures, Open Access to Organizational Data, Weak Authentication, Unprotected Broadband communications, Poor Cyber Security Awareness.

### UNIT III: SECURITY PRACTICES & SECURITY SAFEGUARDS

Security Practices: Security Management, Security Policy, Risk Management, Information Classification Process, Security Procedures and Guidelines, Business Continuity and Disaster Recovery.

Security Safeguards: Overview, Access control, Audit, Authentication, Biometrics, Cryptography, Deception, Denial of Service Filters, Ethical Hacking, Firewalls, Intrusion Detection Systems, Response, Scanning, anti-Malware software.

### UNIT IV: INTRUSION DETECTION & SECURING WEB

Intrusion detection and Prevention Techniques, Basic security for HTTP Applications and Services, Basic Security for SOAP Services, Identity Management and Web Services, Authorization Patterns, Security Considerations, Challenges, Network based Intrusion detection & Prevention Systems.

### UNIT V: SECURITY LAWS, STANDARDS & FORENSIC

Security Laws & Standards: Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, National Cyber Security Policy, Cyber Forensic: Overview, Handling Preliminary Investigations, Controlling an Investigation

### TEXT BOOKS

1. Micki Krause, Harold F. Tipton, "Handbook of Information Security Management", Vol 1-3, CRC Press LLC, 2004.

## REFERENCES

1. Bill Nelson, "Computer Forensics and Investigations", Cengage Learning, India Edition, 2016.
2. Matt Bishop "Computer Security Art and Science", Pearson/PHI, 2002.

## COURSE OUTCOMES

At the end of the course, the student will be able to

1. The cyber threat landscape, both in terms of recent developing issues and those issues which persist over time.
2. The roles and effects of governments, commercial and other organisations, citizens and criminals in cyber security affairs.
3. General values and policies that can be functional to systems to make them more vigorous to attack.
4. Key factors in cyber security from different corrective views including computer science, management, law, criminology, and social sciences.
5. Learn security laws and forensics.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	1	-	-	-	-	-	-	2	-	3	-
CO2	2	2	1	-	1	-	-	-	-	-	-	-	-	3	-
CO3	-	2	-	-	-	1	-	-	-	-	-	-	-	3	-
CO4	-	1	-	-	1	2	-	-	-	-	-	-	-	3	-
CO5	2	2	-	-	1	-	-	-	-	-	-	2	-	3	-

22ITOE606	INDUSTRY 4.0	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To provide students with good depth of knowledge of Designing Industrial IOT Systems for various application.
- Knowledge for the design and analysis of Industry 4.0 Systems for Electronics Engineering students

### UNIT – I Introduction to Industrial IoT (IIoT) Systems:

The Various Industrial Revolutions, Role of Internet of Things (IoT) & Industrial Internet of Things (IIoT) in Industry, Industry 4.0 revolutions, Support System for Industry 4.0, Smart Factories.

### UNIT – II Implementation systems for IIoT

Sensors and Actuators for Industrial Processes, Sensor networks, Process automation and Data Acquisitions on IoT Platform, Microcontrollers and Embedded PC roles in IIoT, Wireless Sensor nodes with Bluetooth, WiFi, and LoRa Protocols and IoT Hub systems



22ITOE606	ROBOTICS SIMULATION FOR MANUFACTURING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To know about robots and robotics.
- To learn various methods of robot teaching with some suitable examples.
- To study the working principles of various sensors used in robots.
- The principles of motion planning algorithms will be learnt.

#### Unit I: Introduction to Robotics

Components, Classification, Characteristics and Applications of Robots. Material transfer, Machine loading/unloading, Processing operation, Assembly and Inspection, Feature Application.

#### Unit II: Drive Systems, Actuators and Sensors

Actuators: Characteristics of Actuating Systems, Actuating Devices and Control. Sensors: Sensor Characteristics, Description of Different Sensors, Touch sensors, Tactile sensor, Proximity and range sensors, Robotic vision sensor, Force sensor, Light sensors, Pressure sensors.

#### Unit III: Basic Concepts of Artificial Intelligence

Concepts of AI, AI Problems, techniques, Characteristics & Applications, AI versus Natural Intelligence, Problem representation in AI, Problem-solution Techniques. Elements of Knowledge Representation: Logic, Production Systems, Semantic Networks, Expert Systems. Defining the Problem as State Space Search, Production Systems, Production Systems, Issues in the Design of Search Programs, DFS & BFS Techniques

#### Unit IV: Intelligent Agents and Multi-agent system

Design of intelligent agents - reasoning agents, agents as reactive systems; hybrid agents; layered agents.

Multi-Agent Systems: Classifying multi-agent interactions - cooperative versus non-cooperative; zero-sum and other interactions; Cooperation, Prisoner's dilemma and Axelrod's experiments; Interactions between self-interested agents: auctions & voting systems: negotiation; Interactions between benevolent agents: cooperative distributed problem solving, partial global planning; coherence and coordination; Interaction languages and protocols: speech acts, KQML/KIF, the FIPA framework.

#### Unit V: Multi-robot representations and Task Planning

Task-Level Programming, Uncertainty, Configuration Space, Gross-Motion Planning, Grasp Planning, Fine Motion Planning, Task Planning Problem.: control architectures, simulation environments, and testbeds. Integration of assorted sensors (IR, Potentiometer, strain gauges etc.), micro controllers and ROS (Robot Operating System) in a robotic system.

### TEXTBOOKS

1. Introduction to Robotics Analysis, Systems, Applications by Saeed B Niku, Prentice Hall, 2nd edition, 2001.
2. Fundamentals of Robotics Analysis and Control, Robert J Schilling, PHI, 5th edition, 2003.

## REFERENCES

1. An Introduction to MultiAgent Systems - Second Edition. Michael Wooldridge Wiley, latest edition.
2. Mikell P Groover, Nicholas G Odrey, Mitchel Weiss, Roger N Nagel, Ashish Dutta, "IndustrialRobotics, Technology programming and Applications", McGraw Hill, 2nd edision, 2017.
3. Craig. J. J. "Introduction to Robotics- mechanics and control", Addison- Wesley, 3rd edition, 2004.

## COURSE OUTCOMES

At the end of the course, the student will be able to

1. Learn how to keep robots in modern industries.
2. Learn how to apply robots in different areas (space, medical, manufacturing etc.).
3. Students will have brief idea of different components of robots system and their working principle.
4. Understand the notion of an agent, how agents are distinct from other software.
5. Understand the key issues in designing societies of agents that can effectively cooperate in order to solve problems, including an understanding of the key types of multi-agent interactions possible in such systems.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	1	1	2	-	1	1	-	-	-	-	-	2	1	-	1
<b>CO2</b>	1	2	-	-	1	-	-	-	-	-	-	2	1	1	-
<b>CO3</b>	-	3	3	2	1	1	1	-	-	1	2	3	1	2	-
<b>CO4</b>	-	1	2	-	-	3	2	1	2	1	-	2	-	1	3
<b>CO5</b>	-	-	-	-	-	1	1	-	-	-	2	1	-	-	3

<b>22ITOE606</b>	<b>SMART ENERGY GRID</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To leverage modern Information and Communication Technology (ICT) infrastructure to help monitor and control of the power system more effectively
- To transform conventional power system networks into smart energy grids that will be responsible for intelligent management, operation, and control of energy flow
- The conventional communication between Remote Terminal Units (RTUs) and Supervisory Control and Data Acquisition (SCADA) system, two-way communication between SCADA and fast responding intelligent devices, such as Intelligent Electronics Devices (IEDs), Phasor Measurement Units (PMUs), and



Internet of Things (IoT) devices, are also being built to carve the smart grid out of the conventional power grid.

- To study the various applications of smart grid technology for better monitoring and control of power system

### **UNIT – I Smart Grid Technology Overview**

Initial Overview of various smart grid measurement and communication technologies, smart grid protocols

**IT Enablers for Smart Grid Technology:** Overview of Multi-agent System, Distributed Intelligence, Big Data Analysis, Cloud Computing, Software-Defined Networks (SDN)

### **UNIT – II Smart Grid Decision Support and operational technology**

Concepts of Visualization, Self-Healing, Congestion Management, Dynamic OPF, Security Assessment, Contingency Analysis, Dynamic State estimation, Stability Analysis, Intelligent Fault Management, Feeder Reconfiguration, Short Circuit Analysis, Topology Processing, Power Quality, Voltage VAR Control, advanced control of generators, improved FACTS devices

### **UNIT – III Smart Analytics**

Computational Intelligence, Wide Area Monitoring and Control Techniques, Demand Response Management, Predictive Asset Management, Forecasting Techniques

### **UNIT – IV New technology Integration**

Renewable Integration, Plug-in Electric Vehicle, Smart home and Smart City concepts, Cooperative grids

### **UNIT – V Smart Grid Market and Economics**

Energy market overview, Role of System Operators, DSO, and TSO under the smart grid, Transactive Energy

### **TEXTBOOKS**

1. Lars T. Berger and Krzysztof Iniewski, “Smart Grid Applications, Communications, And Security,” Wiley, New Delhi, Aug 2015
2. Buchholz, Bernd M., Styczynski, Zbigniew, “Smart Grids – Fundamentals and Technologies in Electricity Networks”, Springer, 2014
3. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, and Nick Jenkins, “Smart Grid: Technology And Applications,” Wiley, New Delhi, Aug 2015

### **REFERENCES**

1. James Momoh, “Smart Grid: Fundamentals of Design and Analysis,” (I E E Power Engineering Series)– Wiley-Blackwell, Apr 2012
2. Takuro Sato, Daniel M. Kammen, Bin Duan, Martin Macuha, Zhenyu Zhou, and Jun Wu, “Smart Grid Standards: Specifications, Requirements, and Technologies,” Wiley- Blackwell, Apr 2015.
3. Chen-Ching Liu, Stephen McArthur, Seung-Jae Lee, “Smart Grid Handbook”, 3 Volume Set, Wiley, USA, 2016

### **COURSE OUTCOMES**

At the end of the course, the student will be able to

1. Understand smart grids measurement and communication technologies.
2. Enable IT related multi agent system, SDN.

3. Understand smart analytics.
4. Develop concepts of smart grid technologies in hybrid electrical vehicles
5. Analyse micro grids and distributed generation systems

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
<b>CO2</b>	2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO3</b>	2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
<b>CO4</b>	1	3	3	3	3	-	-	-	-	-	-	-	1	3	-
<b>CO5</b>	1	3	3	3	3	-	-	-	-	-	-	-	-	3	-

<b>22ITOE606</b>	<b>AUGMENTED &amp; VIRTUAL REALITY DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To gain the knowledge of historical and modern overviews and perspectives on virtual reality.
- To learn the fundamentals of sensation, perception, and perceptual training.
- To have the scientific, technical, and engineering aspects of augmented and virtual reality systems. □To learn the Evaluation of virtual reality from the lens of design.
- To learn the technology of augmented reality and implement it to have practical knowledge.

### **UNIT I Introduction**

Introduction to Augmented-Virtual and Mixed Reality, Taxonomy, technology and features of augmented reality, difference between AR ,VR and MR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality.

### **UNIT II VR systems**

VR as a discipline, Basic features of VR systems, Architecture of VR systems, VR hardware:VR input hardware: tracking systems, motion capture systems, data gloves, VR output hardware: visual displays.

### **UNIT III Stereoscopic Vision & Haptic rendering**

Fundamentals of the human visual system, Depth cues, Stereopsis, Retinal disparity, Haptic sense, Haptic devices, Algorithms for haptic rendering and parallax, Synthesis of stereo pairs, Pipeline for stereo images.

### **UNIT IV VR software development**

Challenges in VR software development, Master/slave and Client/server architectures, Cluster rendering, Game Engines and available sdk to develop VR applications for different

hardware (HTC VIVE, Oculus, Google VR). **Application** of VR in Digital Entertainment: VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

**UNIT V 3D interaction techniques**

3D Manipulation tasks, Manipulation Techniques and Input Devices, Interaction Techniques for 3D Manipulation.

**AR software development**

AR software, Camera parameters and camera calibration, Marker-based augmented reality, AR Toolkit.

**REFERENCES**

1. George Mather, “Foundations of Sensation and Perception:Psychology”, Press; 2<sup>nd</sup>Edition, 2009.
2. Jason Jerald, “The VR Book: HumanCentered Design for Virtual Reality”
3. Tony Parisi, “Learning Virtual Reality”, O’ Reilly
4. Burdea, G. C. and P. Coffet, “Virtual Reality Technology”, Second Edition.WileyIEEE Press, 2003/2006.
5. Alan B. Craig, “Understanding Augmented Reality, Concepts and Applications”, Morgan Kaufmann, 2013.
- 6..Alan Craig, William Sherman and Jeffrey Will, “Developing Virtual Reality Applications”, Foundations of Effective Design, Morgan Kaufmann, 2009.

**E Resources:**

- <http://msl.cs.uiuc.edu/vr/>

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Identify, examine, and develop software that reflects fundamental techniques for the design and deployment of VR and AR experiences.
2. Describe how VR and AR systems work.
3. Choose, develop, explain, and defend the use of particular designs for AR and VR experiences.
4. Evaluate the benefits and drawbacks of specific AR and VR techniques on the human body.
5. Identify and examine stateofheart AR and VR design problems and solutions from the industry and academia.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	3	3	3	2	3	-	-	-	-	-	3	3	2
<b>CO2</b>	3	3	3	3	3	2	3	2	-	-	-	-	3	3	2
<b>CO3</b>	3	3	3	3	3	2	2	2	2	-	-	-	3	3	1
<b>CO4</b>	3	3	3	3	3	3	2	2	2	-	-	-	3	3	1
<b>CO5</b>	3	3	3	3	3	3	2	3	2	3	2	2	3	3	1



## OPEN ELECTIVES – III

22ITOE705	CLOUD ESSENTIALS	L	T	P	C
		3	0	0	3

### Course Objectives:

- To introduce the cloud computing concepts and map reduce programming model.
- To provide skills and knowledge about operations and management in cloud technologies so as to implement large scale systems.
- To provide skills to design suitable cloud infrastructure that meets the business services and customer needs.

### UNIT – I: Foundations of cloud

Inception and need for cloud computing: Motivations from distributed computing predecessors - Evolution - Characteristics - Business Benefits – Challenges in cloud computing - Exploring the Cloud Computing Stack - Fundamental Cloud Architectures – Advanced Cloud Architectures - Specialized Cloud Architectures

### UNIT – II: Service Delivery and Deployment Models

Service Models (XaaS): Infrastructure as a Service (IaaS) - Platform as a Service (PaaS) - Software as a Service(SaaS) - Deployment Models: Types of cloud - Public cloud - Private cloud - Hybrid cloud – Service level agreements - Types of SLA – Lifecycle of SLA- SLA Management

### UNIT – III: Cloud Resource Virtualization

Virtualization as Foundation of Cloud – Understanding Hypervisors – Understanding Machine Image and Instances - Managing Instances – Virtual Machine Provisioning and Service Migrations

### Cloud Computing: Applications and Paradigms

Existing Cloud Applications and Opportunities for New Applications - Architectural Styles for Cloud Applications - Workflows: Coordination of Multiple Activities - Coordination Based on a State Machine Model: The ZooKeeper - The MapReduce Programming Model - A Case Study: The GrepTheWeb Application

### UNIT – IV: Resource Management and Scheduling in Cloud

Policies and Mechanisms for Resource Management – Stability of a Two-Level Resource Allocation Architecture- Feedback Control Based on Dynamic Thresholds - Coordination of Specialized Autonomic Performance Managers - A Utility-Based Model for Cloud-Based Web Services - Resource Bundling: Combinatorial Auctions for Cloud Resources – Scheduling Algorithms for Computing Clouds - Resource Management and Dynamic Application Scaling

### UNIT – V: Cloud Platforms and Application Development

Comparing Amazon web services, Google AppEngine, Microsoft Azure from the perspective of architecture (Compute, Storage Communication) services and cost models. Cloud application development using third party APIs, Working with EC2 API – Google App Engine API - Facebook API, Twitter API.

### Advances in Cloud

Media Clouds - Security Clouds - Computing Clouds - Mobile Clouds – Federated Clouds – Hybrid Clouds

## TEXT BOOKS

1. Rajkumar Buyya, James Broberg, Andrzej, M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st Edition, 2013.
2. Sosinsk, Barrie, Cloud Computing Bible, John Wiley & Sons, 1st Edition, 2011.

## REFERENCES

1. Marinescu, Dan C. Cloud Computing: Theory and Practice. Morgan Kaufmann, 2017.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, Cloud Computing: A Practical Approach, Mc Graw Hill Education, 1st Edition, 2017.
3. Buyya, Rajkumar, Christian Vecchiola, and S. Thamarai Selvi. Mastering Cloud Computing: Foundations and Applications Programming, Tata Mcgraw Hill, 1st Edition, 2017.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the evolution, principles, and benefits of Cloud Computing in order to assess existing cloud infrastructures to choose an appropriate architecture that meets business needs.
2. Decide a suitable model to capture the business needs by interpreting different service delivery and deployment models.
3. Understand virtualization foundations to cater the needs of elasticity, portability and resilience by cloud service providers.
4. Infer architectural style, work flow of real world applications and to implement the cloud applications using map reduce programming models.
5. Design a cloud framework with appropriate resource management policies and mechanism.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	-	2	-	-	1	-	-	-	-	-	-	2	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	3	-	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	-	2	1	3	-	1	-	1	-	-	-	-	-	1	-

22ITOE705	CLOUD COMPUTING											L	T	P	C
												3	0	0	3

## COURSE OBJECTIVES

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing

- Learn how to program the grid and the cloud
- Understand the security issues in the grid and the cloud environment

### **Unit-I**

Evolution of Distributed computing: Scalable computing over the Internet – Technologies for network based systems – clusters of cooperative computers – Grid computing Infrastructures– cloud computing – service oriented architecture-Introduction to Grid Architecture and standards–Elements of Grid – Overview of Grid Architecture.

### **Unit-II**

Introduction to Open Grid Services Architecture(OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

### **Unit-III**

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software-Pros and Cons of cloud computing–Implementation levels of virtualization–virtualization structure-Virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

### **Unit-IV**

Open source grid middleware packages – Globus Toolkit (GT4) Architecture,Configuration – Usage of Globus – Main components and Programming model –Introduction to Hadoop Framework – Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Design of Hadoop file system, HDFS concepts, command line and java interface,dataflow of File read & File write.

### **Unit-V**

Trust models for Grid security environment – Authentication and Authorization methods – Grid security infrastructure-Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

### **TEXT BOOKS**

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, “Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet”, First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
2. Jason Venner, “Pro Hadoop– Build Scalable, Distributed Applications in the Cloud”, A Press, 2009.

### **REFERENCES**

1. Tom White, “Hadoop The Definitive Guide”, First Edition. O’Reilly, 2009
2. Bart Jacob (Editor), “Introduction to Grid Computing”, IBM Red Books, Vervante, 2005
3. Ian Foster, Carl Kesselman, “The Grid: Blueprint for a New Computing Infrastructure”, 2nd Edition, Morgan Kaufmann.
4. Frederic Magoules and Jie Pan, “Introduction to Grid Computing” CRC Press, 2009.
5. Daniel Minoli, “A Networking Approach to Grid Computing”, John WileyPublication,2005.
6. Barry Wilkinson, “Grid Computing: Techniques and Applications”, Chapman and Hall, CRC, Taylor and Francis Group, 2010.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Apply grid computing techniques to solve large scale scientific problems.
2. Introduce the concept of virtualization.
3. Use the grid and cloud tool kits.
4. Configuring the various Grid Packages.
5. Authenticating the Security Methods.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	-	2	-	-	1	-	-	-	-	-	-	2	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	3	-	2	1	-	1	-	-	-	-	-	-	1	-	-
CO5	-	2	1	3	-	1	-	1	-	-	-	-	-	1	-

22ITOE705	DEV OPS				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To learn the basic concepts and terminology of DevOps
- To gain knowledge on Devops platform
- To understand building and deployment of code
- To be familiar with DevOps automation tools
- To learn basics of MLOps

## UNIT I

Software Engineering - traditional and Agile process models - DevOps -Definition - Practices - DevOps life cycle process - need for DevOps –Barriers

## UNIT II

Cloud as a platform - IaaS, PaaS, SaaS - Virtualization - Containers –Supporting Multiple Data Centers - Operation Services - Hardware provisioning- software Provisioning - IT services - SLA - capacity planning - security - Service Transition - Service Operation Concepts.

## UNIT III

Microservices architecture - coordination model - building and testing - Deployment pipeline - Development and Pre-commit Testing -Build and Integration Testing -



continuous integration - monitoring - security - Resources to Be Protected - Identity Management

#### UNIT IV

Infrastructure Automation- Configuration Management - Deployment Automation - Performance Management - Log Management -Monitoring.

#### UNIT V

MLOps - Definition - Challenges -Developing Models - Deploying to production - Model Governance - Real world examples

#### REFERENCES

1. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect's Perspective", Pearson Education, 2016
2. Joakim Verona - "Practical DevOps" - Packet Publishing , 2016
3. Viktor Farcic -"The DevOps 2.1 Toolkit: Docker Swarm" - Packet Publishing, 2017
4. Mark Treveil, and the Dataiku Team-"Introducing MLOps" - O'Reilly Media-2020

#### COURSE OUTCOMES

At the end of this course, the students will be able to

- Implement modern software Engineering process
- Work with DevOps platform
- Build, test and deploy code
- Explore DevOps tools
- Correlate MLOps concepts with real time examples

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3	-	3	3	3
CO2	2	2	1	1	3	-	-	-	-	-	-	-	3	2	-
CO3	3	3	3	3	3	-	3	-	3	-	3	-	3	3	3
CO4	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
CO5	3	3	3	3	3	3	3	3	3	-	3	3	-	3	2

22ITOE705	FULL STACK	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To become knowledgeable about the most recent web development technologies.
- Idea for creating two tier and three tier architectural web applications.
- Design and Analyse real time web applications.
- Constructing suitable client and server side applications.
- To learn core concept of both front end and back end programming.

### UNIT - I

Web Development Basics: Web development Basics - HTML & Web servers Shell - UNIX CLI Version control - Git & Github HTML, CSS

### UNIT - II

Frontend Development: Javascript basics OOPS Aspects of JavaScript Memory usage and Functions in JS AJAX for data exchange with server jQuery Framework jQuery events, UI components etc. JSON data format.

### UNIT - III

REACT JS: Introduction to React React Router and Single Page Applications React Forms, Flow Architecture and Introduction to Redux More Redux and Client-Server Communication

### UNIT - IV

Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application using Maven

### UNIT - V

Databases & Deployment: Relational schemas and normalization Structured Query Language (SQL) Data persistence using Spring JDBC Agile development principles and deploying application in Cloud

### TEXT BOOKS

1. Web Design with HTML, CSS, JavaScript and JQuery Set Book by Jon Duckett Professional JavaScript for Web Developers Book by Nicholas C. Zakas
2. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
3. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015

### REFERENCES

1. Full-Stack JavaScript Development by Eric Bush.
2. Mastering Full Stack React Web Development Paperback – April 28, 2017 by Tomasz Dyl, Kamil Przeorski, Maciej Czarnecki

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Develop a fully functioning website and deploy on a web server.
2. Gain Knowledge about the front end and back end Tools
3. Find and use code packages based on their documentation to produce working results in a project.
4. Create web pages that function using external data.
5. Implementation of web application employing efficient database access.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	3	2	-	-	2	2	2	3	3	2	1
CO2	3	3	3	3	3	2	-	-	2	-	2	3	3	2	1
CO3	3	3	3	2	3	2	-	-	2	2	2	3	3	2	1
CO4	3	3	3	3	3	1	-	-	1	1	2	3	3	2	1
CO5	3	3	3	3	3	1	-	-	-	-	2	3	3	2	1

22ITOE705	<b>BLOCK CHAIN</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### COURSE OBJECTIVES

- To understand the mechanism of Blockchain and Cryptocurrency.
- To understand the functionality of current implementation of blockchain technology.
- To understand the required cryptographic background.
- To explore the applications of Blockchain to cryptocurrencies and understanding limitations of current Blockchain.
- An exposure towards recent research

### UNIT I : Introduction to Cryptography and Cryptocurrencies

Cryptographic Hash Functions, Hash Pointers and Data Structures, Digital Signatures, Public Keys as Identities, A Simple Cryptocurrency.

### UNIT II : How Blockchain Achieves and How to Store and Use

Decentralization-Centralization vs. Decentralization-Distributed consensus, Consensus without identity using a blockchain, Incentives and proof of work. Simple Local Storage, Hot and Cold Storage, Splitting and Sharing Keys, Online Wallets and Exchanges, Payment Services, Transaction Fees, Currency Exchange Markets.

### UNIT III : Mechanics of Bitcoin

Bitcoin transactions, Bitcoin Scripts, Applications of Bitcoin scripts, Bitcoin blocks, The Bitcoin network, Limitations and improvements.

### UNIT IV : Bitcoin Mining

The task of Bitcoin miners, Mining Hardware, Energy consumption and ecology, Mining pools, Mining incentives and strategies

#### Bitcoin and Anonymity

Anonymity Basics, How to De-anonymize Bitcoin, Mixing, Decentralized Mixing, Zerocoin and Zerocash.

## UNIT V: Community, Politics, and Regulation

Consensus in Bitcoin, Bitcoin Core Software, Stakeholders: Who's in Charge, Roots of Bitcoin, Governments Notice on Bitcoin, Anti Money Laundering Regulation, New York's Bit License Proposal. Bitcoin as a Platform: Bitcoin as an Append only Log, Bitcoins as Smart Property, Secure Multi Party Lotteries in Bitcoin, Bitcoin as Public Randomness, Source-Prediction Markets, and Real World Data Feeds.

### Altcoins and the Cryptocurrency Ecosystem

Altcoins: History and Motivation, A Few Altcoins in Detail, Relationship Between Bitcoin and Altcoins, Merge Mining-Atomic Crosschain Swaps-6 Bitcoin Backed Altcoins, Side Chains, Ethereum and Smart Contracts.

## TEXT BOOK

1. Narayanan, A., Bonneau, J., Felten, E., Miller, A., and Goldfeder, S. (2016). Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press.

## REFERENCES

1. Antonopoulos, A. M. (2014). Mastering Bitcoin: unlocking digital cryptocurrencies. O'Reilly Media, Inc."
2. Franco, P. (2014). Understanding Bitcoin: Cryptography, engineering and economics. John Wiley and Sons.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. To Understand and apply the fundamentals of Cryptography in Cryptocurrency
2. To gain knowledge about various operations associated with the life cycle of Blockchain and Cryptocurrency
3. To deal with the methods for verification and validation of Bitcoin transactions
4. To demonstrate the general ecosystem of several Cryptocurrency
5. To educate the principles, practices and policies associated Bitcoin business

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	-	-	1		-	-	2	-	-
CO2	3	2	2	1	-	1	-	-	-	1	-	1	-	2	-
CO3	3	2	2	1	-	1	-	-	-	1	-	1	-	-	2
CO4	3	2	2	-	-	1	-	-	1	1	-	1	-	2	-
CO5	3	-	2	-	-	1	-	-	1	1	-	2	-	-	3

## OPEN ELECTIVES – IV

22ITOE801	DATA ANALYTICS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce fundamental techniques and tools required for data analytics.
- To learn basic tools for statistical analysis, R, and key methods used in machine Learning
- To learn the architecture of Hadoop and develop MapReduce programs for parallel processing using Hadoop.
- To introduce various techniques for documentation and data visualization.
- To analyze real world data using the data analytics tools and techniques learnt so far.

### UNIT-I

Introduction: Data science process – roles, stages in data science project – State of the practice in analytics – Role of data scientists – Key roles for successful analytic project – Main phases of life cycle-Working with data from files – Exploring data – Managing data – Cleaning and sampling for modeling and validation – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools. Introduction to Big Data Platform – Big Data and its importance, Five Vs. Drivers for Big data, Big data analytics, Big data applications.

### UNIT-II

R Programming: R basics – Reading and getting data into R – Ordered and unordered factors – Arrays and matrices – Lists and data frames – Reading data from files – Probability distributions – Statistical models in R – Manipulating objects – Data distribution – Simple programs using R.

### UNIT-III

Map Reduce: Introduction – Distributed file system – Algorithms using map reduce, Matrix-Vector Multiplication by Map Reduce-Hadoop – Understanding the Map Reduce architecture-Writing Hadoop MapReduce Programs – Loading data into HDFS – Executing the Map phase-Shuffling and sorting – Reducing phase execution.

### UNIT-IV

Data Analysis Techniques: Linear and logistic regression modeling – Naïve Baye's classifier – Support vector machine-Neural networks – Principal component analysis – Linear Discriminant Analysis – Decision Trees – Fuzzy logic – Clustering Techniques : Hierarchical, agglomerative, K-Means – Associative Rule Mining.

Case Studies: Social Network Analysis – Text analysis –Marketing analysis.

### UNIT-V

Data Visualization: Documentation and deployment – Producing effective presentations – Introduction to graphical analysis – plot() function – Displaying multivariate data – Matrix plots – Multiple plots in one window – Exporting graph – Using graphics parameters –

Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications.

### TEXT BOOKS

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Chris Eaton, Dirk deRoos et al. , “Understanding Big data ”, McGraw Hill, 2012.

### REFERENCES

1. Mark Gardener, “Beginning R – The Statistical Programming Language”, John Wiley & Sons, Inc., 2012.
2. Boris Imlinskiy, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015.
3. David Hand, Heiki Mannila, Padhria Smyth, “Principles of Data Mining”, PHI 2013.
4. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.
5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, “Practical Data Science Cookbook”, Packt Publishing Ltd., 2014.
6. V.K. Jain, “Big Data and Hadoop”, Khanna Publishing House.
7. V.K. Jain, “Data Science and Analytics”, Khanna Publishing House.

### COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Understand the importance and fundamental concepts of data analytics.
2. Use R programming language to develop data analytics based applications.
3. Develop Map Reduce modules on Hadoop framework.
4. Apply various machine learning techniques to process data and convert hypotheses and data into actionable predictions.
5. Document and transfer the results, and effectively communicate the findings using visualization techniques.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO4	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3
CO5	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3

<b>22ITOE801</b>	<b>DATA ANALYTICS IN BIOINFORMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **COURSE OBJECTIVES**

To impart knowledge on

- To Exposed to the need for Bioinformatics technologies
- To Data warehousing and datamining techniques in bioinformatics
- To Familiar with the modeling techniques
- To Different Pattern Matching and Visualization techniques
- To Use of microarray analysis on various benchmark datasets

## **UNIT I INTRODUCTION**

Need for Bioinformatics technologies – Overview of Bioinformatics technologies  
Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics – Biological Data  
Integration System

## **UNIT IIDATAWAREHOUSING AND DATA MINING IN BIOINFORMATICS**

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics

## **UNIT IIIMODELLING FOR BIOINFORMATICS**

Hidden Markov modeling for biological data analysis – Sequence identification – Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks – Molecular modeling – Computer programs for molecular modelling

## **UNIT IVPATTERN MATCHING AND VISUALIZATION**

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences

## **UNIT VMICROARRAY ANALYSIS**

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model – Benchmark – Tradeoffs

## **TEXT BOOK**

1.Yi-Ping Phoebe Chen (Ed), “BioInformatics Technologies”, Springer Verlag, 2007

## **REFERENCES**

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003
2. Arthur M Lesk, “Introduction to Bioinformatics”, Fourth Edition, Oxford University Press, 2005

## EXTENSIVE READING:

- <https://towardsdatascience.com/hidden-markov-model-applied-to-biological-sequence-373d2b5a24c>
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/bioinformatics>
- <https://www.ebi.ac.uk/training/online/courses/functional-genomics-ii-common-technologies-and-dataanalysis-methods/microarrays/analysis-of-microarray-data/>

## COURSE OUTCOMES

At the end of the course, the students will be able to

1. Use the concept of bioinformatics technologies
2. Analyse biomedical data using machine learning techniques
3. Develop models for biological data
4. Apply pattern matching techniques to bioinformatics, protein and genomic data
5. Implement micro array technologies for evaluation of biological data

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	1	3	3
CO2	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO3	3	3	3	3	3	-	-	-	-	-	-	-	1	3	3
CO4	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3
CO5	1	3	3	3	3	2	2	-	-	-	-	-	1	3	3

22ITOE801	SYSTEM MODELING AND SIMULATION	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the basic system concept and definitions of system.
- To understand the system concept and apply functional modeling method to model the activities of a static system.
- To understand the behavior of a dynamic system and create an analogous model for a dynamic system.
- To understand simulate the operation of a dynamic system and make improvement according to the simulation results.

## UNIT-I

Introduction – Simulation Terminologies– Application areas – Model Classification – Types of Simulation – Steps in a Simulation study– Concepts in Discrete Event Simulation – Monte Carlo Simulation – Simulation Examples.



## **UNIT-II**

Statistical Models – Concepts – Discrete Distribution– Continuous Distribution – Poisson Process– Empirical Distributions– Queueing Models – Characteristics– Notation – Queueing Systems – Markovian Models– Properties of random numbers– Generation of Pseudo Random numbers– Techniques for generating random numbers–Testing random number generators– Generating Random–Variates– Inverse Transform technique Acceptance- Rejection technique–Composition and Convolution Method.

## **UNIT-III**

Input Modeling – Data collection – Assessing sample independence–Hypothesizing distribution family with data – Parameter Estimation – Goodness-of-fit tests – Selecting input models in absence of data– Output analysis for a Single system – Terminating Simulations – Steady state simulations.

## **UNIT-IV**

Model Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.

## **UNIT-V**

Simulation Tools – Model Input – High level computer system simulation – CPU – Memory Simulation – Comparison of systems via simulation – Simulation Programming techniques – Development of Simulation models – Simulation Project Management.

## **TEXT BOOKS**

1. Banks J and John Carson, “Discrete Event System Simulation”, Pearson Education, 2010.
2. Geoffrey Gordon, “System Simulation”, Second Edition, PHI, 2006.

## **REFERENCES**

1. Kelton, WD, Sadowski, R, Zupick, Simulation with Arena, McGraw–Hill, 2014.
2. Frank L. Severance, “System Modeling and Simulation”, Wiley, 2001.
3. Averill M. Law and W.DavidKelton, “Simulation Modeling and Analysis, Third Edition, McGraw Hill, 2006.
4. Jerry Banks, “Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice”, Wiley, 1998.
5. Altiok, T, Melamed, B, Simulation Modeling and Analysis with Arena, Academic Press, 2007.

## **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Acquiring knowledge of Simulation Terminologies and Classification
2. Familiarizing the idea of Mathematical Models
3. Familiarizing of Simulation Data
4. Gaining experience skills on Verification and Validation of Simulation Models
5. Familiarizing on Simulation Tools and Simulation Project Management

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	3	-	-	-	-	-	-	-	-	3	-
CO2	1	2	3	-	3	-	-	-	-	-	-	-	-	3	-
CO3	3	2	3	-	3	-	-	-	-	-	-	-	-	3	-
CO4	2	2	1	-	3	-	-	-	-	-	-	-	-	3	-
CO5	2	2	1	-	3	-	-	-	-	-	-	-	-	3	-

22ITOE801	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To understand the importance of major decisions in supply chain management
- To present the vision of supply chain management and their role in enterprise competitiveness
- To appreciate the current trends in SCM

### UNIT-I

Supply Chain – Fundamentals – Evolution – Role in Economy – Importance-Decision Phases – Supplier– Manufacturer–Customer chain – Enablers/ Drivers of Supply Chain Performance – Supply chain strategy – Supply Chain Performance Measures.

### UNIT-II

Outsourcing – Make Vs buy – Identifying core processes – Market Vs Hierarchy – Make Vs buy continuum – Sourcing strategy: Portfolio Approach – Reconfiguration of the Supply Base – Impact of the internet on Sourcing Strategy.

### UNIT-III

Distribution Network Design – Role-Factors Influencing Distribution Network Design – Design Option for a Distribution Network – E-Business and the Distribution Network – Network Design in Supply Chain – Role-Factors Influencing Network Design Decisions – Framework for Network Design Decisions – Impact of uncertainty on Network Design.

### UNIT-IV

Demand Forecasting in a Supply Chain – The Role of Forecasting in a Supply Chain – Characteristics – Components – Risk Management in Forecasting – Managing Economies of

Scale in a Supply Chain – Role-Economies of Scale to Exploit Fixed Costs – Estimating Cycle Inventory– Managing supply chain cycle inventory – Uncertainty in the supply chain.

## UNIT–V

Supply Chain Integration – Building partnership and trust in SC Value of Information: Bullwhip Effect – Effective forecasting – Coordinating the supply chain – SC Restructuring – SC Mapping – SC process restructuring, Postpone the point of differentiation – IT in Supply Chain – Agile Supply Chains –Reverse Supply chain – Agro Supply Chains.

## TEXT BOOKS

1. Janat Shah, “Supply Chain Management – Text and Cases”, Pearson Education, 2009.
2. Sunil Chopra and Peter Meindl, “Supply Chain Management–Strategy Planning and Operation”, PHI Learning / Pearson Education, 2007.

## REFERENCES

1. Ballou Ronald H, “Business Logistics and Supply Chain Management”, Pearson Education, 5th Edition, 2007.
2. David Simchi–Levi, Philip Kaminsky, Edith Simchi–Levi, “Designing and Managing the Supply Chain: Concepts, Strategies, and Cases”, Tata McGraw–Hill, 2005.
3. Altekar Rahul V, “Supply Chain Management–Concept and Cases”, PHI, 2005.
4. Shapiro Jeremy F, “Modeling the Supply Chain”, Thomson Learning, Second Edition, 2006.
5. Joel D. Wisner, G. Keong Leong, Keah–Choon Tan, “Principles of Supply Chain Management– A Balanced Approach”, South–Western, Cengage Learning, 2008.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the role of supply chain economy and perform analysis on the drivers of supply chain performance.
2. Design supply chain strategies and measure its performance.
3. Identify core processes of SCM and investigate the impact of the internet on the SCM.
4. Forecast the demand in SCM and Conduct investigation to manage risks in forecasting.
5. Coordinate restructure and utilize modern it tools in supply chain.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	3	2	3	2	-	-	2	2	2	3	3	2	1
<b>CO2</b>	3	3	3	3	3	2	-	-	2	-	2	3	3	2	1
<b>CO3</b>	3	3	3	2	3	2	-	-	2	2	2	3	3	2	1
<b>CO4</b>	3	3	3	3	3	1	-	-	1	1	2	3	3	2	1
<b>CO5</b>	3	3	3	3	3	1	-	-	-	-	2	3	3	2	1

22ITOE801	KNOWLEDGE MANAGEMENT FOR E- LEARNING	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVES**

- To introduce the basic concepts of knowledge management.
- To explain the knowledge management system life cycle.
- To facilitate knowledge Discovery and representation.
- To illustrate about knowledge transfer and sharing

### **UNIT I**

Overview of KM – nature of knowledge – KM solutions – factors influencing KM – KM life cycle - technologies to manage knowledge : AI, digital libraries – case based systems – knowledge elicitation – discovering new knowledge- data mining – text KM-text mining fundamentals

### **UNIT II**

Knowledge discovery – systems that create knowledge – knowledge capture systems – concept maps – RSS – process modeling – Wikis – Delphi method – knowledge sharing systems – systems that organize and distribute knowledge – ontology development systems – categorization and classification tools – Bloom’s taxonomy – learning objects

### **UNIT III**

E-learning for small groups – E-learning pedagogy – e-content for E-learning – E-learning wave in higher education – Cognitive Learning – online e-learning – challenges – constraints – emergence of blended learning – roles of teacher – roles of learner – online interactivity, engagement and social presence - Communities of Learning/Inquiry – E-learning Alternatives - Mobile, Wireless, and Ubiquitous Learning

### **UNIT IV**

Knowledge representation – ontology – personalization of ontology for KM - knowledge presentation – concept maps – mind maps – other presentation mechanisms – Reasoning – fundamentals – types – reasoning for knowledge sharing – argumentation as knowledge sharing – discourse and argument interpretation

### **UNIT V**

Knowledge organization – principles – seven objects – ten faults – ten beauties – nature of preface – structure – techniques – knowledge evaluation

### **REFERENCES:**

1. Irma Becerra-Fernandez, Avelino Gonzalez, Rajiv Sabherwal (2004). Knowledge Management Challenges, Solutions, and Technologies (*edition with accompanying CD*). Prentice Hall. ISBN: 013-109931-0.
2. Curtis J. Bonk, Topical Seminar on The Web 2.0 and Participatory Learning, [http://php.indiana.edu/~cjbonk/Syllabus\\_R685\\_Fall\\_of\\_2007.htm](http://php.indiana.edu/~cjbonk/Syllabus_R685_Fall_of_2007.htm)

3. PavananthiMunivar, An English translation of the Nannul: designed for the use of university students by a Tamil graduate of the Madras University, Hobart Press, 47 pages, 1878
4. KamilZvelebil, Companion studies to the history of Tamil literature, Handbook of Oriental Studies, BRILL, 1992.

### COURSE OUTCOMES:

At the end of this course, the students will be able to

1. Understand about knowledge management system
2. Build knowledge management systems and architecture
3. Develop systems for capturing knowledge
4. Implement knowledge transfer and sharing in E-world
5. Understanding Knowledge organization and representation

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	-	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	3	-	3	2	-	-	-	-	-	-	-	-	-	3	-
CO4	3	2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-	3	-

22ITOE801	PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce the basics of software project management.
- To facilitate assessment analysis of projects.
- To illustrate about project scheduling.
- To enable the students to learn about managing software project contracts.
- To expose about organizational behavior.

### UNIT-I

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

### UNIT-II

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

### UNIT-III

Objectives – Project Schedule-Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on

Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

#### UNIT-IV

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value-Prioritizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

#### UNIT-V

Introduction – Understanding Behaviour – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

#### TEXT BOOKS

1. Bob Hughes, Mike Cotterell, Rajib Mall “Software Project Management”, Fifth Edition, Tata McGraw Hill, 2011.
2. Gopaldaswamy Ramesh, “Managing Global Software Projects”, Tata McGraw Hill, New Delhi, 2006.

#### REFERENCES

1. Pankaj Jalote, “Software Project Management in Practice”, Pearson Education, reprinted 2009.
2. Walker Royce, “Software Project Management”, Pearson Education, 2002.
3. Kelkar SA, “Software Project Management”, PHI Learning, New Delhi, 2013.

#### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the basic concepts and issues of software project management
2. Apply project assessment, cost benefit analysis, risk evaluation
3. Implement and schedule the software projects and create project plans
4. Develop framework for monitoring and managing projects
5. Manage people and groups by understanding behavior, providing leadership etc

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	3	3	3	-	-	-	-	-	-	-	-	3	3	-
CO3	3	3	3	3	-	-	-	-	-	-	-	3	-	3	-
CO4	2	2	2	2	-	-	-	-	-	-	-	3	-	3	-
CO5	-	-	-	-	-	2	-	2	3	3	-	-	-	-	3

<b>22ITOE801</b>	<b>PRODUCT DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To introduce the fundamentals of product design.
- To familiarize the students about how to identify customer needs and product specifications
- To train in product development and design.
- To guide the students in estimating product costs.
- To train in product quality control and reliability procedures.

### **UNIT-I**

Introduction: Significance of product design– challenges of product design– product design and development process–sequential engineering design method– the challenges of product development– Identifying opportunities evaluate and prioritize projects–allocation of resources.

### **UNIT-II**

Identifying customer needs and product Specifications: Competitor and customer – behavior analysis– understanding customer–involve customer in development and managing requirements–Interpret raw data in terms of customers need–organize needs in hierarchy – establish the relative importance of needs–Establish target specifications– setting final specifications .

### **UNIT-III**

Product Development: Detailed design– Analysis and modeling– Best practices for detailed design– Design analysis–Prototypes in Detailed Design–Test and Evaluation–Design review, prototyping–simulation and testing–manufacturing–strategies–planning and methodologies.

### **UNIT-IV**

Costs for product Development: Sources of funds for development cost – product costs– Estimating product costs– kinds of cost procedures– value Engineering– Cost reduction.

### **UNIT-V**

Quality Control and reliability: Quality control procedure-Inspection and test equipment–statistical quality control–manufacturing reliability– probability of tool reliability–reliability operations–developing a quality–control and reliability programme.

### **TEXT BOOKS**

1. Karl Ulrich, Steven Eppinger, “Product Design and Development”, Tata McGraw Hill, 6<sup>th</sup> Edition, 2015
2. Alex Milton, Paul Rodgers, “Product Design”, Laurence King Publishing, 2011

## REFERENCES

1. Niebel B.W and Draper A.B., “Product design and process Engineering”, McGraw Hill Book Company, New York, 1974.
2. Stephen C. Armstrong, “Engineering and product development management – the holistic Approach”, Cambridge University press, 2005.
3. Zaidi. A., “SPC Concepts–Methodologies and Tools”, Prentice Hall of India Pvt Ltd.,
4. Kevin Otto, “Product design”, Pearson Education Limited, 2007.

## COURSE OUTCOMES

At the end of the course, the students will be able to

1. Understand the various aspects of product design including significance, challenges, process methods
2. Analyze product specifications, competitor and customer behaviour analysis, setting final specifications
3. Develop knowledge about detail design prototyping simulation and testing
4. Analyze product cost, cost reduction, value Engineering
5. Implement quality control and reliability procedures

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	3	-	2	-	-	3	-	-	-	-	-	-	1	-
CO2	-	3	-	3	-	-	3	-	2	1	-	-	1	1	1
CO3	3	-	-	-	-	-	3	-	-	-	-	2	-	-	-
CO4	-	3	-	3	-	-	3	3	1	-	3	3	-	3	-
CO5	2	1	2	-	1	2	3	2	3	1	-	-	1	2	2

ITOE801	ORGANIZATIONAL BEHAVIOUR AND MANAGEMENT				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To introduce the students to the need and importance of organizational behaviour.
- To enable the students to understand individual behaviour, personality types and attitudes.
- To introduce the students about group behaviour and group decision making.
- To demonstrate about leadership, styles and power.
- To expose the students about organization culture, climate and development.



## **UNIT-I**

Organizational Behavior: Introduction – Definition, Need and Importance of Organizational Behavior – Nature and Scope-Framework of Organizational Behavior models. Management: Introduction – Meaning and Nature of management – Management Systems and Processes – Tasks and Responsibilities of a Professional Manager – Managerial skills.

## **UNIT-II**

Individual Behavior: Personality – Types – Factors influencing personality theories. Learning: Types of learners – The learning process – Learning Theories – Organizational Behavior Modification – Misbehavior: Types – Management Intervention – Emotions: Emotional Labor – Emotional Intelligence-Theories – Attitudes: Characteristics – Components – Formation – Measurement – Values – Perceptions: Importance-Factors influencing Perception – Interpersonal Perception – Impression Management – Motivation: Importance-Types – Effects on Work Behavior.

## **UNIT-III**

Group Behavior: Organization Structure-Formation – Groups in Organizations – Influence-Group Dynamics – Group Decision making Techniques – Team Building – Interpersonal Relations – Communication – Control – Conflict Management – Nature of Conflict – Types of Conflict.

## **UNIT-IV**

Leadership and Power: Leadership – Meaning – Importance Traits – Leadership Styles – Behavioral and Contingency Theories – Leaders vs. Managers – Sources of Power – Power Centers – Organization Politics.

## **UNIT-V**

Dynamics of Organizational Behavior: Organizational Culture and Climate-Factors affecting Organizational Climate – Importance - Job Satisfaction: Determinants – Measurements – Influence on Behavior – Organizational Change: Importance-Stability Vs. Change - Proactive vs. Reaction Change-the Change Process – Resistance to Change-Managing Change-Stress: Work Stressors – Prevention and Management of Stress – Balancing Work and Life. Organizational Development: Characterizes – Objectives – Developing Gender sensitive Workspace.

## **TEXT BOOKS**

1. Stephen P. Robbins, “Organizational Behavior”, Prentice Hall of India, Eleventh Edition, 2008.
2. Fred Luthans, “Organizational Behavior”, McGraw Hill, Eleventh Edition, 2001.

## **REFERENCES**

1. Udai Pareek, “Understanding Organizational Behavior”, Oxford Higher Education, Third Edition, 2011.
2. Mc Shane & von Glinov, “Organizational Behavior”, Tata McGraw Hill, Fourth Edition, 2007.

3. Nelson, Quick, Khandelwal, "ORGB – An Innovative Approach to Learning and Teaching", Cengage learning, Second Edition, 2012.
4. Jerald Greenberg, "Behavior in Organization", PHI Learning, Tenth Edition, 2011.

### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Understand the framework of organizational behaviour models
2. Identify the factors influencing personality theories learning process, emotions and attitudes.
3. Understand about team building and interpersonal skills
4. Develop leadership traits and styles
5. Develop job satisfaction, manage work stress, balancing work and life.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	2	3	3	2	2	-	2	-	-	-	-	3	3	1
<b>CO2</b>	3	3	3	3	2	2	-	1	-	-	-	-	3	3	1
<b>CO3</b>	3	3	3	3	1	-	-	-	2	1	-	-	3	3	1
<b>CO4</b>	3	3	3	3	3	-	1	-	2	3	3	-	3	3	2
<b>CO5</b>	3	3	3	3	3	-	1	-	2	2	3	1	3	3	3

<b>ITOE801</b>	<b>MOBILE APPLICATIONS DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution

### **UNIT I**

INTRODUCTION TO MOBILE APPLICATIONS - Web Vs mobile App – Cost of Development – Myths - Mobile Applications – Marketing -Mobile User Interface Design - Effective Use of Screen – Mobile Users – MobileInformation Design - Mobile Platforms - Tools of Mobile Interface Design

### **UNIT II**

ANDROID USER INTERFACE DESIGN - Android Architecture – Android SDK Tools - Application Components - Intents – Contentproviders - Broadcast receivers –

Services - User Interface Design - Views - View Groups –Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Notifications -Android Localization

### UNIT III

ANDROID DATA STORAGE - Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store – DataAccess and Storage - Shared Preferences - Storage External - Network Connection – SQLiteDatabases

### UNIT IV

ANDROID NATIVE CAPABILITIES - Camera – Audio - Sensors and Bluetooth - Playing audio/video - Media recording - Sensors -Listening to sensor readings – Bluetooth - Android Communications – GPS - Working withLocation Manager, Working with Google Maps extensions - Maps via intent - Map Activity -Location based Services - Location Updates - Location Providers - Selecting a LocationProvider - Finding Location

### UNIT V

IOS DESIGN - iPhone Craze – iOS Features – iOS Tools - iOS Project – Objective C Basics – Building iOS App– Actions and Outlets – Delegates - User Interface Elements – Accelerometer –LocationHandling - SQLite Database

### REFERENCES:

1. Jeff McWherter and Scott Gowell, “Professional Mobile Application Development”, Wrox, 2012.
2. Reto Meier, “Professional Android 4 Development”, John Wiley and Sons, 2012.
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6Development: Exploring the iOS SDK”, Apress, 2013.

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Describe the requirements for mobile applications
2. Design user interface for mobile applications
3. Store mobile data of android applications
4. Evaluate native capabilities of android applications
5. Design iOS applications with tools

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	1	3	2	2	3
CO2	3	3	2	-	-	-	-	-	-	-	1	3	2	2	3
CO3	3	2	2	-	-	-	-	-	-	-	1	3	2	2	3
CO4	2	2	2	-	-	-	-	-	-	-	1	3	2	2	3
CO5	2	2	2	-	-	-	-	-	-	-	1	3	2	2	3

## OPEN ELECTIVES – V

22ITOE802	ENTERPRISE RESOURCE PLANNING	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To know the basics of ERP and to understand the key implementation issues of ERP
- To know the business Modules of ERP
- To be aware of some popular products in the area of ERP
- To appreciate the current and future trends in ERP

#### Unit-I

ERP: Enterprise-An Overview – Basic ERP Concepts – Risks of ERP – Benefits of ERP – ERP and Related Technologies – Business Intelligence(BI) – Business Process Reengineering (BPR) – Data Warehousing – Data Mining – OLAP – SCM.

#### Unit-II

Implementation Challenges – Implementation Strategies – ERP Implementation Lifecycle-Implementation Methodologies – Vendors and Consultants – Contracts with Vendors – Consultants and Employees – Project Management and Monitoring – Post Implementation Activities.

#### Unit-III

Business Modules of an ERP Package-Finance, Manufacturing – Human Resources – Plant Maintenance-Materials Management – Quality Management – Marketing – Sales and Distribution.

#### Unit-IV

ERP Market Place and Market Place Dynamics – SAP AG – PeopleSoft – JD Edwards – Oracle Corporation – QAD Inc – QAD Analytics – QAD Open Technology – SSA Global – Lawson Software-Epicor – Intuitive-ERP UNIT s.

#### Unit-V

Turbo Charge the ERP System – Limitations of ERP Systems – Enterprise Application Integration (EAI) – ERP and E-Business – ERP, Internet and WWW – ERP and Total Quality Management – Future Directions and Trends in ERP.

### TEXT BOOKS

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2008.
2. Mary Sumner, “Enterprise Resource Planning”, Pearson Education, 2007.

### REFERENCES

1. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, USA, 2012.
2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI, New Delhi, 2003.
3. K.Ganesh, Sanjay Mohapatra, S.P.Anbu udayasankar, P.Sivakumar, “Enterprise Resource Planning: Fundamentals of Design and Implementation”, Springer, 2014.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Design and develop ERP implementation cycle.
2. Acquire awareness of core and extended modules of ERP.
3. Understand implementation challenges and strategies of ERP systems.
4. Design implementation strategies for ERP project and perform monitoring port implementation using appropriate methods and techniques.
5. Investigate the future directions and trends in ERP.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	3	-	-	-	-	-	-	-	-	-	3	-	-
CO2	3	1	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	3	-	-	2	-	-	-	-	-	-	-	-	2	-	-
CO4	1	-	3	2	-	-	-	-	-	-	-	-	-	3	-
CO5	-	2	-	3	-	-	-	-	-	-	-	-	2	-	-

22ITOE802	E- COMMERCE				L	T	P	C
					3	0	0	3

## COURSE OBJECTIVES

- To teach the components and applications of e-commerce infrastructure
- To impart knowledge on e-commerce and web
- To provide an understanding of the design and types of Electronic Payment Systems and EDI
- To explain the concepts of Internal Information Systems, Digital Library and Digital Documents
- To educate the students on On-Demand Education and Software Agents

## UNIT-I

E-Commerce Infrastructure: E-Commerce framework – Media Convergence-Anatomy of E-Commerce Applications – Consumer and Organization Applications – Market forces influencing the I-way – Components of the I-way – Network Access Equipment – Distribution Networks – Issues – Internet Terminology – NSFNET – Research and Education network – Internet Governance.

## UNIT-II

E-Commerce and Web: Architecture frame work for E- Commerce-WWW as the architecture-Hypertext publishing – Technology and Security on Web – Consumer Oriented Applications – Mercantile Process Model – Mercantile Models from the perspective of Consumer and merchants.

### **UNIT–III**

Electronic Payment Systems and EDI: Types of Electronic payment systems – Digital token based system – Smart cards – Credit card based system – Risk factors – Designing Electronic payment systems. EDI – EDI Applications in business – Legal, Security and Privacy issues – Standardization in EDI – EDI software implementation – EDI envelope-VANs – Internet based EDI.

### **UNIT–IV**

Inter organizational E-Commerce and Marketing: Internal Information Systems – Macro forces and Internal Commerce-Work–flow automation – Customization – SCM – Corporate Digital Library: Dimensions, Making a business case, Types of Digital Documents – Advertising on Internet – Charting the online marketing process – Market Research.

### **UNIT–V**

On–Demand Education and Software Agents: Computer based Education and Training – Technological Components – Digital Copyrights and E-Commerce-History of software agents – Characteristics and Properties of Agents – Technology behind the Agents – Telescript Agent Language-SafE-Tcl – Software Agents in action – SGML.

### **TEXT BOOKS**

1. Ravi Kalakota, Andrew B. Whinston, “Frontiers of Electronic Commerce”, Paperback – Addison–Wesley Publishing Company, 1996.
2. Kenneth C. Laudon, “E-Commerce: Business, Technology”, Society– 2016 Edition 10.

### **REFERENCES**

1. Dave Chaffey, “E-Business and E-Commerce Management: Strategy, Implementation and Practice”, 2013.
2. Tharam Dillon, Elizabeth Chang, “E-Commerce: Fundamentals and Applications”, Wiley publication 2007.
3. David Whiteley, “E-Commerce: Strategy, Technologies and Applications”, Tata McHill 2001.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Ability to identify the business relationships between the organizations and their customers
2. Identify and analyze the construction and working principles of E-Commerce.
3. Develop and implement the Electronic Payment Systems and EDI.
4. Implement the digital library and marketing of the internal organizations.
5. Understand the suitable Computer based Education and Training.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	-	-	-	-	-	-	2	-	3	-	-
CO2	3	2	2	1	-	-	-	-	-	-	1	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	1	-	1	-	-
CO4	3	1	2	1	-	-	-	-	-	-	1	-	1	-	-
CO5	3	2	2	1	-	-	-	-	-	-	1	-	1	-	-

22ITOE802	INFORMATION TECHNOLOGY ESSENTIALS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To design and develop web pages using HTML and CSS.
- To understand the general concepts of PHP scripting language and MySQL functionalities for the development of simple data-centric applications.
- To provide a basic knowledge of computer hardware and software.
- To familiarize with the basic taxonomy and terminology of computer networking and mobile communications.
- To understand various types of information systems and their complexities.

### UNIT I WEB AND SCRIPTING ESSENTIALS

Internet Basics – Browser Fundamentals – Authoring Tools – Introduction to HTML5 – HTML5 Tags – HTML5 Forms – Cascading Style Sheets (CSS3) Fundamentals – Need for Scripting Languages – Introduction to JavaScript/ Angular JS.

### UNIT II SERVER-SIDE ESSENTIALS (PHP)

Introduction to PHP – PHP Variables – Constants – Operators – Flow Control and Looping – Arrays – Strings – Functions – File Handling – Exception Handling – PHP and HTML – Database Management – Introduction to MySQL – MySQL Commands – MySQL Database Creation – Connecting MySQL and PHP – Querying MySQL Database with PHP – Session and Cookies.

### UNIT III HARDWARE ESSENTIALS

Motherboard – Networking Cards – Graphics Card – Processors – Hard Drive – USB Port – Monitor Ports – Servers – Types of Servers – Web Server – Database Server – Data Center and Cloud Servers – Server Management.

## **UNIT IV NETWORK ESSENTIALS**

Basics of Computer System – Data Transmission Fundamentals – Communication Medium – Fundamentals of Computer Networking – Types of Computer Networks – Network Topologies – Network Standards: OSI Model, TCP/IP Model – Network Protocols: TCP, UDP, IP – Network Components – Introduction to Mobile Communication – Generations of Cellular Networks – GSM.

## **UNIT V APPLICATION ESSENTIALS**

Creation of Simple Interactive Applications – Simple Database Applications – Introduction to Information Systems – Personal Information System – Information Retrieval System – Social Networking Applications.

## **TEXT BOOKS**

1. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites”, O'Reilly Media, Inc, 2014.
2. James Kurose and Keith Ross, “Computer Networking: A Top-Down Approach”, Seventh Edition, 2017.

## **REFERENCES**

1. Steven Holzner, “PHP: The Complete Reference”, Fifth Edition, Mc Graw Hill, 2017.
2. Niederst Robbins, Jennifer, “Learning Web Design: A Beginner's Guide to HTML, CSS, Javascript, and Web Graphics”, Fifth Edition, O'Reilly Media, 2018.
3. Laura Lemay, Rafe Colburn, Jennifer Kyrnin, “Mastering HTML, CSS & JavaScript Web Publishing”, BPB Publications, 2016.
4. Douglas E. Comer, “Computer Networks and Internets”, Sixth Edition, Prentice Hall, 2015.
5. Jochen Schiller, “Mobile Communications”, Pearson Education, 2012.
6. R. Kelly Rainer, Casey G. Cegielski, Brad Prince, “Introduction to Information Systems”, Fifth Edition, Wiley Publication, 2014.

## **COURSE OUTCOMES**

At the end of the course, the students will be able to

1. Create dynamic website/web based applications using HTML, PHP, and MYSQL database.
2. Design websites that meet specified needs and interests using basic elements to control layout and style.
3. Debug the programs by applying concepts and error handling techniques of HTML, JavaScript, PHP and MYSQL.
4. Understand the basic concepts of data communications and networking.
5. Describe the basic principles of mobile communication systems.



Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	-	-	1		-	-	2	-	-
CO2	3	2	2	1	-	1	-	-	-	1	-	1	-	2	-
CO3	3	2	2	1	-	1	-	-	-	1	-	1	-	-	2
CO4	3	2	2	-	-	1	-	-	1	1	-	1	-	2	-
CO5	3	-	2	-	-	1	-	-	1	1	-	2	-	-	3

22ITOE802	UNIX INTERNALS	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To learn about the design of the Unix operating system.
- To become familiar with the various data structures used learn the various low-level algorithms used in Unix.
- To understand the Unix file system and its system calls.
- To study about process management and scheduling in Unix.
- To learn about memory management and I/O systems.

### UNIT I OVERVIEW

General Overview of the System: History – System Structure – User Perspective – Operating System Services – Assumptions about Hardware – Introduction to the Kernel Architecture of the UNIX Operating System – Introduction to System Concept – The Buffer Cache – Buffer headers – Structure of the Buffer Pool – Scenarios for Retrieval of a Buffer– Reading and Writing Disk Blocks – Advantages and Disadvantages of the Buffer Cache.

### UNIT II FILE SUBSYSTEM

Internal Representation of Files: inodes – Structure of a Regular File – Directories – Conversion of a Path Name to an Inode – Super Block – Inode Assignment to a New File – Allocation of Disk Blocks.

### UNIT III SYSTEM CALLS FOR THE FILE SYSTEM

Open – Read – Write – File and Record Locking – Adjusting the Position of File I/O – lseek – Close – File Creation – Creation of Special Files – Changing Directory – Root – Owner – Mode – stat and fstat – Pipes – dup – Mounting And Unmounting File Systems – link – unlink.

### UNIT IV PROCESSES

Process States and Transitions – Layout of System Memory – The Context of a Process – Saving the Context of a Process – Manipulation of the Process Address Space – Process Control – Process Creation – Signals – Process Termination – Awaiting Process Termination

– Invoking other programs – User Id of a Process – Changing the Size of a Process – Shell – System Boot and the INIT Process – Process Scheduling.

## UNIT V MEMORY MANAGEMENT AND I/O

Memory Management Policies – Swapping – Demand Paging - The I/O Subsystem: Driver Interface – Disk Drivers – Terminal Drivers.

### TEXT BOOK

1. Maurice J. Bach, “The Design of the Unix Operating System”, Pearson Education, 1986.

### REFERENCES

1. B. Goodheart, J. Cox, “The Magic Garden Explained”, Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels, J. S. Quarterman., “The Design and Implementation of the 4.3 BSD Unix Operating System”, Addison Wesley, 1998.
3. Robert Love, “Linux Kernel Development”, Third Edition, Addison Wesley, 2010.

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Understand UNIX architecture, describe the component of operating system and Explain how they interact with computer hardware.
2. Gain a deeper understanding of system calls in Unix operating system.
3. Apply the concepts of operating systems design to practical problems.
4. Design and implement the subsystems of an operating system.
5. Critically analyze different data structures and algorithms used in the building of a kernel.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	2	-	-	-	-	-	-	-	-	3		-
CO3	3	2	2	3	2	-	-	-	-	-	-	-	3	3	-
CO4	3	3	2	1	2	-	-	-	-	-	-	-	3	2	-
CO5	3	3	2	1	-	-	-	-	-	-	-	-	3	2	-

<b>22ITOE802</b>	<b>COMPUTER FORENSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To provide an understanding of computer forensics fundamentals.
- To analyze various computer forensics technologies.
- To identify methods for data recovery.
- To apply the methods for preservation of digital evidence.
- To learn about the types of attacks and remedial actions in the context of systems, networks, images and videos.

### **UNIT I INCIDENT AND INCIDENT RESPONSE**

Introduction to Security Threats: Introduction – Computer Crimes – Computer Threats and Intrusions – Phishing – Identity Theft – Cyber Terrorism and Cyber War – Need for Security: Information Security – OS Security – Database Security – Software Development Security – Introduction to Incident – Incident Response Methodology – Steps – Activities in Initial Response Phase After Detection of an Incident.

### **UNIT II FILE STORAGE AND DATA RECOVERY**

File Systems – FAT, NTFS, NTFS Encrypting File System – Forensic Analysis of File Systems – Storage Fundamentals – Initial Response & Volatile Data Collection from Windows System – Initial Response & Volatile Data Collection from Unix system – Forensic Duplication – Tools – Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events – Networks.

### **UNIT III NETWORK AND EMAIL FORENSICS**

Network Evidence – Types of Network Monitoring – Setting Up a Network Monitoring System – Network Data Analysis – Email Clients – Email Tracing – Internet Fraud – Spam Investigations – Mobile Forensics – Subscriber Identity Module (SIM) Investigations – Wireless Device Investigations – PDA Investigations.

### **UNIT IV SYSTEM FORENSICS**

Data Analysis: Analysis Methodology – Investigating Live Systems (Windows & Mac OS) – Hacking: Investigating Hacker Tools – Ethical Issues – Cybercrime. Forensic and Investigative tools – Forensic Equipments for evidence collection – Post exploitation.

### **UNIT V IMAGE AND VIDEO FORENSICS**

Recognizing a Graphics File – Data Compression – Locating and Recovering Graphics Files – Identifying Unknown File Formats – Copyright Issues with Graphics – Fraud using image and video – Detection of Fraud in images and video.

### **TEXT BOOK**

1. Kevin Mandia, Jason T. Luttgens, Matthew Pepe, “Incident Response and Computer Forensics”, Tata McGraw-Hill, 2014.

### **REFERENCES**

1. Bill Nelson, Amelia Philips, Christopher Steuart, “Guide to Computer Forensics and Investigations”, Cengage Learning, 2018.
2. John R. Vacca, “Computer Forensics”, Firewall Media, 2009.

- Rafay Baloch, "Ethical Hacking and Penetration Testing Guide", Auerbach Publications, First Edition, 2014.

## COURSE OUTCOMES

At the end of the course, the students will be able to

- Recognize attacks on systems design a incident response methodology.
- Illustrate the methods for data recovery, evidence collection and data seizure.
- Understand network and email attacks and forensic investigation with tools.
- Use forensic tools and collect evidences of a computer crime.
- Analyze various image encryption/decryption, steganography and fraud in image.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	1	1	2	2
CO2	3	2	2	2	2	-	-	-	-	-	-	1	1	2	2
CO3	3	2	2	2	3	-	-	-	-	-	-	1	1	2	2
CO4	3	2	2	2	3	-	-	-	-	-	-	1	1	2	2
CO5	3	2	2	2	2	-	-	-	-	-	-	1	1	2	2

22ITOE802	USER INTERFACE DESIGN	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To Analyze and model requirements and constraints for the purpose of designing and implementing user interfaces for software applications
- To Design and implement a user interface based on modeling or requirements specification
- To Participate in a team to design and implement a user interface based on modeling or requirements specification.
- To understand the UI Functions and Interfaces .
- To design the user interface, menu creation and windows creation.

## UNIT I INTRODUCTION

Introduction – Importance of the user interface – Graphical user interface: Direct manipulation, Graphical system, Characteristics – Web user interface: Popularity, Characteristics, Principles.

## UNIT II UI DESIGN PROCESS

User interface design process: Obstacles, Usability, Human characteristics in design - Human consideration in design – Develop system menus and navigation schemes: Structures of menus, Functions of menus, Content of menus, Formatting, Phrasing the menu, Selecting menu choice, Navigating menus, Graphical menus.

### UNIT III WINDOWS

Window characteristics – Components – Presentation Styles – Types – Window managements – Organizing window functions – window operations – Web systems – Characteristics of Device-based controls Characteristics – Screen-based Controls: Operable Controls, Text Boxes, Selection Controls.

### UNIT IV MULTIMEDIA

Text for web pages – Effective feedback – Guidance and assistance – Internationalization – Accessibility – Icons – Multimedia – Colors.

### UNIT V WINDOWS LAYOUT

Organizing and Laying out screens – Test: Usability testing, scope of testing, Prototypes, Kinds of tests – Retest.

### TEXTBOOK

1. Wilbent. O. Galitz ,The Essential Guide to User Interface Design, John Wiley & Sons, 2001.

### REFERENCES

1. Ben Shneiderman, Design The User Interface, Pearson Education, 1998.
2. Alan Cooper, The Essential Of User Interface Design, Wiley – Dream Tech Ltd., 2002.
3. Ben Shneiderman, Designing for Effective Human/Computer Interaction, Pearson, 2010.
4. Jenifer Tidwell, Designing Interfaces, Second Edition, O'Reilly publishers, 2011.
5. Patrick Marchand, Graphics and GUIs with MATLAB, Chapman and Hall/CRC, 2002.

### COURSE OUTCOMES

At the end of the course, the students will be able to

1. Knowledge on development methodologies, evaluation techniques and user interface building tools
2. Explore a representative range of design guidelines
3. Gain experience in applying design guidelines to user interface design tasks.
4. Design functional user interface prototypes based on the design
5. Perform Usability testing of the UI

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO2	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO3	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO4	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1
CO5	3	2	2	-	1	-	-	-	-	-	-	1	2	1	1

22ITOE802	ENTREPRENEURSHIP AND STARTUPS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- Acquiring Entrepreneurial spirit and resourcefulness.
- Familiarization with various uses of human resource for earning dignified means of living.
- Understanding the concept and process of entrepreneurship - its contribution and role in the growth and development of individual and the nation.
- Acquiring entrepreneurial quality, competency, and motivation.
- Learning the process and skills of creation and management of entrepreneurial venture.

### UNIT- I Introduction to Entrepreneurship and Start – Ups

- Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- Types of Business Structures, Similarities/differences between entrepreneurs and managers.

### UNIT- II Business Ideas and their implementation

- Discovering ideas and visualizing the business
- Activity map
- Business Plan

### UNIT- III Idea to Start-up

- Market Analysis – Identifying the target market,
- Competition evaluation and Strategy Development,
- Marketing and accounting,
- Risk analysis

### UNIT- IV Management

- Company's Organization Structure, • Recruitment and management of talent.
- Financial organization and management

### UNIT- V Financing and Protection of Ideas

- Financing methods available for start-ups in India
- Communication of Ideas to potential investors – Investor Pitch
- Patenting and Licenses

**Exit strategies for entrepreneurs, bankruptcy, and succession and harvesting strategy.**

## TEXT BOOKS/REFERENCES

1. Steve Blank and Bob Dorf, "The Startup Owner's Manual: The Step-by-Step Guide for Building a Great Company", , , K & S Ranch, ISBN – 978-0984999392
2. The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses, Eric Ries, Penguin UK, ISBN – 978-0670921607

3. Demand: Creating What People Love Before They Know They Want It, Adrian J., Slywotzky with Karl Weber, Headline Book Publishing, ISBN – 978-0755388974
4. The Innovator’s Dilemma: The Revolutionary Book That Will Change the Way You Do Business, Clayton M. Christensen, Harvard Business, ISBN: 978-142219602

**Websites:**

1. <https://www.fundable.com/learn/resources/guides/startup>
2. <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporatestructure/>
3. <https://www.finder.com/small-business-finance-tips>
4. <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. To understand the dynamic role of entrepreneurship and start-ups.
2. To implement business ideas.
3. To develop strategic marketing planning.
4. To manage a start-up organisation.
5. To finance the business and to protect the ideas.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	2	-	-	-	-	-	-	-	-	-	-	-	-	3
<b>CO2</b>	-	-	3	-	-	-	-	-	2	3	3	-	-	-	3
<b>CO3</b>	3	-	-	-	-	-	-	-	2	3	2	-	-	-	3
<b>CO4</b>	3	-	-	-	-	-	-	-	3	3	2	-	-	-	3
<b>CO5</b>	-	-	-	-	-	-	-	-	3	2	3	-	-	-	3

<b>22ITOE802</b>	<b>AI FOR EVERY ONE</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES**

- To know about Machine learning basic concepts.
- To understand work flow in Data science.
- Survey of major AI application.
- Role of AI in the society.
- Case study

**UNIT I Introduction**

Machine Learning, What is data, The terminology of AI, What makes an AI company, What machine learning can and cannot do, Non-technical explanation of deep learning, basics of neural networks, Examples of AI, Application domains of AI.

## **UNIT II Building AI projects**

Workflow of a machine learning project, Workflow of a data science project, how to use data, How to choose an AI project, Working with an AI team, How to process and visualize data, Technical tools for AI teams, use of python in AI related projects.

## **UNIT III Building AI in Your Company**

Case study: Smart speaker, Case study: Self-driving car, Example roles of an AI team, AI pitfalls to avoid, Survey of major AI application areas

## **UNIT IV AI and Society**

A realistic view of AI, Discrimination / Bias, Adversarial attacks on AI, Adverse uses of AI, AI and developing economies, AI and jobs

## **UNIT V AI case studies related to a specific domain.**

### **TEXT BOOKS**

1. Stuart Russell, Peter Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, 2010
2. Kevin Warwick, “Artificial Intelligence: The Basics”, Routledge, 2011
3. Jeff Heaton, “Artificial Intelligence for Humans”, CreateSpace Independent Publishing, 2015

### **REFERENCES:**

1. <https://www.coursera.org/learn/ai-for-everyone#syllabus>
2. <https://www.edx.org/course/artificial-intelligence-for-everyone>

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Understand the basic concepts of AI and machine learning.
2. Understand the working of self-driving systems.
3. Understand how to build different AI projects.
4. Apply AI techniques to any application domain.
5. To know the overview of AI application.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>	<b>PSO3</b>
<b>CO1</b>	3	-	2	-	-	1	-	-	1	1	-	-	-	-	2
<b>CO2</b>	2	1	2	1	-	1	-	-	1	1	-	1	-	2	-
<b>CO3</b>	2	1	2	1	-	1	-	-	1	1	-	1	2	-	-
<b>CO4</b>	2	1	2	-	-	1	-	-	1	1	-	2	-	2	-
<b>CO5</b>	2	1	2	-	-	1	-	-	1	1	-	2	-	-	2



22ITOE802	ICT IN EDUCATION	L	T	P	C
		3	0	0	3

### **COURSE OBJECTIVES**

- To Understand the basics of Information and communication technology.
- To gain knowledge about applications of ICT for development.
- To learn how to develop a prototype for cloud security
- To be familiar with network software applications
- To know the AR-VR technology for development

### **UNIT I PHYSICAL NETWORK**

Basics of Computer network, Ethernet, Fiber Optics, switching - packet, circuit, routers, switches - managed, unmanaged.

### **UNIT II COMMUNICATION NETWORK**

Various Network Topology - Star, Ring, Mesh, etc, Concepts of LAN, WAN, MAN, IP addressing, Class A, Class B and Class C addresses, Subnet, Proxy, OSI layer, Basics of Layered Protocol, Firewall and its importance, Introduction and usage of GIS, RFID technology, Introduction to wireless networks and Mobile network.

### **UNIT III STORAGE AND SERVERS**

Primary and Secondary storage, Cloud technology, mail server, data server, Concept of Data centers

### **UNIT IV SOFTWARE AND APPLICATIONS**

What is Operating Systems, ERP, CRM, Service Architecture introduction — Concepts of SaaS, PaaS, IaaS.

#### **AR-VR Technology for Development**

Basics of Augmented Reality and Virtual Reality, AR in navigation, AR in SearchEngine, etc

### **UNIT V INTRODUCTION TO SMART INFRASTRUCTURE AND VIRTUALIZATION**

Types of Sensors - Moisture sensor - tilt sensor - smoke sensor - Temperature Sensor, Pressure Sensor, Level Sensor Fibre Optic Sensors etc., Basics of Internet of Things (IoT), Concept of Smart Home, Smart Meter, Smart Mobility, Smart Public Safety, Smart Sanitation, Smart Security and Surveillance.

Concepts of Virtual Machine, Hypervisor, Para-Virtualization, Hardware-level virtualization, Operating System level virtualization.

### **TEXT BOOKS**

1. William Stallings, "Data and Computer Communications", Pearson, 2014.
2. Erin Pangilinan, Steve Lukas & Vasanth Mohan, "Creating Augmented and Virtual Realities, First Edition, O'Reilly Media, 2019.
3. Michael J. McGrath and Cliodhna Ni Scanail, "Sensor Technologies Healthcare, Wellness and Environmental Applications", 2014.

### **REFERENCES**

1. Richard Heeks, "Information and Communication Technology for Development (ICT4D)", Routledge, 2018.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the basics of Information and communication technology.
2. Explore the applications of ICT for development.
3. Analyse and exploit the merits of ICT to establish more effective infrastructure.
4. Emerging trends and technologies of IoT, Augmented and Virtual reality for development.
5. To know about types of sensors and its application.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	-	2	-	-	1	-	-	1	-	-	-	2	-	-
CO2	3	2	2	1	-	1	-	-	-	1	-	1	-	2	-
CO3	3	2	2	1	-	1	-	-	-	1	-	1	-	-	2
CO4	3	2	2	-	-	1	-	-	1	1	-	1	-	2	-
CO5	3	-	2	-	-	1	-	-	1	1	-	2	-	-	3

22ITOE802	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- To understand the concepts IPR
- To understand Trademarks, Trade Secretes and GI of goods.
- To understand Copyrights, Patents and Industrial Designs.
- To learn about how to manage IP rights and legal aspects.
- To understand the concepts of Cyber laws in IPR.

### UNIT - I

**Introduction to Intellectual Property:** IPR - Definition - Types of IPR: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, IP as a factor in R&D; Few Case Studies WTO - Definition - Functions - Forms of IPR Protection.

### UNIT-II

**Trade Marks:** Purpose and function of trademarks, Acquisition of trade mark rights, transfer of rights, Selecting and evaluating trademark, registration of trademarks, claims.

**Trade Secrets:** Trade secret law, determination of trade secret status, liability for misappropriation of trade secrets, trade secret litigation. Geographical Indication of Goods: Basic aspects and need for the registration

### UNIT-III

**Copyrights:** Fundamentals of copyright law, originality of material, right of reproduction, right to perform the work publicly, copyright ownership issues, notice of copyright.

**Patents:** Foundation of patent law, patent searching process, Basic Criteria of Patentability

**Industrial Designs:** Kind of protection provided in Industrial design

#### UNIT-IV

**Managing IP Rights:** Acquiring IP Rights: letters of instruction, joint collaboration agreement.

**Protecting IP Rights:** nondisclosure agreement, cease and desist letter, settlement memorandum.

**Transferring IP Rights:** Assignment contract, license agreement, deed of assignment

#### UNIT-V

**Introduction to Cyber law:** Information Technology Act, cybercrime and e-commerce, data security, confidentiality, privacy, international aspects of computer and online crime.

#### REFERENCES

1. Bare Act, The Indian Patent Act 1970 and the Patent Rules, Universal Law Publishing Co. Pvt. Ltd., 2007.
2. Mittal D.P., Indian Patents Law. Taxmann Allied Services (p) Ltd., 1999.
3. Deborah E Bouchoux, Intellectual Property: Right: The Law of Trademarks, Copyrights, Patents and Trade Secrets, 2012.
4. Gerald R. Ferrera, Cyber law: Text and Cases, South-Western Cengage Learning, 2012.
5. N.K Acharya, Intellectual property rights, Scandinavian Languages Edition, 2021.
6. Kompal Bansal, Fundamentals of Intellectual Property for Engineers, BS Publications 2013.
7. P. Radhakrishna, Intellectual Property Rights: Text and Cases, Excel Books, 2008.

#### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Learner should be able to demonstrate understanding of basic concepts of IPR.
2. Able to differentiate between Trademarks, Trade secrets and GI of goods.
3. Able to understand Copyrights, Patents and Industrial Designs.
4. Able to manage and protect IP
5. Will gain Knowledge on Cyber law

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	-	-	-	2	-	-	2	2	-	-	2	-	-
CO2	2	-	-	-	-	2	-	-	2	3	-	-	2	-	-
CO3	2	-	-	-	-	3	-	3	2	2	-	-	2	-	-
CO4	2	-	-	-	-	2	-	3	2	3	-	-	2	-	-
CO5	2	-	-	-	-	2	-	3	2	3	-	-	2	-	-

## HONOURS ELECTIVES

22ITHESCN	INFORMATION SYSTEM AUDIT	L	T	P	C
		3	0	0	4

### COURSE OBJECTIVES

- To understand the models of system audit.
- To impart knowledge of security control and database access.
- Managing and evaluating the audit function.

Module:1 Overview of Information System

Auditing-Conducting an Information Systems Audit - Overview & steps in an Audit.

Module:2 The Management Control Framework-I

Introduction - Systems Development Management Controls - Approaches to Auditing Systems Development - Normative Models of the Systems Development Process - Evaluating the Major phases in the Systems Development Process

Module:3 The Management Control Framework-II

Security Management Controls - Operations management Controls - Quality assurance Management Controls.

Module:4 The Application Control Framework

Boundary Controls - Input Controls- Processing Controls - Database Controls - output Controls

Module:5 Evidence Collection

Audit Software - Code Review - Test Data and Code Comparison - Concurrent Auditing techniques – Interviews -Questionnaires - Control Flowcharts- Performance Management tools.

Module:6 Evidence Evaluation

Evaluating Asset Safeguarding and Data Integrity - Evaluating System Effectiveness - Evaluating System Efficiency.

Module:7 Information Systems Audit and Management

Managing the Information Systems Audit Function - Planning Function - Organizing Function - Staffing Function - Leading Function - Controlling Function - Some Features of Information Systems Auditing – Troubleshooting the Audit Service.

Module:8 Contemporary issues

### TEXT BOOK

1. CA. Manoj Agarwal, Information Systems Control and Audit, Fifth Edition, Bharat Law House, 2017

## REFERENCES

1. David L Cannon, Timothy S Beigmann, Brandy Pamplin, Certified Information System, Auditor study guide, Wiley Publications, 2011.
2. JamesA.Hall, Information Technology Auditing and Assurance, Fourth Edition, SouthWestern College Pub, 2015.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Elaborate the steps of audit in detail
2. Impart the knowledge of various approaches and models of system audit
3. Solve real life problems using security and quality assurance.
4. Analyse all the controls such as database and output.
5. Understand the concurrent auditing and performance management tools.
6. Comprehend data integrity and system efficiency.
7. Select and analyze features of information systems auditing and management.

22ITHESCN	DESIGN THINKING	L	T	P	C
		3	0	0	4

## COURSE OBJECTIVES

The objective of this Course is to provide the new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products which useful fora student in preparing for an engineering career.

### Unit 1: An Insight to Learning

Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting

### Unit 2: Remembering Memory

Understanding the Memory process, Problems in retention, Memory enhancement techniques

### Unit 3: Emotions: Experience & Expression

Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers

### Unit 4: Basics of Design Thinking

Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) –  
**Empathize, Define, Ideate, Prototype, Test**

### Unit 5: Being Ingenious & Fixing Problem

Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving

### Unit 6: Process of Product Design

Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, **Assignment – Engineering Product Design**

### **Unit 7: Prototyping & Testing**

What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, **Sample Example**, Test Group Marketing

### **Unit 8: Celebrating the Difference**

Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

### **Unit 9: Design Thinking & Customer Centricity**

Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design

### **Unit 10: Feedback, Re-Design & Re-Crete**

Feedback loop, Focus on User Experience, Address “ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – **“Solving Practical Engineering Problem through Innovative Product Design & Creative Solution”**”.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education
2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products
3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products
4. Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development
5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience

<b>22ITHESCN</b>	<b>PREDICTIVE ANALYTICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVE**

The students should be able to understand how to transform data and make it suitable for data driven predictive tasks. Understand how to compute basic statistics using real-world datasets of consumer activities, like product reviews.

#### **Module 1: Introduction**

Data Product, Data Product Examples in Enterprise, Developing a Data Product Strategy,

#### **Module 2: Reading Data in Python**

Reading CSV & JSON Files, Processing Structured Data in Python, Live-Coding: JSON, Extracting Simple Statistics from Datasets

#### **Data Processing in Python**

Data Filtering and Cleaning, Processing Text and Strings in Python, Processing Times and Dates in Python

### **Module 3: Python Libraries and Toolkits**

Matrix Processing and Numpy, Introduction to Data Visualization, Introduction to Matplotlib, urllib and BeautifulSoup

### **Module 4: Gradient Descent**

Classification in Python, Introduction to Training and Testing, Gradient Descent in Python, Gradient Descent in TensorFlow

### **Module 5: Diagnostics for Data**

Meaningful Predictive modelling, Regression Diagnostic, Over- and Under-Fitting, Classification

Diagnostics: Accuracy and Error, Classification Diagnostics: Precision and Recall. Codebase for Evaluation and Validation, Model Complexity and Regularization, Evaluating Classifiers for Ranking.

### **Laboratory/ Practicals:**

1. Hands on with data processing (dates, time, strings) in Python.
2. Hands on with different python libraries used for data visualization.
3. Hands on with TensorFlow for understand deep neural networks.
4. Hands on with regression diagnostic using python.
5. Hands on with classification diagnostic using python.

### **Text Books/Suggested References:**

1. <https://www.coursera.org/learn/basic-data-processing-visualization-python>
2. <https://www.coursera.org/learn/design-thinking-predictive-analytics-data-products>
3. <https://www.coursera.org/learn/meaningful-predictive-modeling>
4. Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst, Dean Abbott, 2014, Wiley.
5. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, Tom Fawcett, O'Reilly, 1st edition, 2013.

### **COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Apply Python to create interactive data visualizations to make meaningful predictions and build simple demo systems.
2. Apply simple regressions and classifications on datasets using machine learning libraries.
3. Understand the usage of different python libraries.

<b>22ITHESCN</b>	<b>HETEROGENEOUS COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand the development of parallel and massively parallel systems.
- To understand the challenges in heterogeneous processing systems.
- To Use shared programming models for parallel programs.
- To learn to program heterogeneous systems.
- To learn to provide effective parallel solutions for GPGPU architectures.

### **UNIT I PARALLEL COMPUTING BASICS**

Importance of Parallelism – Processes, Tasks and Threads – Modifications to von-Neumann model – ILP – TLP – Parallel Hardware – Flynn's Classification – Shared Memory and Distributed Memory Architectures – Cache Coherence – Parallel Software – Performance – Speedup and Scalability – Massive Parallelism – GPUs – GPGPUs.

### **UNIT II SHARED MEMORY PROGRAMMING WITH OPENMP**

OpenMP Program Structure – OpenMP Clauses and Directives – Scheduling Primitives – Synchronization Primitives – Performance Issues with Caches – Case Study – Tree Search.

### **UNIT III PROGRAMMING GPUS**

GPU Architectures – Data Parallelism – CUDA Basics – CUDA Program Structure – Threads, Blocks, Grids – Memory Handling.

### **UNIT IV PROGRAMMING WITH CUDA**

Parallel Patterns – Convolution – Prefix Sum – Sparse matrix – Vector Multiplication – Imaging Case Study.

### **UNIT V OTHER GPU PROGRAMMING PLATFORMS**

Introduction to OpenCL – OpenACC – C++AMP – Thrust – Programming Heterogeneous Clusters – CUDA and MPI.

### **TEXT BOOKS:**

1. Peter Pacheco, "Introduction to Parallel Programming", Morgan Kaufman, 2011.
2. David B. Kirk, Wen-meí W. Hwu, "Programming Massively Parallel Processors", Third Edition, Morgan Kaufman, 2016.

### **REFERENCES:**

1. Shane Cook, "CUDA Programming – A Developers Guide To Parallel Computing with GPUs", Morgan Kaufman, 2013.
2. B.R. Gaster, L. Howes, D.R. Kaeli, P. Mistry, D. Schaa, " Heterogeneous Computing with OpenCL 2.0", Morgan Kaufman, 2015.



## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Identify parallelism in an application.
2. Choose the right parallel processing paradigm for a given problem.
3. Write parallel programs using OpenMP.
4. Devise solutions for an application on a heterogeneous multi-core platform.
5. Program GPUs using CUDA / OpenCL.
6. Compare characteristics of and evaluate different GPU programming platforms.

<b>22ITHESCN</b>	<b>AGILE SOFTWARE DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## COURSE OBJECTIVES

- To understand the basic concepts of Agile software process.
- To gain knowledge in various agile methodologies.
- To develop agile software process.
- To learn the principles of agile testing.

## UNIT I INTRODUCTION

Software is new product development – Iterative development – Risk-Driven and ClientDriven iterative planning – Time boxed iterative development – During the iteration, No changes from external stakeholders – Evolutionary and adaptive development - Evolutionary requirements analysis – Early “Top Ten” high-level requirements and skilful analysis – Evolutionary and adaptive planning – Incremental delivery – Evolutionary delivery – The most common mistake – Specific iterative and Evolutionary methods.

## UNIT II AGILE PROCESSES

Agile development – Classification of methods – The agile manifesto and principles – Agile project management – Embrace communication and feedback – Simple practices and project tools – Empirical Vs defined and prescriptive process – Principle-based versus Rule-Based – Sustainable discipline: The human touch – Team as a complex adaptive system – Agile hype – Specific agile methods. The facts of change on software projects – Key motivations for iterative development – Meeting the requirements challenge iteratively – Problems with the waterfall.

## UNIT III AGILE METHODOLOGIES I

SCRUM and Extreme programming: Method overview, Lifecycle, Work products, Roles and Practices values, Common mistakes and misunderstandings – Sample projects – Process mixtures – Adoption strategies – Fact versus fantasy – Strengths versus “Other” history.

## UNIT IV AGILE METHODOLOGIES II

Crystal – Dynamic Systems Development method – Feature Driven Development– Lean Development–Unified Process – EVO – How to choose a process.

## UNIT V AGILE ROLES AND TESTING

Deep Dive in Scrum roles - Roles in other methodologies - Testing: Creating a quality focused culture, TDD- Refactored code: Refactoring example, Complex Test cases, Comparison of test cases, Manual, automated, Customer testing.

**TEXT BOOKS:**

1. Craig Larman Agile and Iterative Development – A Manager’s Guide Pearson Education – 2004. ([Unit 1,2,3,4])
2. Sondra Ashmore, Kristin Runyan, Introduction to Agile methods, Addison-Wesley. (Unit4, 5)

**REFERENCES:**

1. Alistair Agile Software Development series Cockburn - 2001.
2. [www.agileintro.wordpress.com/2008](http://www.agileintro.wordpress.com/2008).
3. Elisabeth Hendrickson, Agile Testing Quality Tree Software Inc 2008.
4. Jim Highsmith, Agile Project Management, Addison-Wesley Professional, 2004.

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Compare evolutionary, iterative and adaptive development
2. Explain agile software process.
3. Apply agile methodologies for software design.
4. Apply agile based testing.

<b>22ITHESCN</b>	<b>IoT BASED SMART SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COURSE OBJECTIVES:**

- To understand smart objects and IoT Architectures.
- To learn about various IoT related protocols.
- To build simple IoT systems using open hardware such as Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT.
- To build IoT based smart systems.

**UNIT I FUNDAMENTALS OF IoT**

Evolution of Internet of Things – Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT Models – Simplified IoT Architecture and Core IoT Functional Stack – Fog, Edge and Cloud in IoT – Functional Blocks of an IoT Ecosystem – Sensors, Actuators, and Smart Objects – Open Hardware Platforms for IoT.

**Suggested Activities:**

- Survey of different real world IoT applications.
- Assignments on operational principles of sensors and actuators.
- Mini project on building a smart system - Identify the sensors required for the system, connect sensors (such as temperature, pressure, light) to a suitable IoT hardware platform and take measurements.

**Suggested Evaluation Methods:**

- Evaluation of survey for breadth and depth - pair-wise comparison.
- Quiz on sensors and actuators.
- Demonstration of practical setup on connecting sensors.

## **UNIT II IoT PROTOCOLS - I**

IoT Access Technologies: Physical and MAC Layers, Topology and Security of IEEE 802.15.4, 1901.2a, 802.11ah and LoRaWAN – Network Layer: Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo.

### **Suggested Activities:**

- Assignment on access technologies (simulator could be used).
- Flipped classroom on 6LoWPAN.
- Mini project on building a smart system - Choose appropriate access technology and connect the hardware to the Internet.

### **Suggested Evaluation Methods:**

- Quiz on access technologies.
- Quiz on 6LoWPAN.
- Demonstration of practical setup on connecting to the Internet.

## **UNIT III IoT PROTOCOLS - II**

Routing over Low Power and Lossy Networks (RPL) – Application Transport Methods: Application Layer Not Present, Supervisory Control and Data Acquisition (SCADA) – Application Layer Protocols: CoAP and MQTT – Service discovery – mDNS.

### **Suggested Activities:**

- Assignment on RPL (simulator could be used).
- Mini project on building a smart system - Choose appropriate application protocol and connect to the cloud using available open platforms (such as IBM Bluemix).

### **Suggested Evaluation Methods:**

- Quiz on RPL for different topologies.
- Demonstration of practical setup on connecting to the cloud.

## **UNIT IV CLOUD, FOG AND DATA ANALYTICS FRAMEWORKS**

Cloud and Fog Topologies – Cloud Services Model – Fog Computing – Structured versus Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Security in IoT – CISCO IoT System – IBM Watson IoT Platform.

### **Suggested Activities:**

- Use a simulator such as FogSim to study the characteristics of fog computing.
- Mini project on building a smart system - Choose appropriate analytics mechanisms to analyze the data collected, and build the application.

### **Suggested Evaluation Methods:**

- Quiz on fog characteristics.
- Demonstration of application with analytics.

## **UNIT V APPLICATIONS**

Smart and Connected Cities: Street Layer, City Layer, Data Center Layer and Services Layer, Street Lighting, Smart Parking Architecture and Smart Traffic Control – Smart Transportation – Connected Cars.

**Suggested Activities:**

- Design the architecture and use cases for various smart systems (eg., agriculture, home automation, smart campus, smart hostel).
- Mini project on building a smart system - Enhance the system with additional smart features.

**Suggested Evaluation Methods:**

- Report and presentation of architecture solutions.
- Demonstration of complete smart system.

**TEXTBOOK:**

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, CISCO Press, 2017.

**REFERENCES:**

1. Perry Lea, “Internet of things for architects”, Packt, 2018.
2. Jan Höller, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle, “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Elsevier, 2014.
3. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key Applications and Protocols”, Wiley, 2012.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011.
5. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015
6. <https://www.arduino.cc/>
7. [https://www.ibm.com/smarterplanet/us/en/?ca=v\\_smarterplanet](https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet)

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Explain the concept and architecture of IoT.
2. Choose the right sensors and actuators for an application.
3. Analyze various protocols for IoT.
4. Apply data analytics and use cloud/fog offerings related to IoT.
5. Analyze applications of IoT in real time scenario.
6. Design an IoT based smart system using open hardware platforms and open cloud offerings.

## MINOR ENGINEERING ELECTIVES

22ITMISCN	INTRODUCTION TO INFORMATION TECHNOLOGY	L	T	P	C
		3	0	0	3

### COURSE OBJECTIVES

- To introduce the fundamentals of computer programming languages, Operating system, database terminology.
- To introduce the basics of information technology, its role and present scenario and basics of multimedia.
- To introduce network concepts, internet tools and search engines.
- To elaborate on future trends of information technology.

### Unit-I

Classification of computers, computer architecture and Memory. Computer Basics- Introduction, Evolution of Computers, Generations of Computers, Classification of Computers, The Computer system, Applications of Computers. Computer organization and Architecture - Introduction, Central Processing Unit, Types of Number Systems. Computer Memory and Storage - Introduction, Memory Hierarchy. Input Output Media - Introduction.

### Unit-II

The generations of programming languages, operating system and Database basics. Computer Programming and Languages - Introduction, Algorithm, Programming Paradigms, characteristics of a good program, programming Languages, generations of programming Languages, Features of a Good Programming Language. Operating System - Introduction, Operating System Definition, Evolution of Operating System, Types of Operating Systems. Database Fundamentals - Introduction, database definition.

### Unit-III

The Information Technology and Multimedia Basics. Information Technology Basics - Introduction, Information, Technology, Information Technology, Present scenario, Role of Information Technology, Information Technology and the Internet. Multimedia: Introduction, Multimedia - definition, Multimedia Applications.

### Unit-IV

The Basics of Networks, Internet and Internet Tools. Computer Networks - Computer Network, Network Topologies, Network Devices. Internet - Introduction, Evolution of Internet, Basic Internet Terms, and Getting connected to the Internet, Internet Applications. Internet Tools - Introduction, Web Browser, Browsing Internet using Internet Explorer, E-mail Address Structure, Search engines.

### Unit-V

Know the Future Trends in IT. Current and Future Trends in IT - Introduction, Electronic commerce, Electronic data interchange, Smart card, internet protocol television, Blogging, Radio frequency identification, Imminent Technologies.

### TEXT BOOKS

1. "Introduction to Information Technology", IITL Education solutions limited, PEARSON.

### REFERENCES

1. Alexis Leon, Mathews Leon, "Fundamentals of Information Technology", Second edition, (Leon VIKAS)

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Identify system components and utilize computer hardware.
2. Describe basics of programming, components of a database and operating system.
3. Understand the strategic importance of information technology.
4. Understand the fundamental terminology of data communication and internet tools.
5. Recognize the applications of IT in various sectors and future trends.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	2	-	2	-	-	1	-	-	-	-	3	-
CO2	3	1	-	2	-	1	3	-	-	-	-	-	-	3	-
CO3	3	-	3	2	1	-	2	-	1	-	-	-	3	-	-
CO4	-	2	2	1	1	1	-	-	-	-	-	-	1	-	-
CO5	3	1	-	3	-	1	-	1	-	-	-	-	-	-	2

22ITMISCN	FUNDAMENTALS OF OBJECT ORIENTED PROGRAMMING				L	T	P	C
					3	0	0	3

### COURSE OBJECTIVES

- To introduce the object oriented concepts.
- To learn object oriented programming using C++.
- To understand the challenges in developing object oriented programming.

### Unit-I

Introduction: Evolution of programming methodologies-Disadvantages of conventional programming-programming paradigms.

Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation – inheritance – abstract classes – polymorphism.

### Unit-II

C++ Program Elements: -Limitations of C – Introduction to C++ – Structure of the C++ program – Tokens- Expressions- Data types- variables- dynamic initialization- scope and life time of variables

Control structures: Decision making statements – jump statement – switch case statement – looping statements.

### Unit-III

Functions:- Passing arguments – LValues and RValues – return by reference –default arguments – Inline functions – function overloading– const and volatile functions – static Members data hiding or encapsulation.

Classes and objects: Defining member functions function and data members – objects and memory – static object – array of objects – objects as function arguments, friend functions, member functions and non-member functions – overloading member functions.

## Unit-IV

Constructors & Destructor – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors.

Overloading Functions: Overloading unary operators — overloading binary operators – overloading with friend functions.

Inheritance: Introduction – public, private, and protected derivations-Types of Inheritance

## Unit-V

Polymorphism and Virtual Functions: Binding in C++ –Virtual functions- Runtime polymorphism –pure virtual functions –Abstract classes – Virtual functions in derived classes – constructors and virtual functions – virtual destructors – destructors and virtual functions.

Exception Handling: Fundamentals of Exception Handling – Using Multiple catch statements – Catching All Exception – Rethrowing Exception – Specifying Exception - controlling uncaught Exceptions.

## TEXT BOOKS

1. Ashok N.Kamthane, “Object Oriented Programming with ANSI and Turbo C++”, Pearson Edition
2. Deitel & Deitel, “C++ How to program”, Prentice Hall, Eighth Edition, 2011.

## REFERENCES

1. Eric Nagler, “Learning C++ A Hands on Approach”, Jaiho publishing house.
2. E Balagurusamy, “Object Oriented Programming with C++”, Tata McGraw Hill, 2nd Edition.
3. Sotter A Nicholas and Kleper J Scott, “Professional C++”, Wiley Publishing Inc.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Analyze and design a problem using an object-oriented approach.
2. Implement the problem using C++ programming Language.
3. Understand the concepts of Features of object oriented programming.
4. Learn the programming details of object oriented programming.
5. Develop C++ programs for various real time applications.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	1	-	-	-	-	-	2	-	3	-	-
CO2	2	1	2	1	1	1	-	-	1	-	1	-	2	-	-
CO3	3	2	1	1	-	-	-	-	-	-	1	-	2	-	-
CO4	3	2	2	-	-	-	-	-	-	-	1	-	2	-	-
CO5	2	1	2	1	1	-	-	-	1	-	1	-	1	-	-

<b>22ITMISCN</b>	<b>DATA COMMUNICATION AND COMPUTER NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **COURSE OBJECTIVES**

- Build an understanding of the fundamental concepts of computer networking.
- Familiarize the student with the basic taxonomy and terminology of the computer networking area.
- Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.
- Gets the idea of choosing the required functionality at each layer for a given application and trace the flow of information from one node to another node in the network.
- Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

#### **Unit-I**

Introduction: Introduction to Networks and Communication Media: History of Computer Networking and the Internet-Need for Networking- Uses – Network Hardware-Network Software – Reference Models – Example Networks – Network Standardization.

Basis for data communication - Transmission media – Wireless Transmission – Telephone Systems – Satellite Communication.

#### **Unit-II**

Data link layer: Layer Services– Framing - Error correction and detection – Link Level Flow Control – Medium Access – Ethernet – Token Ring –FDDI – Wireless LAN – Bridges and Switches.

#### **Unit-III**

Network layer : Network Layer design issues – Circuit Switching - Packet Switching Virtual Circuit Switching – IP – ARP – DHCP – ICMP – Routing –RIP – OSPF – Sub netting – CIDR – Inter domain Routing – BGP – IPV6 Basic Features Routing algorithms – Congestion- Control algorithms.

#### **Unit-IV**

Transport Layer: Transport Layer Services – Multiplexing and Demultiplexing – Internet Transport Protocols- UDP – Reliable Data Transfer –Connection-Oriented Transport: TCP – TCP Structure.

#### **Unit-V**

Application Layer: DNS – Name space – Resource records – name servers – e-mail - Message Formats - Message Transfer - Final Delivery – WWW - Static Web Pages - Dynamic Web Pages and Web Applications - HTTP – Network Security-Basic Cryptography - DES - RSA.

### **TEXT BOOKS**

1. Andrews S. Tanenbaum, “Computer Networks”, Prentice Hall of India Private Limited, (4th Edition), 2003.



- Larry L. Peterson and Bruce S. Davie, "Computer Networks: A Systems Approach", Elsevier, Fourth edition, 2007.

## REFERENCES

- Leon Garcia and Widjaja, Communication Networks - Fundamental concepts and key architecture, Tata McGraw Hill, 2001.
- William Stallings, Data and Computer Communication, Sixth Edition, Pearson Education, 2000.
- Behrouz A. Forouzan, Data communication and Networking, Tata McGraw-Hill, 2004.

## COURSE OUTCOMES

At the end of this course, the students will be able to

- Understand and explain the concept of Data Communication and networks, layered architecture and their applications.
- Evaluate data communication link considering elementary concepts of data link layer protocols for error detection and correction.
- Apply various network layer techniques for designing subnets and analyse packet flow on basis of routing protocols.
- Understand the transport layer and application layer operation.
- Understand and design application layer protocols and internet applications such as network security, Email and DNS.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	1	2	2	2	2	1	2	1	2	1
CO2	3	2	1	1	1	1	2	2	1	2	2	2	1	2	1
CO3	3	2	2	1	2	1	2	2	2	2	2	2	1	2	1
CO4	3	2	2	2	2	1	2	2	2	2	2	2	1	2	1
CO5	3	2	1	1	2	1	2	2	2	2	1	2	1	1	-

22ITMISCN	BASICS OF COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

## COURSE OBJECTIVES

- The purpose of this subject is to introduce the concepts and techniques used in Computer Graphics, Animations & Multimedia.
- The students should have general idea about input/output devices and computing fundamentals.
- In addition, a familiarity with general mathematical transformations is required.

- This subject will give idea about various algorithms of drawing and filling primitive shapes. It also delivers the inside knowledge about 2D/3D transformations, clipping, viewing.

### Unit-I

Pixel, frame, buffer, application of computer graphics, Raster Graphics fundamentals. Display Devices– Random Scan, Raster Scan Monitors, Color CRT Monitor, DVST and Plasma Panel.

### Unit-II

Graphics Primitives: Algorithms for line Generation, circle generation, Polygon generation and polygon filling algorithm, Anti-aliasing. 2D Transformation: Translation, Scaling, Rotation, Reflection, Homogeneous Coordinates.

### Unit-III

3-D Transformation: Translation, Scaling, Rotation, windowing & clipping windows, view port, line clipping, polygon clipping, windows & view port transformation. Display file, Segment table, Segment creation, deletion, rename.

### Unit-IV

Multimedia: Text – Font, Faces, animating Text, Hyper Text. Sound: MIDI, Digital audio basics, auto file formats, audio editing, MCI–Multimedia Control Interface. Image – Bitmap, Vector drawing, color palate, concept of 3D Modeling, Image file formats (BMP, JPG). Animation: principle of animation, cell animation, kinematics, Morphing.

### Unit-V

Video – Broadcast video standards (NTSC, PAL), Integrating computer and Television, video capture board, video, color, shooting and editing video, video hardware resolution, video compression (JPEG, MPEG). Hard copy devices: Printers & plotters, Input devices: mouse, Trackball, Light pen, Scanner, Digital Camera.

### TEXT BOOKS

1. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill
2. Donald Hearn and M.P. Becker, "Computer Graphics", Pearson Pub.
3. Parekh, "Principles of Multimedia", Tata McGraw Hill

### REFERENCES

1. Maurya, "Computer Graphics with Virtual Reality System", Wiley India
2. Pakhira, "Computer Graphics, Multimedia & Animation", PHI learning
3. Andleigh, Thakral, "Multimedia System Design", PHI Learning

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Identify system components and utilize computer hardware.
2. Describe basics of programming, components of a database and operating system.
3. Understand the strategic importance of information technology.
4. Know the fundamental terminology of data communication and internet tools.
5. Recognize the applications of IT in various sectors and future trends.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	1	2	2	2	2	1	2	1	2	1
CO2	3	2	1	1	1	1	2	2	1	2	2	2	1	2	1
CO3	3	2	2	1	2	1	2	2	2	2	2	2	1	2	1
CO4	3	2	2	2	2	1	2	2	2	2	2	2	1	2	1
CO5	3	2	1	1	2	1	2	2	2	2	1	2	1	1	2

<b>22ITMISCN</b>	<b>INFORMATION SECURITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **COURSE OBJECTIVES**

- To understand various information security concerns and vulnerabilities
- To learn protection and Authentication mechanisms
- To understand the issues in database security
- To familiarize with different threats and protection methods in networks
- To analyze and manage security risks in a network

#### **Unit-I**

Introduction: Security-Threats-Harm-Attacks-Computer criminals-Method of defence  
 Program Security: Secure programs-Non-malicious program errors-Viruses and other malicious code-Targeted malicious code- Controls against program threats

#### **Unit-II**

Operating System Security: Protected objects and methods of protection-Memory address protection-Control of access to general objects-File protection mechanism-  
 Authentication: Authentication basics- Password-Challenge-response-Biometrics

#### **Unit-III**

Database Security: Security requirements-Reliability and integrity-Sensitive data-  
 Interface- Multilevel database-Proposals for multilevel security

#### **Unit-IV**

Security in Networks: Threats in networks- Network security control-Firewalls-Intrusion detection systems- Secure e-mail-Networks and cryptography-Example protocols: PEM-SSL-Ipsec.

#### **Unit-V**

Management and Incidents: Security planning- Risk analysis-Organizational security policies-Physical security -Legal-Privacy-Ethical Issues in Computer Security -Protecting programs and data- Information and law-Rights of employees and employers- Software failures-Computer crime-Privacy-Ethical issues in computer society-Case studies of ethics.

### **TEXT BOOKS**

1. C. P. Pfleeger, and S. L. Pfleeger, "Security in Computing", Pearson Education, 5<sup>th</sup> Edition, 2015.
2. Matt Bishop, "Computer Security: Art and Science", Pearson Education, 2005

### **REFERENCES**

1. Stallings, "Cryptography And Network Security: Principles and practice", 5<sup>th</sup> Edition, 2011.
2. Kaufman, Perlman, Speciner, "Network Security", Prentice Hall, 3<sup>rd</sup> Edition, 2005.
3. Eric Maiwald, "Network Security : A Beginner's Guide", TMH, 1999.
4. Macro Pistoia, "Java Network Security", Pearson Education, 2nd Edition, 1999.
5. Whitman, Mattord, "Principles of information security", Thomson, 2nd Edition, 2005

### **COURSE OUTCOMES:**

At the end of this course, the students will be able to

1. Identify the security concerns and vulnerabilities
2. Provide protection to different types of system security attacks
3. Design and protect databases from Security issues
4. Handle security threats in a network
5. Assess and manage the security risks in an organisation

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1	-	2	-	-	-	-	1	1	1	3	1	1
CO2	3	2	2	1	3	1	-	-	-	1	2	1	3	2	1
CO3	3	3	2	1	3	1	-	-	3	1	2	1	3	2	1
CO4	3	3	2	1	3	1	-	-	3	3	2	1	3	3	1
CO5	1	3	-	-	3	1	-	1	3	3	3	1	2	3	3

22ITMISCN	FUNDAMENTALS OF DATA MINING	L	T	P	C
		3	0	0	4

### COURSE OBJECTIVES

- Students will be enabled to understand and implement classical models and algorithms in data warehousing and data mining.
- They will learn how to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
- They will further be able to assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.
- Learn and know the concepts of mining, Classification, prediction and Association rule mining and its application in Data Mining.
- Acquire the knowledge of Cluster Analysis and its applications in Data Mining.

### Unit-I

Introduction: Why Data Mining? What Is Data Mining? What Kinds of Data Can Be Mined? What Kinds of Patterns Can Be Mined? Which Technologies Are Used? Which Kinds of Applications Are Targeted? Major Issues in Data Mining. Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity and Dissimilarity

### Unit-II

Data Pre-processing: Data Preprocessing: An Overview, Data Cleaning, Data Integration, Data Reduction, Data Transformation and Data Discretization

### Unit-III

Classification: Basic Concepts, General Approach to solving a classification problem, Decision Tree Induction: Working of Decision Tree, building a decision tree, methods for expressing an attribute test conditions, measures for selecting the best split, Algorithm for decision tree induction. Alternative Techniques, Bayes' Theorem, Naïve Bayesian Classification, Bayesian Belief Networks

#### Unit-IV

Association Analysis: Basic Concepts and Algorithms: Problem Defecation, Frequent Item Set generation, Rule generation, compact representation of frequent item sets, FP-Growth Algorithm. (Tan & Vipin)

#### Unit-V

Cluster Analysis: Basic Concepts and Algorithms: Overview: What Is Cluster Analysis? Different Types of Clustering, Different Types of Clusters; K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, Strengths and Weaknesses; Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm DBSCAN: Traditional Density Center-Based Approach, DBSCAN Algorithm, Strengths and Weaknesses. (Tan & Vipin)

#### TEXT BOOKS

1. Pang-Ning Tan & Michael Steinbach, Vipin Kumar, "Introduction to Data Mining", Pearson.
2. Jiawei Han, Michel Kamber, "Data Mining concepts and Techniques", 3<sup>rd</sup> Edition, Elsevier.

#### REFERENCES

1. Hongbo Du, "The Data Mining Techniques and Applications: An Introduction", Cengage Learning.
2. Vikram Pudi and P. Radha Krishna, "Data Mining", Oxford.
3. Mohammed J. Zaki, Wagner Meira, "Data Mining and Analysis – Fundamental Concepts and Algorithms", Oxford
4. Alex Berson, Stephen Smith, "Data Warehousing Data Mining & OLAP", TMH.

#### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Understand the basics of Data Mining.
2. Know the need and importance of preprocessing techniques.
3. Realize the need and importance of Similarity and dissimilarity techniques.
4. Analyze and evaluate the performance of algorithms for Association Rules.
5. Explore Classification and Clustering algorithms.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	2	2	1	1	2	2	2	1	1	3	2	3
CO2	3	3	2	2	2	1	-	2	2	2	2	1	3	3	2
CO3	3	2	2	2	2	1	1	2	1	2	1	1	3	2	3
CO4	3	3	2	2	2	1	1	2	2	2	1	2	3	2	2
CO5	3	3	2	2	1	1	-	2	2	2	2	2	3	3	2

## ONE CREDIT COURSES

22ITOCSCN	OFFICE AUTOMATION TOOLS LAB	L	T	P	C
		0	1	0	1

### COURSE OBJECTIVES

- To be proficient in important Microsoft Office tools: MS WORD, EXCEL, POWERPOINT.
- To be proficient in using MS WORD to create quality technical documents, by using standard templates, widely acceptable styles and formats, variety of features to enhance the presentability and overall utility value of content.
- To be proficient in using MS EXCEL for all data manipulation tasks including the common statistical, logical, mathematical etc., operations, conversion, analytics, search and explore, visualize, interlink, and utilizing many more critical features offered
- To be able to create and share quality presentations by using the features of MS PowerPoint, including: organization of content, presentability, aesthetics, using media elements and enhance the overall quality of presentations.

### LIST OF EXPERIMENTS

#### MS WORD

1. Create and format a document
2. Working with tables
3. Working with Bullets and Lists
4. Working with styles, shapes, smart art, charts
5. Inserting objects, charts and importing objects from other office tools
6. Creating and Using document templates
7. Inserting equations, symbols and special characters
8. Working with Table of contents and References, citations
9. Insert and review comments
10. Create bookmarks, hyperlinks, endnotes footnote
11. Viewing document in different modes
12. Working with document protection and security
13. Inspect document for accessibility
14. Mail merge

#### MS EXCEL

1. Create worksheets, insert and format data
2. Work with different types of data: text, currency, date, numeric etc.
3. Split, validate, consolidate, Convert data
4. Sort and filter data
5. Perform calculations and use functions: (Statistical, Logical, Mathematical, date, Time etc.,)
6. Work with Lookup and reference formulae
7. Create and Work with different types of charts
8. Use pivot tables to summarize and analyse data
9. Perform data analysis using own formulae and functions
10. Combine data from multiple worksheets using own formulae and built-in functions to generate results
11. Export data and sheets to other file formats
12. Working with macros

### 13. Protecting data and Securing the workbook

#### MS POWERPOINT

1. Select slide templates, layout and themes
2. Formatting slide content and using bullets and numbering
3. Insert and format images, smart art, tables, charts
4. Using Slide master, notes and handout master
5. Working with animation and transitions
6. Organize and Group slides
7. Import or create and use media objects: audio, video, animation
8. Perform slideshow recording and Record narration and create presentable videos

#### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements
2. Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding
3. Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	2	-	2	-	-	-	-	-	-	3	-	-
CO2	3	3	2	1	-	-	1	-	-	-	-	-	3	-	-
CO3	2	3	2	2	1	-	-	-	-	-	-	-	-	-	2

22ITOCSCN	SOCIALLY RELEVANT PROJECT LAB	L	T	P	C
		0	1	0	1

#### COURSE OBJECTIVES

- To identify socially relevant problems.
- To design solutions for socially relevant problems.
- To develop projects based on software design process.
- To implement solutions for societal valued projects using relevant state of the art technologies.
- To test the implemented project based on user needs and usefulness.

Students are expected to take up problems that would directly benefit the society and design and implement an IT based solution for the problem, based on the courses undertaken up to that semester. The domains of the problems may reach out to sectors like but not limited to Energy, Education, Material, Environment, Telecommunications, Defense, Healthcare, Entertainment and Agriculture. The societal value of the project is to be evaluated based on the need of the hour and request from stakeholders. The evaluation of the project would be based on the usefulness of the problem statement, formulation of the problem, stakeholders need, and the usage statistics of the solution and the technical merit of the solution.

The project design, development and testing phases can be as shown below:

**REQUIREMENTS ENGINEERING PHASE:**

- Problem identification.
- Feasibility study of domain.
- Requirement elicitation and analysis.

**DESIGN PHASE:**

- Architectural design.
- UI design.
- Component Design.
- Database design.

**IMPLEMENTATION PHASE:**

- Coding in a suitable language using necessary platforms and tools.

**TESTING AND VALIDATION PHASE:**

- Component Testing
- System Testing
- Acceptance Testing

**REFERENCES:**

- 1. <https://www.niti.gov.in/>.
- 2. <https://www.sih.gov.in/>.

**COURSE OUTCOMES**

At the end of this course, the students will be able to

1. Analyze social problems and provide technical solutions.
2. Design, develop and implement solutions for social problems.
3. Design, develop and implement standard solutions to social problems applying Software engineering methodologies.

<b>Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)</b>															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	3	1	2	-	-	-	-	-	-	-	-	-	-	-
<b>CO2</b>	3	-	2	1	-	-	-	-	-	-	-	-	-	-	-
<b>CO3</b>	2	3	2	2	1	-	-	-	-	-	-	-	-	-	-

<b>22ITOCSCN</b>	<b>PROFESSIONAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>

**COURSE OBJECTIVES**

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.



## UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills— Grooming as a professional with values—Time Management—General awareness of Current Affairs

## UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

## UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- activities to improve GD skills

## UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

## UNIT V

Recognizing differences between groups and teams- managing time-managing stress-networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

**Recommended Software** 1. Globearena 2. Win English

## REFERENCES

1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Make effective presentations
2. Participate confidently in Group Discussions.
3. Attend job interviews and be successful in them.
4. Develop adequate Soft Skills required for the workplace

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	1	2	2	2	2	1	2	1	2	1
CO2	3	2	1	1	1	1	2	2	1	2	2	2	1	2	1
CO3	3	2	2	1	2	1	2	2	2	2	2	2	1	2	1
CO4	3	2	2	2	2	1	2	2	2	2	2	2	1	2	1
CO5	3	2	1	1	2	1	2	2	2	2	1	2	1	1	2





22ITOCSCN	ADOBE EXPERIENCE MANAGER LAB	L	T	P	C
		0	1	0	1

### **COURSE OBJECTIVES**

- To know well about Adobe Flash, make animations, and use masking.
- To become familiar with Adobe Illustrator, draw symbols, and create a logo.
- To be acquainted with Adobe Photoshop, handle images, and use filters.
- To learn about Adobe Dreamweaver, handle webpages, and templates with layouts.
- To be aware of Adobe InDesign, handle newsletters, pamphlets and others.

### **LIST OF EXPERIMENTS**

#### **FLASH ANIMATAION**

1. The Flash Screen
2. Creating Animations
3. Animating Along a Path
4. Creating a Bouncing Ball
5. Creating Orbits
6. Fixed Point Animations
7. Shape Tweening
8. Using Masks
9. Movie Clips
10. Invisible Buttons

#### **COMPUTER GRAPHICS**

1. Using the Drawing Tools
2. Editing Objects
3. Adding Text to Designs
4. Formatting Text in Designs
5. Creating an Office Design
6. Creating a Backyard Design
7. Creating a House Plan

#### **PHOTO EDITING**

1. Selecting Parts of Images
2. Displaying Just the Car
3. Adjusting Image Sizes
4. Saving Files for the Web
5. Aligned Cloning
6. Unaligned Cloning
7. The Red Eye Effect
8. Enhancing Skin Complexion
9. Sharpening the Eyes
10. Creating a Brick Wall
11. Adding Distorted Text
12. Adding Three-Dimensional Effects
13. Adding a Custom Shape

#### **WEBPAGE AUTHORIZING**

1. Creating a Home Page
2. Using Tables
3. Creating a Template
4. Creating Pages from the Template
5. Linking Pages

6. Creating Forms
7. Email and Other Site Links
8. Anchor Links
9. Enhancing Web Pages
10. More Detailed Page Layouts

### DESKTOP PUBLISHING

1. Creating a Flyer
2. Creating Greeting Card
3. Creating Restaurant Menus
4. Creating Tables
5. Creating Newsletters
6. Publicity Pamphlets

### COURSE OUTCOMES

At the end of this course, the students will be able to

1. Create animation and orbits using flash and Integrate graphics solutions and designs plans.
2. Get exposure in editing using adobe environment.
3. Implement online solution for Webpage Authoring in a global scenario and desktop publishing.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	2	3	2	-	1	-	-	-	-	-	-	-	-	-	-

22ITOCSCN	MOBILE APPLICATION DEVELOPMENT LAB	L	T	P	C
		0	1	0	1

### COURSE OBJECTIVES

- To know about various platforms and tools available for developing mobile applications.
- To realize the differences between the development of conventional applications and mobile applications.
- To learn programming skills in J2ME and Android SDK.
- To study about micro browser based applications to access the Internet using Sun Java Toolkit.

### LIST OF EXPERIMENTS

1. Survey of Mobile Application Development Tools.
2. Form design for mobile applications using layout manager.
3. Develop mobile Applications using GUI controls.
4. Graphical and Multimedia applications.
5. Data retrieval applications.
6. Networking applications.
7. Develop a native application that uses GPS location information.



## VALUE ADDED COURSES

22EINTVAC01	WEB DEVELOPMENT	L	T	P	C
		3	0	0	0

### COURSE OBJECTIVES

- To introduce the fundamentals of Internet, and the principles of web design.
- To construct basic websites using HTML and Cascading Style Sheets.
- To build dynamic web pages with validation using Java Script objects and by applying different event handling mechanisms.
- To develop modern interactive web applications using PHP, XML and MySQL

#### Unit-I

**Introduction :** Concept of WWW, Internet and WWW, HTTP Protocol : Request and Response, Web browser and Web servers, Features of latest version of Web.

**Web Design :** Concepts of effective web design, Web design issues including Browser, Bandwidth and Cache, Display resolution, Look and Feel of the Website, Page Layout and linking, User centric design, Sitemap, Planning and publishing website, Designing effective navigation.

#### Unit-II

**HTML :** Basics of HTML, formatting and fonts, commenting code, color, hyperlink, lists, tables, images, forms, XHTML, Meta tags, Character entities, frames and frame sets, Browser architecture and Web site structure. Overview and features of latest version of HTML.

**Style sheets :** Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, borders and boxes, margins, padding lists, positioning using CSS, CSS2, Overview and features of of latest version of CSS.

#### Unit-III

**JavaScript :** Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, Advance JavaScript: Javascript and objects, JavaScript own objects, the DOM and web browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and Javascript, Events and buttons.

#### Unit-IV

**XML :** Introduction to XML, uses of XML, simple XML, XML key components, DTD and Schemas, Using XML with application. Transforming XML using XSL and XSLT.

**PHP :** Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions

#### Unit-V

**PHP and MySQL :** Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs.

## TEXT BOOKS

1. Ralph Moseley and M. T. Savaliya, Developing Web Applications, Wiley-India Private Limited, 2011.
2. Robert W. Sebesta, Programming the World Wide Web, 7th edition, Pearson Education, 2013.

## REFERENCES

1. Kogent Learning Solutions Inc., Web Technologies Black Book, Dreamtech Press, 2009.
2. Joel Sklar, Principles of Web Design, Cengage Learning, 6<sup>th</sup> Edition, 2015.
3. B. M. Harwani, Developing Web Applications in PHP and AJAX, Tata McGraw-Hill, 2010.
4. Internet and World Wide Web How to program, Paul J. Deitel, Harvey M. Deitel, and Abbey Deitel, 5<sup>th</sup> Edition, Pearson Education, 2011.

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Describe the concepts of World Wide Web, and the requirements of effective web design.
2. Develop web pages using the HTML and CSS features with different layouts as per need of applications.
3. Use the JavaScript to develop the dynamic web pages.
4. Construct simple web pages in PHP and to represent data in XML format.
5. Use server side scripting with PHP to generate the web pages dynamically using the database connectivity.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	1	-	-	-	-	-	2	1	2	1
CO2	3	2	1	1	1	1	-	-	-	-	-	2	1	2	1
CO3	3	2	2	1	2	1	-	-	-	-	-	2	1	2	1
CO4	3	2	2	2	2	1	-	-	-	-	-	2	1	2	1
CO5	3	2	1	1	2	1	-	-	-	-	-	2	1	1	-

22EINTVAC02	MOBILE APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	0

## COURSE OBJECTIVES

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution



## UNIT I INTRODUCTION

Introduction to mobile applications – Embedded systems - Market and business drivers for mobile applications – Publishing and delivery of mobile applications – Requirements gathering and validation for mobile applications

## UNIT II BASIC DESIGN

Introduction – Basics of embedded systems design – Embedded OS - Design constraints for mobile applications, both hardware and software related – Architecting mobile applications – user interfaces for mobile applications – touch events and gestures – Achieving quality constraints – performance, usability, security, availability and modifiability.

## UNIT III ADVANCED DESIGN

Designing applications with multimedia and web access capabilities – Integration with GPS and social media networking applications – Accessing applications hosted in a cloud computing environment – Design patterns for mobile applications.

## UNIT IV TECHNOLOGY I - ANDROID

Introduction – Establishing the development environment – Android architecture – Activities and views – Interacting with UI – Persisting data using SQLite – Packaging and deployment – Interaction with server side applications – Using Google Maps, GPS and Wifi – Integration with social media applications.

## UNIT V WORK, DEVELOPMENT AND DEPLOYMENT

Work with android system Text to Speech, Camera, Taking Picture with Camera, Manage BluetoothConnection, Monitor and Manage Wi-Fi, Accelerometer Sensor & Gyroscope. Delvik Debug Tool, Logcat, Emulator Control, Device Control, Work with ADB, Connect Real Devices, Execute Application on RealDevice, Publish your Application.

## REFERENCES

1. <http://developer.android.com/develop/index.html>
2. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012
3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", DreamTech, 2012
4. James Dovey and Ash Furrow, "Beginning Objective C", Apress, 2012
5. Pradeep Kothari, "Android Application Development Black Book", DreamTech
6. Wei Meng Lee, "Beginning Android 4 Application Development", Wrox
7. Lauren Darcey, Shane Conder, "Android Wireless Application Development", Pearson U

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Describe the requirements for mobile applications
2. Explain the challenges in mobile application design and development
3. Develop design for mobile applications for specific requirements
4. Implement the design using Android SDK
5. Deploy mobile applications in Android and iPhone marketplace for distribution

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	1	1	1	1
CO2	3	2	2	3	3	-	-	-	-	-	-	1	1	1	1
CO3	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1
CO4	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1
CO5	3	-	-	-	-	1	-	2	-	-	-	1	1	1	1

<b>22EINTVAC03</b>	<b>BIG DATA TECHNOLOGIES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

### **COURSE OBJECTIVES**

- To understand several key big data technologies used for storage, analysis and manipulation of data.
- To recognize the key concepts of Hadoop framework, MapReduce, and Hadoop Ecosystem.
- To analyze various big data based cases studies and prepare a sample big data project.

### **UNIT-I**

Fundamentals of Big Data – Big Data Types – Basics of Distributed Computing – Big Data Technology Components – MapReduce Fundamentals - Defining Big Data Analytics – A Brief History of Hadoop - The Hadoop Foundation and Ecosystem.

### **UNIT-II**

The Hadoop Distributed File system: The Design of HDFS - HDFS Concepts - The Command-Line Interface - Hadoop Filesystems - The Java Interface - Data Flow. Setting Up a Hadoop Cluster: Cluster Specification - Cluster Setup and Installation - SSH Configuration - Hadoop Configuration - YARN Configuration

### **UNIT-III**

MapReduce: Analyzing the Data with Hadoop - Scaling Out - Hadoop Streaming - Hadoop Pipes. Developing a MapReduce Application: The Configuration API - Configuring the Development Environment - Writing a Unit Test - Running Locally on Test Data - Running on a Cluster - Tuning a Job - MapReduce Workflow - Anatomy of a MapReduce Job Run - Failures - Job Scheduling - Shuffle and Sort -Task Execution

### **UNIT-IV**

Pig: Installing and Running - An Example - Pig Latin - User-Defined Functions - Pig in Practice  
 Hive - Installing Hive - An Example - Running Hive - Comparison with Traditional Databases - HiveQL - Tables - Querying Data - User-Defined Functions  
 Hbase: Hbasics - Concepts - Installation - Clients – Example

### **UNIT-V**

ZooKeeper: Installing and Running ZooKeeper - An Example - The ZooKeeper Service - Building Applications with ZooKeeper  
 Sqoop: Getting Sqoop - A Sample Import - Generated Code - Database Imports - Working with Imported Data - Importing Large Objects - Performing an Export.  
 Case Studies: Hadoop Usage at Last.fm - Hadoop and Hive at Facebook - Nutch Search Engine - Log Processing at Rackspace

### **TEXT BOOKS**

1. Tom White, “Hadoop: The Definitive Guide”, 3rd Edition, O’reilly, 2012.
2. Judith Hurwitz, Alan Nugent, Fern Halper, and Marcia Kaufman, *Big Data for Dummies, First Edition*, For Dummies, 2013.

## REFERENCES

1. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015.
2. Borko Furht and Flavio Villanustre, “Big Data Technologies and Applications”, First Edition, Springer Publishing Company, Incorporated, 2016

## COURSE OUTCOMES

At the end of this course, the students will be able to

1. Categorize and summarize big data and its importance.
2. Differentiate various big data technologies like Hadoop, MapReduce, and Hadoop Ecosystem
3. Apply tools and techniques to analyze big data.
4. Earn tips and tricks for big data use cases and solutions.
5. Run and build applications using zookeeper.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
<b>CO1</b>	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-
<b>CO2</b>	-	2	2	3	3	-	-	-	-	-	-	-	1	-	-
<b>CO3</b>	3	2	2	-	-	1	-	2	-	-	-	-	1	-	-
<b>CO4</b>	-	-	-	-	-	1	-	2	-	-	-	-	1	-	-
<b>CO5</b>	3	-	-	-	-	1	-	2	-	1	-	-	1	-	-

<b>22EINTVAC04</b>	<b>FOUNDATION OF DATA SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>

## COURSE OBJECTIVES

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.
- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

## UNIT I INTRODUCTION

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data

## UNIT II DESCRIBING DATA

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

## UNIT III DESCRIBING RELATIONSHIPS

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r<sup>2</sup> –multiple regression equations – regression towards the mean

## UNIT IV PYTHON LIBRARIES FOR DATA WRANGLING

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

## UNIT V DATA VISUALIZATION

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

### TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

### REFERENCES

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press, 2014.

### COURSE OUTCOMES

At the end of this course, the students will be able to:

1. Define the data science process
2. Understand different types of data description for data science process
3. Gain knowledge on relationships between data
4. Use the Python Libraries for Data Wrangling
5. Apply visualization Libraries in Python to interpret and explore data

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	-	-
CO3	3	-	-	-	-	1	-	2	-	-	-	1	1	-	-
CO4	3	-	-	-	-	1	-	2	-	-	-	1	1	-	-
CO5	3	-	2	3	3	1	-	2	-	-	-	1	1	-	-

22EINTVAC05	INTRODUCTION TO CYBER SECURITY	L	T	P	C
		3	0	0	0

### COURSE OBJECTIVES

- To understand the basics of network and security
- To explore and analyze Attacker Techniques and Fraud Techniques
- To analyze exploitation techniques

### UNIT-I

Network and Security Concepts: Information Assurance Fundamentals- Authentication, Authorization, Nonrepudiation, Confidentiality, Integrity, Availability.

## UNIT-II

Attacker Techniques and motivations: How Hackers Cover Their Tracks (Antiforensics), Tunneling Techniques- HTTP, DNS, ICMP, Intermediaries, Steganography and Other Concepts, Detection and Prevention

## UNIT-III

Basic Cryptography, Symmetric Encryption, Public Key Encryption, Firewalls. Microsoft Windows Security Principles: Windows Tokens, Window Messaging, Windows Program Execution.

## UNIT-IV

Fraud Techniques and Threat Infrastructure: Phishing, Smishing, Vishing, and Mobile, Malicious Code, Rogue Antivirus, Click Fraud, Botnets, Fast-Flux, Advanced Fast-Flux.

## UNIT-V

Exploitation Techniques to Gain a Foothold: Shellcode, Integer Overflow Vulnerabilities, Stack-Based Buffer Overflows, Format String Vulnerabilities, SQL Injection, Malicious PDF Files, Race Conditions.

## TEXT BOOK

1. James Graham, Richard Howard, Ryan Olson “CYBER SECURITY ESSENTIALS”, CRC Press, Taylor & Francis Group, 2011.

## REFERENCES

1. Martti Lehto, Pekka Neittaanmäki, “ Cyber Security: Analytics, Technology and Automation”, Springer-Intelligent Systems, Control and Automation: Science and Engineering-Volume 78, 2015.

## WEB REFERENCES

1. <https://www.coursera.org/learn/intro-cyber-security-business>

## COURSE OUTCOMES

At the end of this course, the students will be able to:

1. Gain Basic Programming Knowledge for Cyber Security
2. Understand the various attacks in web interface.
3. Understand the level of security in operating systems.
4. Know the concepts of Network Security.
5. Understand and apply the security concepts in data base management systems.

Mapping of Course Outcomes (COs) with Programme Outcomes (POs) and Program Specific Outcomes (PSOs)															
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	2	2	-	-	-	-	-	-	1	-	-	1
CO2	3	-	-	-	3	-	-	-	-	-	-	1	-	-	1
CO3	3	-	-	-	-	1	-	2	-	-	-	1	-	-	1
CO4	3	2	2	3	-	1	-	2	-	-	-	1	-	-	1
CO5	3	-	-	-	-	1	-	2	-	-	-	1	-	-	1