ANNAMALAI UNIVERSITY
FACULTY OF ENGINEERING AND TECHNOLOGY

M.E (Two-Year Full Time) DEGREE PROGRAM
Choice Based Credit System

Regulations - 2023

Curriculum for Students Admitted in the Academic Year 2023-2024

HAND BOOK
2023

ANNAMALAI UNIVERSITY

FACULTY OF ENGINERING AND TECHNOLOGY

DEPARTMENT OF CIVIL AND STRUCTURAL ENGINEERING

M.E. (CONSTRUCTION ENGINEERING AND MANAGEMENT)

(Full-Time)

(Choice Based Credit System)

CURRICULAM AND SYLLABI BASED ON R-2023

MEETING OF

BOARD OF STUDIES IN CIVIL AND STRUCTURAL ENGINEERING

HELD ON

21.01.2023

ANNAMALAI UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

M.E. (Two -Year Full Time) DEGRE PROGRAMME (CBCS)

REGULATIONS - 2023

1. Conditions for Admission

Candidates for admission to the first year of the four-semester **M.E Degree Programme in Engineering** shall be required to have passed B.E / B.Tech degree of Annamalai University or any other authority accepted by the syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

2. Branches of Study in M.E

The Branch and Eligibility criteria of Programmes are given in Annexure

3. Courses of Study

The courses of study along with the respective syllabi and the scheme of Examinations for each of the M.E Programmes offered by the different Departments of study in the Faculty of Engineering and Technology are given in Annexures of the respective Departments.

4. Choice Based Credit System (CBCS)

The curriculum includes Program Core, Program Electives and Open Electives, Mandatory Learning Courses and Audit Courses in addition to the Thesis. Each semester curriculum shall normally have a blend of theory and practical courses.

5. Assignment of Credits for Courses

Each course is normally assigned one credit per hour of lecture / tutorial per week and 0.5 credit for one hour of laboratory or project or industrial training or seminar per week. The total credits for the Programme will be **68**.

6. Duration of the Programme

A student of M.E Programme is normally expected to complete in four semesters for the full-time but in any case not more than four years from the date of admission.

7. Registration for Courses

A newly admitted student will automatically be registered for all the courses prescribed for the first semester, without any option. Every other student shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late

registration with the approval of the Dean on the recommendation of the Head of the Department along with a late fee will be done up to the last working day. Registration for the Thesis Phase - I and Phase-II shall be done at the appropriate semesters.

8. Electives

8.1 Program Electives

The student has to select two electives in first semester, another two electives in the second semester and one more in the third semester from the list of Program Electives.

8.2 Open Electives

The student has to select two electives in third semester from the list of Open Electives offered by the Department and / or other departments in the Faculty of Engineering and Technology.

9. Industrial Project

A student may be allowed to take up the one program elective and two open elective courses of third semester (Full Time program) in the first and second semester, to enable him/her to carry out Project Phase-I and Phase-II in an industry during the entire second year of study. The condition is that the student must register those courses in the first 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.

10. Assessment

10.1 Theory Courses

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

First assessment (Mid-Semester Test-I)	:	08 marks
Second assessment (Mid-Semester Test-II)	:	12 marks
Third Assessment	:	05 marks
End Semester Examination	:	75 marks

10.2 Practical Courses

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

First assessment (Test-I)	:	15 marks
Second assessment (Test-II)	:	15 marks
Maintenance of record book	:	10 marks

End Semester Examination : 60 marks

10.3 Thesis Work

The thesis Phase-I will be assessed for 40 marks by a committee consisting of the Head of the Department, the guide and a minimum of two members nominated by the Head of the Department. The Head of the Department will be the chairman. The number of reviews must be a minimum of three per semester. 60 marks are allotted for the thesis work and viva voce examination at the end of the third semester. The same procedure will be adopted for thesis Phase II in the fourth semester.

10.4 Seminar / Industrial Training

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of the seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

11. Student Counselors (Mentors)

To help the students in planning their course of study and for general advice on the academic Programme, the Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor (mentor) for those students throughout their period of study.

12. Class Committee

For each of the semesters of M.E programmes separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from first to fourth semesters for Full time will be as follows:

- Teachers of the individual courses.
- A Thesis coordinator (for Thesis Phase - I and II) shall be appointed by the Head of the Department from among the Thesis supervisors.
- A thesis review committee chairman shall be appointed by the Head of the Department
- 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.
- All counselors of the class and the Head of the Department (if not already a member) or any staff member nominated by the Head of the Department may opt to be special invitees.

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 courses / 40 marks for practical courses, for Industrial Training and for Thesis work (Phase-I and Phase-II) will be finalized for every student and tabulated and submitted to the Head of the Department for approval and transmission to the Controller of Examinations.

13. Temporary Break of Study

A student can take a one-time temporary break of study covering the current semester and / or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid- semester test. However, the student must complete the entire Programme within the maximum period of **four years.**

14. Substitute Assessments

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 end of semester 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 Head of the Department within a week from the date of the missed assessment.

15. 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.

A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register and repeat the same semester in the subsequent academic years.

16. 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 and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade RA / 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-totaling 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.

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

17. Awarding Degree

After successful completion of the Programme, the degree will be awarded with the following

classifications based on CGPA.

For First Class with Distinction the student must earn a minimum of 68 credits within four semesters from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn a minimum of 68 credits within two years and six months from the time of admission and obtain a CGPA of 6.75 or above.

For Second class, the student must earn a minimum of 68 credits within four years from the time of admission.

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

Percentage of marks = (OGPA/CGPA - 0.25) x 10

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

C_i - Credit hours of a course

GP_i - Grade Point of that course

18. Ranking of Candidates

The candidates who are eligible to get the M.E degree in First Class with Distinction will be ranked on the basis of CGPA for all the courses of study from I to IV semester.

The candidates passing with First Class and without failing in any subject from the time of admission will be ranked next to those with distinction on the basis of CGPA for all the courses of study from I to IV semester.

19. Transitory Regulations

If a candidate studying under the old regulations M.E could not attend any of the courses in his/her courses, shall be permitted to attend equal number of courses, under the new regulation and will be examined on those subjects. The choice of courses will be decided by the concerned Head of the department. However he/she will be permitted to submit the thesis as per the old regulations. The results of such candidates will be passed as per old 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.

ANNEXURE

S. No.	Department		Programme (Full Time)	Eligible B.E. / B.Tech Programme
1	Civil Engineering	i	Environmental Engineering	B.E. / B.Tech - Civil Engineering, Civil &Structural Engineering, Environmental Engineering, Mechanical Engineering, Industrial Engineering, Chemical Engineering, Bio Chemical Engineering, Biotechnology, Industrial Biotechnology, Chemical & Environmental Engineering.
		ii	Water resources Engineering & Management	B.E. / B.Tech - Civil Engineering, Civil &Structural Engineering, Environmental Engineering, Mechanical Engineering, Agricutural and irrigation Engineering, Geo informatics, Energy and Environmental Engineering.
2	Civil & Structural Engineering	i	Structural Engineering	B.E. / B.Tech - Civil Engineering, Civil & Structural Engineering.
		ii	Construction Engineering. and Management	
3	Mechanical Engineering	i	Thermal Power	B.E. / B.Tech - Mechanical Engineering, Automobile Engineering, Mechanical Engineering (Manufacturing).
		ii.	Energy Engineering & Management	B.E. / B.Tech - Mechanical Engineering, Automobile Engineering, Mechanical (Manufacturing) Engineering, Chemical Engineering
4	Manufacturing Engineering	i	Manufacturing Engineering	B.E. / B.Tech - Mechanical Engineering, Automobile Engineering, Manufacturing Engineering, Production Engineering, Marine Materials science Engineering,Metallurgy Engineering, Mechatronics Engineering and Industrial Engineering.
5	Electrical Engineering	i	Power System Engineering	B.E. / B.Tech - Electrical and Electronics Engineering,
6	Electronics & Instrumentation Engineering	i	Process Control & Instrumentation	B.E. / B.Tech - Electronics and Instrumentation Engineering, Electrical and Electronics Engineering, Control and Instrumentation Engineering, Instrumentation Engineering, , Electronics and Communication Engineering,
7	Chemical Engineering	i	Chemical Engineering	B.E. / B.Tech - Chemical Engineering, Petroleum Engineering, Petrochemical Technology
		ii	Food Processing Technology	B.E. / B.Tech - Chemical Engineering, Food Technology,Biotechnology, Biochemical Engineering, Agricultural Engineering.

S. No.	Department		Programme (Full Time)	Eligible B.E. / B.Tech Programme
8	Computer Science and Engineering	i	Computer Science and Engineering	B.E. / B.Tech - Computer Science and Engineering, Computer Science and Engineering (Artificial Intelligence and Machine Learning), Computer Science and Engineering (Data Science), Information Technology, Electronics & Communication Engineering, Software Engineering
9	Electronic & Communication Engineering	i.	Communication Systems	B.E. / B.Tech -Electronics and Communication Engineering, Electronics Engineering.

DETAILS OF COURSE CODE

S. No	3rd & 4th Digits	DETAILS		5th & 6th Digits	DETAILS	7th & 8th Digits	DETAILS
1	CE	Civil Engineering	i	WR	Water Resources Engineering & Management	PC	Program Core
			ii	EE	Environmental Engineering		
2	CZ	Civil & Structural Engineering	i	SE	Structural Engineering	PE	Program Elective
			ii	CM	Construction Engineering. and Management		
3	ME	Mechanical Engineering	i	TP	Thermal Power Engineering	OE	Open Elective
			ii	EM	Energy Engineering & Management		
4	MF	Manufacturing Engineering	i	ME	Manufacturing Engineering	CP	Core Practical
5	EE	Electrical Engineering	i	PS	Power System Engineering	TS	Industrial Training and Seminar
6	EI	Electronics & Instrumentation Engineering	i	PC	Process Control & Instrumentation	PV	Project work & Viva-voce
7	CH	Chemical Engineering	i	CE	Chemical Engineering	MC	Mandatory Learning Course
			ii	FT	Food Processing Technology		
8	CS	Computer Science and Engineering	i	CS	Computer Science and Engineering	AC	Audit Course

S. No	3rd & 4th Digits	DETAILS		5th & 6th Digits	DETAILS	7th & 8th Digits	DETAILS
9	EC	Electronics & Communication Engineering	i	CS	Communication Systems		
10	YY	Name of the Department					
11	ZZ	Name of the Program					

The first two digits relate to the year from which the Regulations commence
9th digit represents the semester and 10th digit represents the serial number of courses.
YY and ZZ relates to the Open Elective where YY corresponds to Name of the Department and ZZ to Name of the Program.

M.E (CONSTRUCTION ENGINEERING AND MANAGEMENT)
(FULL TIME)

COURSES OF STUDY AND SCHEME OF EXAMINATIONS

SEMESTER I										
Sl. No	**Course Code**	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
1	23CZCMPC11	PC - I	Construction Project Management	3	-	-	25	75	100	3
2	23CZCMPC12	PC - II	Quality control and Assurance in construction	3	-	-	25	75	100	3
3	23CZCMPE13	PE - I	Program Elective-I	3	-	-	25	75	100	3
4	23CZCMPE14	PE - II	Program Elective-II	3	-	-	25	75	100	3
5	23CZCMMC15	MC	Research Methodology and IPR.	2	-	-	25	75	100	2
6	23CZCMCP16	CP - I	Construction Project Management Lab	-	-	3	40	60	100	2
7	23CZCMCP17	CP-II	Advanced Concrete Lab	-	-	3	40	60	100	2
8	23CZCMAC18	AC - I	Audit Course–I	-	-	-	-	-	-	-
			Total				**205**	**495**	**700**	**18**

SEMESTER II										
Sl. No	**Course Code**	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
1	23CZCMPC21	PC - III	Safety in Construction	3	-	-	25	75	100	3
2	23CZCMPC22	PC - IV	Construction Equipment and Management	3	-	-	25	75	100	3
3	23CZCMPE23	PE - III	Program Elective-III	3	-	-	25	75	100	3
4	23CZCMPE24	PE - IV	Program Elective-IV	3	-	-	25	75	100	3
5	23CZCMOE25	OE - I	Open Elective - I	3	-	-	25	75	100	3
6	23CZCMCP26	CP - III	Numerical Analysis Lab & Model Testing Lab	-	-	3	40	60	100	2
7	23CZCMTS27	TS	Industrial Training and Seminar/ Mini project	-	Tr 2	S 2	40	60	100	2
8	23CZCMAC28	AC - II	Audit Course– II	-	-	-	-	-	-	0
			Total				**205**	**495**	**700**	**19**

SEMESTER III										
Sl. No	**Course Code**	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
1	23CZCMPE31	PE - V	Program Elective- V	3	-	-	25	75	100	3
2	23CZCMOE32	OE	Open Elective	3	-	-	25	75	100	3
3	23CZCMPV33	PV-I	Project work and Viva-Voce Phase 1	-	Pr 16	S 4	40	60	100	10
4	23CZCMAC34	AC - III	Audit Course - III	-	-	-	**-**	**-**	**-**	
			Total				**90**	**210**	**300**	**16**

SEMESTER IV										
Sl. No	**Course Code**	**Category**	**Course**	**L**	**T**	**P**	**CA**	**FE**	**Total**	**Credits**
3	23CZCMPV41	PV-II	Project work and Viva-Voce Phase II	-	Pr 26	S 4	40	60	100	16
			Total				**40**	**60**	**100**	**16**

PC	Program core	**MC**	Mandatory learning Course
PE	Program Elective	**AC**	Audit Course
OE	Open Elective	**PV**	Project work and Viva voce
CP	Core Practical	**EC**	Branch code
TS	Industrial Training and Seminar	**CS**	ME Specialisation code

L	Lecture	**CA**	Continuous Assessment
P	Practical	**FE**	Final Examination
T	Thesis		

PROGRAM ELECTIVES

Sl. No	Course code	List of Program Electives	Credits
	Regular		
1	23CZCMPE13	System Integration in Construction Engineering	3
2	23CZCMPE14	Forensic Engineering and Retrofitting of Structures	3
3	23CZCMPE23	Contract Laws and Regulations	3
4	23CZCMPE24	Construction Workplace and Employees Behavior	3
5	23CZCMPE31	Construction Economics and Finance Management	3
6	23CZCMPEXX	Project Formulation and Appraisal	3
7	23CZCMPEXX	Resource Management and Control in Construction	3
8	23CZCMPEXX	Construction Planning, Scheduling and Control	3
9	23CZCMPEXX	Advanced topics in Acoustics, Lighting and Ventilation	3
10	23CZCMPEXX	Information Technology for Construction Managers	3
11	23CZCMPEXX	Advanced Concrete Technology	3
12	23CZCMPEXX	Analytical and Numerical Methods for Construction Engineering	3
13	23CZCMPEXX	Advanced Construction Methods for Special Structures	3
14	23CZCMPEXX	Design of Form Work	3

OPEN ELECTIVES

Sl.No	Course Code	List of Open Electives	Credits
	Regular		
1	23CZCMOE25	Computer Application in Construction Engineering and Planning	3
2	23CZCMOE32	Geographic Information System in Construction Engineering and Management	3
3	23CZCMOEXX	Composite Construction	3
4	23CZCMOEXX	Shoring, Scaffolding and Formwork	3
5	23CZCMOEXX	Value Engineering and Valuation	3
6	23CZCMOEXX	Energy Conservation Techniques in building Construction	3
7	23CZCMOEXX	Advanced Construction Engineering Techniques	3
8	23CZCMOEXX	Prefabricated Structures	3
9	23CZCMOEXX	Public Health Engineering Structures	3
10	23CZCMOEXX	Research Methodology	3
11	23CZCMOEXX	Construction Personnel Management	3
12	23CZCMOEXX	Industries Organizational Psychology	3
13	23CZCMOEXX	Composite Materials	3
14	23CZCMOEXX	Cost Management of Engineering Projects	3
15	23CZCMOEXX	Industrial Safety	3

AUDIT COURSES

Sl.No	Course Code	List of Audit Courses
	Regular	
1	23CZCMAC18	Stress Management by Yoga
2	23CZCMAC28	English for Research paper writing
3	23CZCMAC34	Constitution of India
4	23CZCMACXX	Disaster management
5	23CZCMACXX	Sanskrit for Technical knowledge
6	23CZCMACXX	Value education
7	23CZCMACXX	Pedagogy Studies
8	23CZCMACXX	Personality development through Life enlighten skills

DEPARTMENT OF CIVIL & STRUCTURAL ENGINEERING

VISION

To impart high quality education and technical expertise to the students and inculcate in them humanistic attitude, scientific temper, sense of commitment to the profession and spirit of participation in nation building.

MISSION

M1: To provide quality education and knowledge base to the students in structural engineering.

M2: To prepare the students as nationally competitive and trend setters for the future generation in the realm of technical education.

M3: To assimilate the available theories, explore new frontiers, to propound new theories which will result in improving the quality of the life of the student community.

M4: To develop personality of the students in a healthy way and to provide opportunity to acquire knowledge in state-of-the-art research.

M5: To provide service to the university, engineering profession, and the public through consultancy services.

M.E. (CONSTRUCTION ENGINEERING AND MANAGEMENT)

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1	To develop the technical and engineering skills of the students and to train them in applying fundamental principles in the domain, feeding the needs of global expectations with professional competence.
PEO2	To explore the students in the field of Civil and Structural Engineering areas both in theory and practice and tuning the academic programmes periodically to make the students fit for professional jobs, research assignment or self-employment.
PEO3	To demonstrate their ability to deal effectively with ethical and professional issues, taking into account the broader societal implications.
PEO4	To impart communication, analytical and soft skills for the students towards either placing them in a comfort zone in their profession or a path to pursue higher studies.

M.E. (CONSTRUCTION ENGINEERING AND MANAGEMENT)

PROGRAMME OUTCOMES (POs)

PO1	**Scholarship of Knowledge** Acquire in-depth knowledge of specific discipline or professional area, including wider and global perspective, with an ability to discriminate, evaluate, analyse andsynthesise existing and new knowledge, and integration of the same for enhancement of knowledge.
PO2	**Critical Thinking** Analyse complex engineering problems critically, apply independent judgement for synthesising information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
PO3	**Problem Solving** Think laterally and originally, conceptualise and solve engineering problems, evaluate a wide range of potential solutions for those problems and arrive at feasible, optimal solutions after considering public health and safety, cultural, societal and environmental factors in the core areas of expertise.
PO4	**Research Skill** Extract information pertinent to unfamiliar problems through literature survey and experiments, apply appropriate research methodologies, techniques and tools, design, conduct experiments, analyse and interpret data, demonstrate higher order skill and view things in a broader perspective, contribute individually/in group(s) to the development of scientific/technological knowledge in one or more domains of engineering.
PO5	**Usage of modern tools** Create, select, learn and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to complex engineering activities with an understanding of the limitations.
PO6	**Collaborative and Multidisciplinary work** Possess knowledge and understanding of group dynamics, recognise opportunities and contribute positively to collaborative-multidisciplinary scientific research, demonstrate a capacity for self-management and teamwork, decision-making based on open-mindedness, objectivity and rational analysis in order to achieve common goals and further the learning of themselves as well as others.
PO7	**Project Management and Finance** Demonstrate knowledge and understanding of engineering and management principles and apply the same to one's own work, as a member and leader in a team, manage projects efficiently in respective disciplines and multidisciplinary environments after consideration of economical and financial factors.
PO8	**Communication** Communicate with the engineering community, and with society at large, regarding complex engineering activities confidently and effectively, such as, being able to comprehend and write effective reports and design documentation by adhering to appropriate standards, make effective presentations, and give and receive clear instructions.
PO9	**Life-long Learning** Recognise the need for, and have the preparation and ability to engage in life-long learning independently, with a high level of enthusiasm and commitment to improve knowledge and competence continuously.

PO10	**Ethical Practices and Social Responsibility** Acquire professional and intellectual integrity, professional code of conduct, ethics of research and scholarship, consideration of the impact of research outcomes on professional practices and an understanding of responsibility to contribute to the community for sustainable development of society.
PO11	**Independent and Reflective Learning** Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

Mapping PEO with Mission					
	M1	**M2**	**M3**	**M4**	**M5**
PEO1	3	1	3	1	1
PEO2	3	3	1	1	1
PEO3	3	3	3	3	3
PEO4	1	3	1	3	1
PEO5	1	1	3	3	3

Mapping PO with PEO											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**
PEO1	3	3	3			1	1	1	3		3
PEO2	3	3	3	3	3	1	1	1	3		3
PEO3	3	3	3			1	1	1	3	3	
PEO4	3	3	3	3		3	2	3	3		3

SEMESTER I

23CZCMPC11	CONSTRUCTION PROJECT MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of Project management planning on construction projects
- To manage the project team, defining roles and responsibilities and fixing scope of the project
- To know the time management of a construction project by proper scheduling using PERT, CPM, RPM, etc. Apply excel, MSP, PRIMAVERA, Construction manager and other softwaresto solve construction problems.
- To learn about project controlling
- To study the site mobilization, material and labor management

Basics of Management
Introduction to construction industries, concepts and need of management in construction. Modern scientific management, Management Functions, Management Styles.

Construction Project Planning

Project life cycle, identification, preparation, appraisal, detailed planning, implementation, Project delivery system, Leader ship and motivation for the project team- effect of project risk on organization role and responsibilities of project Manager, Role of Project Management Consultants, Web based project management, monitoring and control.

Project Scheduling

Construction Scheduling, Work break down structure, activity cost and time estimation in CPM, PERT, RPM (Repetitive Project Modelling) techniques. LOB technique, Mass haul diagrams. Precedence Network Analysis, software in Construction scheduling (MSP, primavera, Construction manager).

Project Controlling
Monitoring and Control, Crashing, Resource Levelling, Updating.

Construction Management

Site Mobilization: Demobilization aspects, various Resources management based on funds availability. Co-coordinating, communicating & reporting techniques. Application of MIS to construction. Training of Construction Managers. Material Management: Scope, importance, objectives, functions of material management classification and codification of material, inventory control: need, function, economic order quantity. Labour Management: Labour laws for construction projects, welfare measures for labours. Equipment Management: Types of equipment and factors affecting selection, Functions of equipment management, owning and operating costs, Time-value of money concept, Economic life, safety, maintenance and repair of equipment.

REFERENCES:

1. Chitakara, *Construction Project Management Planning, Scheduling and Controlling*, TataMcGraw Hill, New Delhi, 2009.
2. Kumar NeerajJha, *Construction Project Management Theory & Practice*, Pearson, 2012.
3. Charles Patrick, *Construction Project planning & Scheduling*, Pearson, 2012
4. Chris Hendrickson, Tung Au, *Project Management Construction – Fundamental Concepts forOwners, Engineers, Architects and Builders*, Prentice Hall Inc, 2000.

COURSE OUTCOMES:

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

1. Have an idea about the concept of Project management planning on construction projects
2. Understand the roles and responsibilities in project planning.
3. Find project duration and optimize the time and minimize the cost implement resourceallocation and.
4. Understand the control techniques plan and implement
5. Know about site mobilization, material and labor management

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	3		1			3	3			3				3	3
CO2	3		1			3	3			3				3	3
CO3	3		1			3	3			3				3	3
CO4	3		1			3	3			3				3	3
CO5	3		1			3	3			3				3	3

23CZCMPC12	QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Know the quality plan and performance factors influencing construction quality
- To provide a basic information about quality Management Guidelines
- To Know the quality planning and taguchi's concept-codes
- To examine the quality assurance, appraisals and quality control by reliability testing.
- To find out how the quality techniques can be improved.

Introduction

Definition-Concept of quality-meaning of quality-design-conformance-performance- dimensions-factors influencing construction quality.

Quality Management

Fundamentals of quality management—function-inspection, control and enforcement-quality management system and method-quality circle-total quality management-quality management guidelines-responsibilities and authority

Quality Planning

Quality policy, objectives and methods- consumers' satisfaction-time completion- documents- process and products- quality cost- Taguchi's concept-codes and standards

Quality Control and Assurance

Objectives of quality control-appraisals- needs and techniques of quality control- critical, major failure aspects-failure mode and effect analysis-statistical process control-quality systems- quality audit- responsibilities and authorities in quality control and assurance

Quality Improvement Techniques

Selection of new materials-influencing drawings, detailing, specification, standardization-bid preparation- construction activity, environmental safety, social and environmental factors-natural causes and speed of construction-life cycle costing- value engineering and value analysis.

REFERENCES:

1. James, J.O.Brain, *Construction Inspection Handbook-Quality Assurance and Quality control*,Van Nostrand, New York, 1989.
2. SP 28:*Hand Book of Statistical Quality Control, Bureau of Indian Standards*, New Delhi.
3. Frank M Gryna, *Quality Planning and Analysis*, McGraw-Hill 2001
4. *International Standards Organization* – ISO 9001 and ISO 9004
5. Steven McCabe, *Quality Improvement Techniques in Construction*, Addison Wesley LongmanLtd, 1998
6. John L. Ashford, *The Management of Quality in Construction*, E &F.N.Spon,1989.

COURSE OUTCOMES:

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

1. Understand the concept of quality plan
2. Learn about quality Management Guidelines
3. Use taguchi's concept-codes and standards
4. Know quality assurance, appraisals and quality control by reliability testing
5. Implement the quality improvement techniques

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	3		1			3	3			3				3	3
CO2	3		1			3	3			3				3	3
CO3	3		1			3	3			3				3	3
CO4	3		1			3	3			3				3	3
CO5	3		1			3	3			3				3	3

23CZCMMC15	RESEARCH METHODOLOGY AND IPR	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES:

- To study the research problem and formulation.
- To Analyze the Plagiarism and Research ethics.
- To Know about Preparation of research proposal.
- To understand about Patenting.
- To learn about IPR.

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations

Effective literature studies approaches, analysis Plagiarism, Research ethics,Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES:

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science &engineeringstudents’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: AnIntroduction”
3. Ranjit Kumar, 2nd Edition , “Research Methodology: A Step by Step Guide forbeginners”
4. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd,2007.
5. Mayall , “Industrial Design”, McGraw Hill,1992.
6. Niebel , “Product Design”, McGraw Hill,1974.
7. Asimov , “Introduction to Design”, Prentice Hall,1962.
8. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in NewTechnological Age”,2016.

9. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand,2008

COURSE OUTCOMES

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

1. Understand research problem formulation.
2. Analyze the Plagiarism and Research ethics.
3. Explain about Preparation of research proposal.
4. Learn about Patenting.
5. Understand IPR.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1				3		2				3	3			3	3
CO2				3		2				3	3			3	3
CO3				3		2				3	3			3	3
CO4				3		2				3	3			3	3
CO5				3		2				3	3			3	3

23CZCMCP16	CONSTRUCTION PROJECT MANAGEMENT LABORATORY	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To study the quantity take off, preparation and delivery of the bid.
- To learn about the simple equipment information.
- To prepare proper scheduling for a small construction project using primavera.
- To prepare proper scheduling for a small construction project using tools like MS project.
- To analyse and study the project risk.

LIST OF EXPERIMENTS

1. Quantity take off, preparation and delivery of the bid or proposal of an Engineering construction project.
2. Design of a simple equipment information system of an Engineering construction project.
3. Scheduling of a small construction project using primavera Scheduling system including reports and tacking.
4. Scheduling of a small construction project using tools likes MS project Scheduling system including reports and tacking.
5. Simulation models for project risk analysis.

REFERENCES:

1. Chitakara, *Construction Project Management Planning, Scheduling and Controlling*, Tata McGraw Hill, New Delhi, 2009.
2. Kumar Neeraj Jha, *Construction Project Management Theory & Practice*, Pearson, 2012.
3. Charles Patrick, *Construction Project planning & Scheduling*, Pearson, 2012.
4. Chris Hendrickson, Tung Au, *Project Management Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders*, Prentice Hall Inc, 2000.
5. Using **PRIMAVERA** and **MS PROJECT** software

COURSE OUTCOMES:

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

1. Know about the Preparation and delivery of the bid or proposal of an Engineering construction project.
2. Learn about the Design of a simple equipment information system.
3. Understand the Computer application of using primavera scheduling system including reports and tacking.
4. Understand the Computer application of using primavera Scheduling system including reports and tacking.
5. Analyse the models for projects risk .

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3		3			3			2		3	3		
CO2	3	3		3			3			2		3	3		
CO3	3	3		3			3			2		3	3		
CO4	3	3		3			3			2		3	3		
CO5	3	3		3			3			2		3	3		

23CZCMCP17	ADVANCED CONCRETE LABORATORY	L	T	P	C
		0	0	3	2

COURSE OBJECTIVES:

- To Design high grade concrete and study the parameters affecting its performance.
- To study Non Destructive Tests on existing concrete structures.
- To understand engineering principles and behaviour of structural/ elements.
- To learn about the cyclic load testing.
- To learn about the durability tests on concrete.

LIST OF EXPERIMENTS

1. Concrete mix design by ACI, IS and BS methods.
2. Use of water reducing admixtures.
3. Use of acceleration/retarding admixtures in concrete.
4. Non-destructing testing methods-use of rebound hammer and ultrasonic pulse velocity tester.
5. Preparation of reinforcement grill and casting of RCC beams (under-reinforced and overreinforced) and RCC columns.
6. Testing of reinforcement (mild steel, HYSD and High Tensile) and prestressing strands.
7. Testing of masonry specimen (as per IS 1905).
8. Test on clear specimen of timber.
9. Bituminous Mix Design.
10. Methods of sampling of construction material (as per IS code)

REFERENCES:

1. Properties of concrete, Neville A.M., 5th edition, prentice hall, 2012.
2. Concrete technology, Shetty M.S., Chand and Co., 2006.
3. Concrete Mix design by ACI 211.1-91 method, IS code method as per 10262- 2019& 456-2000, DOE method
4. IS 9103.1999 specification for concrete admixtures
5. Testing of masonry specimen as per IS 1905
6. Non-destructive testing as per IS 13311-1, 1992.
7. RCC code practice using IS 456-2000.
8. Methods of sampling and analysis of concrete as per IS 1199.

COURSE OUTCOMES:

At the completion of the course students will be able to

1. Design high grade concrete and study the parameters affecting its performance.
2. Conduct Non Destructive Tests on existing concrete structures.
3. Apply engineering principles to understand behaviour of structural/ elements.
4. Know about the cyclic load testing.
5. Know about the durability tests on concrete.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
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	

SEMESTER - II

23CZCMPC21	SAFETY IN CONSTRUCTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To Know about Accidents and their Causes and Legal Implications.
- To provide an information about duties and responsibilities of construction management.
- To study about the safety in constructions and their applications.
- To Understand the Various Safety Equipment And Gear Used On Site.
- To learn about the safety policies.

Construction Accidents

Accidents and their Causes – Human Factors in Construction Safety - Costs of Construction Injuries – Occupational and Safety Hazard Assessment – Legal Implications

Construction Safety Management

Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.

Safety in Construction Operations

Safety of accidents on various construction sites such as buildings, dams, tunnels, bridges, roads, etc. safety at various stages of construction. Prevention of accidents. Safety measures. Safety in use of construction equipment e.g. vehicles, cranes, hoists and lifts etc. safety of scaffolding and working platforms. Safety while using electrical appliances. Explosives used.

Various Safety Equipment And Gear Used On Site

First aid on site, Safety awareness program. Labour laws, legal requirement and cost aspects of accidents on site, Incentive for safety practices.

Study of Safety Policies

Methods, equipment, training provided on any ISO approved construction Company, safety in office, working on sites of high rise construction, deep excavation.

REFERENCES:

1. *Construction safety manual* published by National Safety Commission of India.
2. *Safety Management in Construction Industry – A manual for project managers*. NICMAR Mumbai.
3. Davies V.S.Thomasin K, *Construction Safety Handbook*, Thomas Telford, London.
4. *ISI for safety in Construction* – Bureau of Indian Standards.
5. Girimaldi and Simonds, "*Safety management*" –, AITBS, New Delhi.
6. Jimmie Hinze, *Construction safety*, Prentice-Hall, ©1997.

7. Herbert William Heinrich*, Industrial Accident Prevention*, McGraw-Hill, 1950

COURSE OUTCOMES:

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

1. Know about Accidents and their Causes and Legal Implications.
2. Gain knowledge about duties and responsibilities of construction management.
3. Learn about the safety in and their applications.
4. Manage the Various Safety Equipment And Gear Used On Site.
5. Summarize the safety policies, methods equipment's, training provided on any ISO approved construction company.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
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

23CZCMPC22	CONSTRUCTION EQUIPMENT AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about the equipment in construction projects and its cost.
- To learn about construction equipment management.
- To provide an information about soil identification, earth moving technique andequipment's.
- To understand the working principles of construction Equipment's.
- To study about the method of scheduling.

Construction Equipment Cost

Introduction - Role of Construction Equipment - From Tools to Machines - Development of Earthmoving, Excavating, and Lifting Machines - Future of Heavy Construction Equipment. Cost of Owning and Operating Construction Equipment - Ownership Cost - Initial Cost - Depreciation - Investment (or Interest) Cost - Insurance Tax and Storage Costs - Total Ownership Cost - Cost of Operating Construction Equipment - Maintenance and Repair Cost - Tire Cost - Consumable Costs - Mobilization and Demobilization Cost - Equipment Operator Cost - Special Items Cost - Methods of Calculating Ownership and Operating Cost - Caterpillar Method - Corps of Engineers Method - Associated General Contractors of America (AGC) Method –Peurifoy/Schexnayder Method - Comparison of Costs Calculated by Different Methods.

Construction Equipment Management

Acquiring Construction Equipment - Financing Methods - Outright Cash Purchase - Conventional Financing Purchase – Leasing – Renting - Rent-to-Own (Rental Purchase) - Equipment Financing Comparison - Acquisition Comparison - Rental and Lease Contract - The Buy, Lease, or Rent Decision. Equipment Life and Replacement Procedures - Equipment Life - Physical Life - Profit Life - Economic Life - Replacement Analysis - Theoretical Methods - Practical Methods - Sensitivity Analysis on Theoretical Methods - Comparison and Discussion of Sensitivity Analysis Results - Replacement Equipment Selection - Replacement Decision Making.

Equipment for Earthwork

Introduction to Earthmoving - Earthmoving Materials -Soil Identification and Classification – Soil Volume-Change Characteristics - Spoil Banks - Estimating Earthwork Volume - Construction Useof the Mass Diagram – Problems. Selection of construction equipment – Tractors – Classification of

equipment – Excavating and Lifting -Introduction - Hydraulic Excavators – Shovels – Draglines – Clamshells - Trenching and Trenchless Technology – Cranes – Problems. Loading and Hauling - Estimating Equipment Travel Time – Dozers – Loaders – Scrapers - Trucks and Wagons – Problems. Compacting and Finishing -

Principles of Compaction- Compaction Equipment and Procedures - Ground Modification - Grading and Finishing – Problems. Rock Excavation - Introduction - Drilling– Blasting– Rock Ripping - Estimating Production and Cost – Problems.

Equipment for Other Works

Production of Aggregate, Concrete, and Asphalt Mixes - Production of Aggregate - Crushers

– Feeders - Screening Equipment - Handling Equipment. Production of Concrete - Batching and Mixing Equipment - Hauling, Pouring and Pumping Equipment - Production of Asphalt Mixes – Problems. Paving and Surface Treatments- Concrete Paving –Asphalt Paving and Surface Treatments - Pavement Repair and Rehabilitation - Problems. Compressed Air and Water Systems - Introduction – Compressed Air Systems - Water Supply Systems – Problems. Drilling, Blasting And Tunnelling Equipment- Definition of terms, bits, Jackhammers, Drifters, wagon drills, che drills, piston drills, blast hole drills, shot drills, diamond drills, tunnelling equipment, selecting the drilling method equipment; selecting drilling pattern; Rates for drilling rock, compressors. Pile driving equipment: Pile hammers, selecting a pile hammer, loss of energy due to impact, Energy losses due to causes other than impact.

Equipment Scheduling

Horizontal Construction Projects – Introduction – Background - Precedence Diagramming Method - Determining the Critical Path - Critical Resource Identification - Resource Loading the Schedule - Cost Loading the Schedule -Linear Scheduling Method - Identifying Production-Driven Activities - Establishing Production Rates - Lines, Bars, and Blocks - Converting to PDM - Developing Equipment Resource Packages (Crews) - Rules for Developing Crew Sizes - Developing Crew Costs

- Establishing Project Management Assessment Parameters - Minimum Required Daily Production -Expected Daily Production - Allowable Cycle Time Variation - Cost and Unit Targets.

Vertical Construction – Introduction- Lifting and Vertical Constructions - Lifting Productivity - Scheduling Lifting for High-Rise Work - Lifting Strategy - Typical Lifting Activities for High-Rise Construction - Concrete-Placing Cranes - Bucket Pouring – Pumping - Scheduling and Ordering Concrete -Tower Crane Erection and Dismantling.

REFERENCES:

1. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, 6th Edition, Tata McGraw-Hill, New Delhi, 2003
2. Sharma S.C., *Construction equipment and management*, Khanna Publishers, New Delhi, 2011.
3. Douglas D. Gransberg, Calin M. Popescu, Richard C. Ryan, *Construction Equipment Management for Engineers, Estimators, and Owners*, Taylor & Francis Group, New York, 2006.
4. S. W. Nunnally, *Construction Methods and Management*, Pearson Prentice

Hall, New Jersey, 2007

COURSE OUTCOMES:

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

1. Manage the equipment, cost control and maintenance of a project.
2. Identify and understand the working principle of earthwork equipment's.
3. Identify and understand the working of various equipment's for different construction process.
4. Identify and understand the working principle of material handling equipment's.
5. Understand the concept of scheduling.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
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

23CZCMCP26	NUMERICAL ANALYSIS LAB AND MODEL TESTING LAB	L	Tr	S	C
		0	2	2	2

COURSE OBJECTIVES:

- To find roots of nonlinear equations by bisection method and newton's method.
- To study the system of linear equations using gauss- elimination/gauss-Seidal Iteration/gauss-Jorden method.
- To integrate using trapezoidal and Simpson's rules.
- To find the numerical solution of ordinary differential equations by Euler's method, Runge-kutta method.
- To learn response of structural models under static and dynamic conditions.

LIST OF EXPERIMENTS (NUMERICAL ANALYSIS LAB)

1. Find the roots of Non-Linear Equation Using Bisection methods.
2. Find the roots of Non-Linear Equation Using Newton's methods.
3. Curve fitting by least square approximation
4. Solve the system of Linear Equation Using Gauss-elimination Method.
5. Solve the system of Linear Equation Using Gauss-seidal iteration Method.
6. Solve the system of Linear Equation Using Gauss-Jorden Method.
7. Integrate numerically using Trapezoidal rule.
8. Integrate numerically using Simpson's rule.
9. Numerical solutions of ordinary Differential equations by Euler's methods.
10. Numerical solutions of ordinary Differential equations by Runge – Kutta method

LIST OF EXPERIMENTS (MODEL TESTING LAB)

1. Model Analysis – Continuous beam.
2. Model Analysis – Portal frame.
3. Model Analysis –Plate.
4. Free vibration analysis of wooden cantilever beam model.
5. Free vibration analysis of steel cantilever beam model.
6. Free vibration analysis of aluminum cantilever beam model.
7. Free vibration analysis of glass cantilever beam model.
8. Determination of viscous damping co-efficient for wooden beam model.
9. Determination of viscous damping co-efficient for steel beam model.
10. Determination of viscous damping co-efficient for aluminum beam model.
11. Determination of viscous damping co-efficient for glass beam model.
12. Free vibration Analysis of Simply Supported Steel Beam model.
13. Forced vibration Analysis of Simply Supported Steel Beam model.

COURSE OUTCOMES:

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

1. Understand roots of non linear equations by bisection method and newton's method.
2. Solve the system of linear equations using gauss- elimination/gauss-Seidal Iteration/ gauss-Jorden method.
3. Integrate numerically using trapezoidal and simpson's rules.
4. Solve the numerical solution of ordinary differential equations by Euler's method, Runge-kuttamethod.
5. To understand the response of structures under static and dynamic conditions.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3									3	3		
CO2	3	3	3									3	3		
CO3	3	3	3									3	3		
CO4	3	3	3									3	3		
CO5	3	3	3									3	3		

23CZCMTS27	INDUSTRIAL TRAINING AND SEMINAR/ MINI PROJECT	L	Tr	S	C
		0	2	2	2

COURSE OBJECTIVES:

- To study the response of structures.
- To understand the models.
- To know about model testing for static loading
- To know about model testing for free and forced vibrations
- To learn about Evaluation of dynamic modulus

The students individually undergo a training program in reputed concerns in the field of Construction Engineering and Management during the summer vacation (at the end of second semester for full – time / fourth semester for part – time) for a minimum stipulated period of four weeks. At the end of the training, the student has to submit a detailed report on the training he had, within ten days from the commencement of the third semester for Full-time / fifth semester for part- time. The students will be evaluated by a team of staff members nominated by head of the department through a viva-voce examination.

COURSE OUTCOMES:

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

1. Understand the response of structures.
2. Prepare the models.
3. Conduct model testing for static loading.
4. Conduct model testing for free and forced vibrations.
5. Evaluate of dynamic modulus.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	3		2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	3		2	3	3
CO3	3	3	3	3	3	3	3	2	3	3	3		2	3	3
CO4	3	3	3	3	2	3	3	3	3	3	3		2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3		2	3	3

SEMESTER III

23CZCMPV33	PROJECT WORK AND VIVA-VOCE PHASE I	L	Pr	S	C
		0	16	4	10

COURSE OBJECTIVES:

- To study structural engineering problems reviewing available literature.
- To study different techniques used to analyze complex structural systems.
- To evaluate given and present solution by using his/her technique applying engineering principles.
- To learn about contemporary / emerging technology.
- To manage effectively in oral and written form and formulate documents.

The student individually works on a specific topic approved by the Head of the Department under the guidance of a faculty member who is familiar in this area of interest. The student can select any topic which is relevant to the area of construction engineering and management. The topic may be theoretical or case studies. At the end of the semester, a detailed report on the work done should be submitted which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work. The students will be evaluated through a viva-voce examination by a panel of examiners including one external examiner.

COURSE OUTCOMES:

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

1. Identify structural engineering problems reviewing available literature.
2. Understand different techniques used to analyze complex structural systems.
3. Work on the solutions given and present solution by using his/her technique applying engineering principles.
4. Understand of contemporary / emerging technology.
5. Share knowledge effectively in oral and written form and formulate documents.

Mapping of COs with POs												Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO3	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3

SEMESTER IV

23CZCMPV41	PROJECT WORK AND VIVA-VOCE PHASE -II	L	T	P	C
		0	3	0	16

COURSE OBJECTIVES:

- To learn about the final report of project work in standard format
- To study about knowledge and skills in-depth and execution of new technical problem.
- To analyze suitable research design from different methodologies.
- To present the findings of their technical solution in a written report.
- To provide an information about presenting the work in International/National conference orreputed journals.

The student should continue the phase I work on the selected topic as per the formulated methodology under the same supervisor. At the end of the semester, after completing the work to thesatisfaction of the supervisor and review committee, a detailed report should be prepared and submitted to the head of the department. The students will be evaluated through based on the report and the viva-voce examination by a panel of examiners including one external examiner.

COURSE OUTCOMES:

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

1. Prepare the final report of project work in standard format for satisfactory completion of thework.
2. Synthesize knowledge and skills previously gained and applied to an in-depth study andexecution of new technical problem.
3. Capable to select from different methodologies, methods and forms of analysis to produce asuitable research design and justify their design..
4. Find technical solution in a written report.
5. Present the work in International/National conference or reputed journals.

Mapping of COs with POs												Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO2	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO3	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO4	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	1	2	2	3	3

23CZCMPE13	SYSTEM INTEGRATION IN CONSTRUCTION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the basics of structural integration and systems.
- To learn about the environmental factors and its relevant structural integration.
- To know the services regarding plumbing and electricity.
- To study the maintenance techniques and the materials involved.
- To understand the safety and preventive systems.

Structural Integration

Structural System, Systems for enclosing Buildings, Functional aesthetic system, Materials Selection and Specification.

Environmental Factors

Qualities of enclosure necessary to maintain a specified level of interior environmental quality

– weather resistance – Thermal infiltration – Acoustic Control – Transmission reduction – Air quality –illumination – Relevant systems integration with structural systems.

Services

Plumbing – Electricity – Vertical circulation and their interaction – HVAC.

Maintenance

Component longevity in terms of operation performance and resistance to deleterious forces - Planning systems for least maintenance materials and construction – access for maintenance – Feasibility for replacement of damaged components – equal life elemental design – maintenance free exposed and finished surfaces.

Safety

Ability of systems to protect fire – Preventive systems – fire escape system design – Planning for pollution free construction environmental – Hazard free Construction execution.

REFERENCES

1. A.J.Elder and MartizVindenBarg, *Handbook of Building Enclosure*, McGraw-Hill Book Company, 1983.
2. David V.Chadderton, *Building Services Engineering*, Taylar and Francis, 2007.
3. Jane Taylor and Gordin Cooke, *the Fire Precautions Act in Practices*, 1987.
4. Peter R. Smith and Warren G. Julian, *Building Services*, Applied Science Publishers Ltd., London, 1993.
5. William T. Mayer, *Energy Economics and Building Design*, McGraw-Hill Book Company, 1983.

COURSE OUTCOMES:

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

1. Have an idea about the system integration.
2. Understand the influence of environmental factors.
3. Learn about the Plumbing and Electricity services in construction Engineering.
4. Know about the maintenance in construction Engineering.
5. Attain knowledge about the safety systems in construction Engineering.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3		2									3	
CO2	3	3	3		2									3	
CO3	3	3	3		2									3	
CO4	3	3	3		2									3	
CO5	3	3	3		2									3	

23CZCMPE14	FORENSIC ENGINEERING AND RETROFITTING OF STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about Durability criteria of concrete structures.
- To find out the methods of investigation and Diagnosis of concrete structures.
- To examine about the repair materials.
- To provide an information about the strategies for repair and retrofitting of structures.
- To evaluate protection techniques of structures.

Durability and Deterioration of Concrete

Plastic Shrinkage - Plastic Settlement - Drying Shrinkage - Thermal Movement - Freez and Thaw - Weathering - Carbonation - Sulphate Action - Alkali-Aggregate Reaction.

Acids - Crazing - Honey Combing - Popouts - Creep - Abrasion - Erosion and Cavitation - Fire

- Sub-grade Movement - Formwork Movement - Premature Removal of Forms / Shores - Rebar Corrosion - Poor Design Details - Errors in Design.

Investigation and Diagnosis

General Considerations - Observation - Questioning - Field and Laboratory Testing - Destructive Testing - Non-Destructive Testing - Rebound Hammer - Ultrasonic Pulse Velocity - Pachometer - Semi-Destructive Testing - Probe Test - Pull-Out Test - Pull-Off Test - Break-Off Test - Core Test - Half-Cell Potential Measurements - Resistivity Measurements - Dust Sampling - Carbonation Depth Testing - Tests for determining cement content, chloride content and sulphate content.

Repair Materials

Patching Materials - Resurfacing Materials - Sealing Materials - Water-Proofing Materials - Admixtures - Substrate Preparation.

Refurbishment Techniques

Routing and Sealing - Stitching - External Stressing - Resin Injection - Grouting - Blanketing -Overlays - Sprayed Concrete - Prepacked Concrete – Dry packing - Jacketing - Plate Bonding **Protection Techniques**

Protective Coatings - Autogenous Healing - Vacuum Impregnation - Chloride Extraction -Realkalization of Concrete - Cathodic Protection.

REFERENCES:

1. Peter H.Emmons, *Concrete Repair and Maintenance*, Galgotia Publishers, 2001.
2. S.Champion, *Failure and Repair of Concrete Structures*, John Wiley & Sons, 1990.
3. Ted Kay, Assessment and Renovation of Concrete Structures, Longman Scientific &Technical, 1992.
4. R.T.L.Allen and S.C.Edwards, *The Repair of Concrete Structures*, Blackie &SonLtd.V.K.1987.
5. Sidney M.Johnson, *Deterioration, Maintenance and Repair of Concrete Structures*, McGraw-Hill Book Company, 1992
6. P.H.Perkins, *Repair, Protection and Waterproofing of Concrete Structures*, E & FN Spon,1997.
7. R.N.Raikar, *Diagnosis and Treatment of Structures in Distress*, Structwel, D & C Pvt. Ltd.
8. N.P.Mailvaganam, *Repair and Protection of Concrete Structures*, CRC Press, 1992.

COURSE OUTCOMES:

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

1. Understand the concepts of durability criteria.
2. Investigate the methods and Diagnosis of concrete structures.
3. Know about the repair materials.
4. Manage strategies for repair and retrofitting of structures.
5. Know the protection techniques of structures.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3		2									3	
CO2	3	3	3		2									3	
CO3	3	3	3		2									3	
CO4	3	3	3		2									3	
CO5	3	3	3		2									3	

23CZCMPE23	CONTRACT LAWS AND REGULATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce types of contract- Indian contract and International contract.
- To analyze World Bank Procedures and Guidelines – Tamilnadu Transparency in TendersAct.
- To find out the Powers and Duties of Arbitrator.
- To understand about the legal requirements for contracts and construction activities.
- To know about Labour regulations-Indian Factory Act – Tamilnadu Factory Act.

Construction Contracts

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document –Law of Torts.

Tenders

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

Arbitration

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs.

Legal Requirements

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land

– Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations.

Labour Regulations

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labor Administration – Insurance and Safety Regulations – Workmen's Compensation Act

– Indian Factory Act – Tamilnadu Factory Act – Child Labor Act - Other Labor Laws.

REFERENCES:

1. Gajaria G.T., *Laws Relating to Building and Engineering Contracts in India*,
2. Jimmie Hinze, *Construction Contracts*, McGraw Hill, 2001.
3. Joseph T. Bockrath, *Contracts and the Legal Environment for Engineers and Architects*,McGraw Hill, 2000.
4. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., *Fundamentals of Construction Management and Organisation*, Printice Hall, 1985.M.M.Tripathi Private Ltd., Bombay, 1982.
5. Patil. B.S, *Civil Engineering Contracts and Estimates*, Universities Press (India) PrivateLimited, 2006.

COURSE OUTCOMES:

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

1. Identify and understand the types of contract
2. Implement the various processes involved in tenders.
3. Achieve awareness on powers and duty of an arbitrator.
4. Assess the legal requirements and the corresponding government laws.
5. Achieve awareness about the Labour regulations-Indian Factory Act – Tamilnadu FactoryAct.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			2									3	
CO2	3	3			2									3	
CO3	3	3			2									3	
CO4	3	3			2									3	
CO5	3	3			2									3	

23CZCMPE24	CONSTRUCTION WORKPLACE AND EMPLOYEES BEHAVIOUR	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study about the Industrial Health and Psychological problems of Employees.
- To Know about Occupational Stresses.
- To learn about the individual stress factors and career planning.
- To study about the factors influencing personality and emotions.
- To know about formation of Group in organizations and decision making techniques.

Industrial Health, Safety

Causes of Accidents - Prevention – Safety Provisions – Industrial Health and Hygiene – Importance – Problems – Occupational Hazards – Diseases – Psychological problems – Counselling. **Stress in the Workplace**

Job Stress – Occupational Stresses – Self Assessment Exercise – Organizational Stressors – Individual Stressors in the Workplace – Environmental Stresses.

Common Stress Factors Time and Career Planning

Works Related Stress – Individual Stress – Reducing Stress – Burnout - Time Management – Techniques – Importance of planning the day – Time management schedule – Developing concentration – Organizing the Work Area – Prioritizing.

Individual Behaviour

Personality – types – Factors influencing personality – Theories – Types of learners – The learning process – Learning theories – Organizational behavior modification. Misbehavior – Types – Management Intervention. Emotions - Emotional Labour – Emotional Intelligence – Theories.

Group Behaviour

Organization structure – Formation – Groups in organizations – Influence – Group dynamics – Emergence of informal leaders and working norms – Group decision making techniques – Teambuilding **-** Interpersonal relations – Communication – Control.

REFERENCE:

1. ArunMonappa, RanjeetNambudiri, PatturajaSelvaraj. *Industrial relations and Labour Laws*.Tata
2. Fred Luthans, *Organisational Behavior*, McGraw Hill, 11th Edition, 2001.
3. House, New Delhi, 2007.
4. Mamoria C.B. and SathishMamoria, *Dynamics of Industrial Relations*, Himalaya Publishing
5. McGraw Hill. 2012
6. P.N.Singh, Neeraj Kumar. *Employee relations Management*. Pearson. 2011.
7. P.R.N Sinha, InduBala Sinha, SeemaPriyardarshiniShekhar. *Industrial Relations, Trade Unions and Labour Legislation*. Pearson. 2004
8. Srivastava, *Industrial Relations and Labour laws*, Vikas, 2007.
9. Stephen P. Robins, *Organisational Behavior*, PHI Learning / Pearson Education, 11th edition, 2008.

COURSE OUTCOMES:

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

1. Assess Industrial Health and Psychological problems of Employees.
2. Understand occupational Stresses.
3. Manage individual stress factors and career planning.
4. Solve the factors influencing personality and emotions.
5. Achieve awareness about formation of Group in organizations and decision makingtechniques.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3						3	2	3	1				3	
CO2	3						3	2	3	1				3	
CO3	3						3	2	3	1				3	
CO4	3						3	2	3	1				3	
CO5	3						3	2	3	1				3	

23CZCMPE31	CONSTRUCTION ECONOMICS AND FINANCE MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce about the Construction Economics.
- To study about the Finance management.
- To find about the financial control and the need of financial management.
- To evaluate the Accounting for tax reporting purposes and financial reporting purposes.
- To learn about subcontracting and purchasing

Economics

Interests and time value consideration-depreciation, tax, inflation-lifecycle cost analysis- approached to asset valuation-resource allocation decision for asset management-cost of construction resources-cost of construction, land and administration-contingencies provisions and management

Financing

Need for financial management-types of financing-short term borrowing-long term borrowing- leasing-equity financing-internal generation of funds-external commercial borrowing-assistance from government budgeting support and international finance corporation.

Analysis of Finance

Analysis of financial statements-balance sheet-profit and loss account-cash flow and fund flow analysis-ratio analysis-investment and financing-financial control-job control and centralized management.

Accounting Method

Basics of accounting method - budget and budgeting - site accounts-joint venture, project financial packaging, fund mobilization - accounting for tax reporting purposes and financial reporting purpose.

Lending to Contractors

Loans to contractors-work package breakdown-subcontracting and purchasing.

REFERENCES:

1. Cormican.D., Construction Management, Planning and Finance Construction press, London,1985.
2. G J Thuesen,W J Fabrycky, Engineering Economy, Prentice Hall, ©2001.
3. Anthony J Tarquin, Leland T Blank, Engineering Economy-A Behavioral Approach, McGraw-Hill, 1976.
4. R L Peurifoy, Solutions to Problems in Estimating Construction Costs, McGraw- Hill, ©1975.

COURSE OUTCOMES:

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

1. Have an idea about the Construction Economics.
2. Understand Finance management.
3. Analyze the financial control and the need of financial management.
4. Prepare accounting for tax reporting and financial reporting purposes.
5. Know about subcontracting and purchasing.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3				3	3		3	3				3	
CO2	3	3				3	3		3	3				3	
CO3	3	3				3	3		3	3				3	
CO4	3	3				3	3		3	3				3	
CO5	3	3				3	3		3	3				3	

23CZCMPEXX	PROJECT FORMULATION AND APPRAISAL	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the formulation,
- To study about the costing of construction projects, appraisal, finance and private sector participation in construction Industry.
- To examine different project appraisal methods.
- To know about project finance.
- To find about Technology Transfer

Project Formulation

Project – Concepts – Capital investments - Generation and Screening of Project Ideas - Project identification – Preliminary Analysis, Market, Technical, Financial, Economic and Ecological - Pre-Feasibility Report and its Clearance, Project Estimates and Techno-Economic Feasibility Report, Detailed Project Report – Different Project Clearances required.

Project Costing

Project Cash Flows – Time Value of Money – Cost of Capital.

Project Appraisal

NPV – BCR – IRR – ARR – Urgency – Pay Back Period – Assessment of Various Methods – Indian Practice of Investment Appraisal – International Practice of Appraisal – Analysis of Risk – Different Methods – Selection of a Project and Risk Analysis in Practice.

Project Financing

Project Financing – Means of Finance – Financial Institutions – Special Schemes – Key Financial Indicators – Ratios.

Private Sector Participation

Private sector participation in Infrastructure Development Projects - BOT, BOLT, BOOT - Technology Transfer and Foreign Collaboration - Scope of Technology Transfer.

REFERENCES:

1. Barcus, S.W. and Wilkinson.J.W., *Hand Book of Management Consulting Services*, McGrawHill, New York, 1986.
2. Joy P.K., Total Project Management - The Indian Context, New Delhi, Macmillan India Ltd.,1992
3. Prasanna Chandra, *Projects – Planning, Analysis, Selection, Implementation Review*, McGraw Hill Publishing Company Ltd., New Delhi. 2006.
4. United Nations Industrial Development Organisation (UNIDO) *Manual for the Preparation of Industrial Feasibility Studies*, (IDBI Reproduction) Bombay, 1987.

COURSE OUTCOMES:

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

1. Formulate and generate the project and prepare reports for executing the work.
2. Understand the costing and cash flows of a project.
3. Assess various methods of project appraisal.
4. Understand the project financing and special schemes.
5. Know about private sector participation in Infrastructure Development Projects

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3				3	3		3	3				3	
CO2	3	3				3	3		3	3				3	
CO3	3	3				3	3		3	3				3	
CO4	3	3				3	3		3	3				3	
CO5	3	3				3	3		3	3				3	

23CZCMPEXX	RESOURCE MANAGEMENTAND CONTROL INCONSTRUCTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concept of resource planning.
- To know about the resource allocation and leveling techniques in single and multi-projects.
- To study the various Systems approach in resource management.
- To evaluate the resources - material, equipment, labour and time.
- To know about the Skill in management of Time.

Resource Planning

Resource Planning, Procurement, identification, Personnel, Planning for material, Labour,time schedule and cost control. Types of resources, manpower, Equipment, Material, Money, Time. **Resource Allocation and Levelling**

Time-cost trade of, Computer application in resource leveling examples, resource list,resource allocation graph, Resource loading, Cumulative cost ETC – Value Management.

Resources Management

Systems approach in resource management, characteristics of resources, Resources, Utilization, measurement of actual resources required. Tools for measurement of resources- Labour- classes of Labour-Cost of Labour- Labour Schedule- optimum use Labour.

Materials and Equipment

Time of purchase- Quantity of material- sources- Transportation- Delivery and Distribution. Planning and selecting by optimistic choice with respect to cost- Time- Source and handling.

Time

Personnel time- Management and planning - Managing time on the project - forecasting the future - Critical path measuring the changes and their effects.

Cost control: Cash flow and cost control - objectives of cost - Time and Quality.

REFERENCES:

1. Andrew D, Szilagg, *Hand Book of Engineering Management*, 1982.
2. Richard H. Clough, Glenn A. Sears, *Construction Project Management* 2nd Edition, Wiley, ©1979.
3. Harvey A Levine*, Project Management using Microcomputers Osborne*,
4. McGraw-Hill, ©1986
5. James J Adrian, *Quantitative Methods in Construction Management Construction Systems*,Pub. Co., ©1973
6. R Oxley, J Poskitt, *Management Techniques Applied to the Construction Industry* ,BlackwellScience, 1996

COURSE OUTCOMES:

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

1. Understand the Resource Planning, Procurement and Identification.
2. Use the resource allocation and leveling techniques in single and multi-projects.
3. Implement various Systems approach in resource management.
4. Assess the resources - material, equipment, labour and time.
5. Manage time on the project and forecasting the future.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3				3	3		3	3				3	
CO2	3	3				3	3		3	3				3	
CO3	3	3				3	3		3	3				3	
CO4	3	3				3	3		3	3				3	
CO5	3	3				3	3		3	3				3	

23CZCMPEXX	CONSTRUCTION PLANNING, SCHEDULING AND CONTROL	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an information about the basic concepts in development of construction planning.
- To evaluate the elements of scheduling and to apply appropriate tools and techniques.
- To study about the monitoring and accounting of projects through cost control.
- To know about the concept of organizing and Use of Project Information.

Construction Planning

Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

Scheduling Procedures

Construction Schedules – Critical Path Method – Scheduling Calculations – Float – Presenting Project Schedules – Scheduling for Activity-on-Node and with Leads, Lags, and Windows
– Scheduling with Resource Constraints and Precedence.

Scheduling Techniques

Use of Advanced Scheduling Techniques – Scheduling with Uncertain Durations – Calculations for Monte Carlo Schedule Simulation – Crashing and Time/Cost Tradeoffs – Improving the Scheduling Process.

Cost Control, Monitoring and Accounting

The Cost Control Problem – The Project Budget – Forecasting for Activity Cost Control – Financial Accounting Systems and Cost Accounts – Control of Project Cash Flows –Schedule Control
– Schedule and Budget Updates – Relating Cost and Schedule Information.

Organization and Use of Project Information

Types of Project Information – Accuracy and Use of Information – Computerized Organization and Use of Information – Organizing Information in Databases – Relational Model of Databases – Other Conceptual Models of Databases – Centralized Database Management Systems – Databases and Applications Programs – Information Transfer and Flow.

REFERENCES:

1. Calin M. Popescu, ChotchaiCharoenngam, *Project Planning, Scheduling and Control inConstruction: An Encyclopedia of terms and Applications, Wiley, New York, 1995.*
2. Chitkara, K.K. *Construction Project Management: Planning, Scheduling and Control*,McGrawHill Publishing Company, New Delhi, 1998.
3. Chris Hendrickson and Tung Au, *Project Management for Construction – FundamentalConcepts for Owners, Engineers, Architects and Builders*, Prentice Hall, Pittsburgh, 2000.

COURSE OUTCOMES:

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

1. Understand the basic concepts in development of construction planning.
2. Understand the concepts in scheduling procedures.
3. Apply appropriate tools and techniques for scheduling.
4. Gain knowledge about the monitoring and accounting of projects through cost control.
5. Apply the concept of organization and Use of Project Information

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3				3	3		3	3				3	
CO2	3	3				3	3		3	3				3	
CO3	3	3			2	3	3		3	3				3	
CO4	3	3				3	3		3	3				3	
CO5	3	3				3	3		3	3				3	

23CZCMPEXX	ADVANCED TOPICS IN ACOUSTICS, LIGHTING AND VENTILATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To examine the effects of acoustics in buildings.
- To analyze the concepts of day lighting and components of daylight factor
- To study about the concept of ventilation and calculation of natural ventilation

Acoustics

Sound – Velocity of sound – Frequency and intensityof sound – Reflection of sound – Reverberation –Absorption of sound – Sabin's equation – Absorptionmaterials – Conditions for goodacoustics.

Design of an auditorium – Defects in an auditorium and their remedies. Acoustics of studies –Noise and its effects – Type of noises – Transmission of noise – Sound insulation –Transmission loss
– Acceptable noise levels – Method of sound insulation.

Lighting

Day lighting (or) Natural lighting – Design of windows– Orientation of buildings – Lighting for industrial structure – Supplementary illumination – Artificial illumination – Summary.

Ventilation

Ventilation due to wind – Ventilation due to stack effect – Ventilation due to combined effect – Infiltration –Ventilation of industrial building – Calculation of Natural Ventilation.

Mechanical Ventilation – Examples –Building regulation – Air Conditioning – Summary.

REFERENCES

1. Percy L. Marks, *A Handbook for Architects and Engineers*, 1940.
2. Leo. L., Beranek, *Music, Acoustics & Architecture,* 1962.
3. Frederick S. Merritt, *Standard Handbook for Civil Engineers* (Third edition), 1986.
4. Hopkinson R.G., *Architectural Physics Lighting*, 1963.
5. George A.Hool S.B & Nathan, *Handbook of Building Construction,* 1929.
6. Andrews F.T., *Building Mechanical Systems,* 1966.

COURSE OUTCOMES:

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

1. Learn about the effects of acoustics in buildings.
2. Learn about the design of an auditorium.
3. Understand the concepts of day lighting and components of daylight factor.
4. Understand the concept of ventilation and calculation of natural ventilation.
5. Understand the concept of mechanical ventilation and air conditioning.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3						3			3				3	2
CO2	3						3			3				3	2
CO3	3						3			3				3	2
CO4	3						3			3				3	2
CO5	3						3			3				3	2

23CZCMPEXX	INFORMATION TECHNOLOGY FOR CONSTRUCTION MANAGERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce about computer networking and use of network.
- To learn about the Database application in construction industry.
- To study about the role and types of information systems.
- To analyze the development and planning of information systems.
- Know about Computer aided design and issues in information systems.

Networking and Internet

Introduction to computer networking - Uses of a network - Types of networks - Network topologies, Internet, Intranet, World Wide Web - E Commerce Applications – Emailing, Chatting, Surfing, Blog – Browsers, Search Engines Concepts of Web upload, download – Threats – Spyware,Adware, SPAM

Database Application

Creating Database Using MS Access, Tables, Relationships, Queries, Forms, Reports

.Management Information System: Introduction, Responsibilities of a Property Systems Manager, MIS Security Issues, Information Protection and Problems caused by the use of PC‘s - Selecting and Implementing a Computer System – Installation, Introduction to Point of Sale, Computerized Reservation System, Global Distribution System

Information Systems for Strategic Management

Meaning and Role of Information Systems, Types of Information Systems: Operations Support Systems, Management Support Systems, Office Automation System, Decision Support Systems, Expert Systems, and Knowledge Management Systems. Competitive Strategy Concepts, Strategic Role of Information Systems, Integrating Information Systems with Business Strategy, Value Chain Analysis, Computer Applications for cost control, scheduling and time management.

Planning for Information Systems

System Development Process, Identification of Applications, Resource Requirements for Information Systems: Hardware and Capacity Planning, Software Needs, Implementation, Risks in Information Systems. Procurement Options – Make or Buy decisions, IS Outsourcing,

Emerging Concepts and Issues in Information Systems

Enterprise Resource Planning, electronic business, Supply Chain Management, Customer Relationship Management, GIS Applications in Real Estate, Introduction to Data Warehousing, Data Mining and its Applications. Computer aided design and visualization – building engineering application – computer aided cost estimation – planning, scheduling, site management – computer aided facilities management – integration – business and information management

REFERENCES:

1. S.J.Xavier Alphonse, *Computer Made Easy-A textbook on Basic Computing Skills*, ICRDCE Publications. 2011.
2. Peter Norton, "*Introduction to computers*", 7th Edition, Tata McGraw Hill,(2010).
3. Henry C.Lucas, "*Information Technology for Management*", Tata McGraw – Hill,(2001).
4. Elmasri*. R,* Navathe*.S*. "*Fundamentals of Database systems*", Third Edition, AddisonWesley,2000.
5. Prasanna Chandra. *A management guide to PERT/CPM Project planning , analysis andselection*.2011
6. Tim Pyron, *Using Microsoft Project*,2003
7. David A. Marchman**,** *Construction scheduling with Primavera*,2003

COURSE OUTCOMES:

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

1. Have an idea about computer networking and use of network.
2. Use database application in construction industry.
3. Implement the role and types of information systems.
4. Identify the development and planning of information systems.
5. Formulate and generate computer aided design and issues in information systems.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3				3	2	1		2				2	2
CO2	3	3				3	2	1		2				2	2
CO3	3	3				3	2	1		2				2	2
CO4	3	3				3	2	1		2				2	2
CO5	3	3				3	2	1		2				2	2

23CZCMPEXX	ADVANCED CONCRETE TECHNOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the cementitious material and its properties.
- To study mix design for different types of concrete.
- To Understand the properties of fresh and hardened concrete
- To Know the special types of concrete
- To study the various concreting methods.

Constituents of concrete - Portland cement – composition – types – codal standards – hydration – structure of hydrated cement paste – factors influencing cement quality – supplementary Cementitious materials and their characterization – admixtures - construction chemicals - classification - mechanism – performance – application – aggregates - shape – properties – absorption – chemical stability – packing characteristics – effect of aggregate on concrete properties – conventional and non-conventional aggregates – light weight and heavy weight aggregates – significance of aggregate characterization.

Concrete mixture proportion - concrete constituents – relevant parameters – relationships of mix Composition and properties of concrete – Principles of concrete mix design, Methods of concrete mix design, IS Method, ACI Method, DOE Method– Statistical quality control–Sampling and acceptance criteria. High Performance – Entropy and Shack lock's Empirical graphs –particle packing theory.

Properties of fresh concrete - Workability – factors influencing – loss of workability – setting – hardening – plastic and thermal cracking – Interfacial Transition Zone – fracture strength – mechanical properties – shrinkage – creep – temperature effects - Durability of concrete - basic considerations – stability of constituents – permeation characteristics – testing – chemical attack – freeze and thaw action – efflorescence - Testing of fresh and hardened concrete – non-destructive testing.

Special concretes -Fibre reinforced concrete – aerated concrete – no fines concrete – SIFCON – SIMCON - spun concrete – polymer concrete – lightweight concrete – high density concrete – high performance concrete (HPC) – self compacting concrete (SCC)– vacuum concrete. Fly ash concrete, Fibre reinforced concrete, Sulphur impregnated concrete, Polymer Concrete–High performance concrete. High performance fiber reinforced concrete, Self- Compacting-Concrete, Geo- Polymer Concrete, Waste material based concrete–Ready mixed concrete – Testing methods –Codal standards –principle – mechanism – properties – applications

Process of manufacturing of ready mix concrete, methods of transportation, placing and curing. Extreme weather concreting, special concreting methods. Vacuum dewatering–Underwater Concrete.

REFERENCES:

1. Mehta, P.K., and Montero, P.J.M., *Concrete Microstructure, Properties and*

Materials, IndianConcrete Institute Chennai, 1999.

2. Neville, A.M., *Properties of Concrete*, 4th Edition, Longman, 1995.
3. Mindess and Young, *Concrete,* Prentice Hall, 1998.
4. John Newman and Ban Seng Choo, *Concrete Technology*, *Vol. I to IV*, Elsevier, 2003.
5. Francois de Larrard, *Concrete Mixture Proportioning – Scientific Approach* E &FN SPON,London, 1999.
6. Jan P. Skalny, *Material Science of Concrete*, *Vol. I to IV*, The American Ceramic Society, Inc.Westerville, OH., 1989.
7. Krishna Raju, N, *Design of Concrete Mixes*, CBS Publishers, Delhi, 2000.

COURSE OUTCOMES:

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

1. Understand the cementitious material and its properties.
2. Carry out mix design for different types of concrete.
3. Assess the properties of fresh and hardened concrete
4. Gain knowledge about the special types of concrete
5. Adopt various concreting methods.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3									3				3	
CO2	3		2							3				3	
CO3	3									3				3	
CO4	3									3				3	
CO5	3									3				3	

23CZCMPEXX	**ANALYTICAL AND NUMERICAL METHODS FOR CONSTRUCTION ENGINEERS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To introduce basic concepts of numerical methods applicable to construction problems.
- To learn a written computer program for solving a mathematical problem.

Fundamentals of Numerical Methods: Error Analysis, Polynomial Approximations and Interpolations,

Curve Fitting; Interpolation and extrapolation.

Solution of Nonlinear Algebraic and Transcendental Equations

Elements of Matrix Algebra: Solution of Systems of Linear Equations, Eigen Value Problems. **Numerical Differentiation & Integration:** Solution of Ordinary and Partial Differential Equations.

Finite Difference scheme: Implicit & Explicit scheme.

Computer Algorithms: Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.

REFERENCES:

1. An Introduction to Numerical Analysis, Atkinson K.E., J. Wiley and Sons, 1989.
2. Theory and Problems of Numerical Analysis, Scheid F, McGraw Hill Book Company, (Shaum Series), 1988.
3. Introductory Methods of Numerical Analysis, Sastry S. S, Prentice Hall of India

COURSE OUTCOMES:

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

1. Solve ordinary and partial differential equations in structural mechanics using numerical methods.
2. Gain the knowledge about the solution of nonlinear equations.
3. Understand the solution of differential equations.
4. Solve the problems using finite difference scheme.
5. Write a program to solve a mathematical problem using software.

Mapping of COs with POs												Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3	3									3	3		
CO2	3	3	3									3	3		
CO3	3	3	3									3	3		
CO4	3	3	3									3	3		
CO5	3	3	3									3	3		

23CZCMPEXX	ADVANCED CONSTRUCTION METHODS FOR SPECIAL STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study about the special structures and their applications.
- To learn about the construction methods of Bridge structures.
- To know about the construction methods of tunnelling and underground structures.
- To analyze the construction methods of marine structures.
- To study about Construction methods and techniques for high-rise buildings and power plantstructures.

Introduction

Types of Special Structures: According to - location/environment, design, strength, radiation shielding, shape, aesthetic appearance, type of construction methods and techniques

Bridge Structures

Bridges, steel bridges, arch bridges, cantilever bridges, box girders. Construction of special type of bridges - cable stayed bridge, suspension and pre-stressed bridge. Segmental construction, cantilever construction, incremental construction, successive launching and pushing of box decks.

Underground Structures

Pipe lines, bedding of conduits. Trenchless technology. Tunnelling methods – mechanical boring, cut and cover construction, drilling and blasting, tunnel driving in hard & soft strata and TBM tunnelling. Tunnel forming components, safety in tunnelling operations.

Construction of Metro Railway structures - Underground and over ground structures, Viaduct Ground anchoring & diaphragm walls, launching gantry crane. Problems and solutions –during maintenance and up-keep of structures. Fire, Ventilation, Dewatering, power supply, Subsidence, Vibration.

Marine Structures

Off shore structures - beacons, oil drilling platforms, jetties and break water structures. Dredging equipment's and techniques for construction of channels and islands. Laying operations for built up off-shore system. Underwater concreting using tremie method, underwater construction- problems encountered, caisson well sinking methods – conventional and jack down methods.

High Rise Structures and Power Plant Structures

Construction methods and techniques for high-rise buildings, continuous concreting erection of prefabricated components on tall structures, tunnel form, launching techniques for heavy decks, Slip form, jump form, dry wall technology. Fire fighting and safety. Construction Sequence and methods in Cooling towers, Silos, Chimney.

Construction methods for power generating structures. Thermal power stations, Atomic powerstations. Windmills, chimneys (single and multi-flue). Cooling towers - Natural Draft Cooling Towers (NDCT) & Induced Draft Cooling Tower (IDCT). Ash handling system, containment structure, Electro Static Precipitator (ESP). Installing major components inside the reactor and containment building. Energy management - power factor, management of maximum demand, energy savings in(pumps &equipment's, compressed air systems, fans, lighting system, air

conditioning system) construction projects.

REFERENCES:

1. Jerry Irvine, *Advanced Construction Techniques*, California Rocketry, 1984.
2. Illingworh. J R, *Construction Methods and Planning*, E& FN Spon, 2000.
3. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., *Construction Planning, Equipment and Methods*, McGraw Hill, Singapore, 2006.
4. Sankar.S.K and Saraswati.S *Construction Technology* Oxford University Press, NewDelhi 2008.
5. *National Building Code of India*, *Part-IV and VII* – 2006.

COURSE OUTCOMES:

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

1. Understand the special structures and their applications.
2. Assess construction methods of Bridge structures.
3. Evaluate the construction methods of tunneling and underground structures.
4. Gain knowledge about the construction methods of marine structures.
5. Get an exposure on construction methods and techniques for high-rise buildings and powerplant structures.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3									3				3	
CO2	3		2							3				3	
CO3	3									3				3	
CO4	3									3				3	
CO5	3									3				3	

23CZCMPEXX	DESIGN OF FORMWORK	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide the basic concepts understand the design of form work.
- To familiarise the students with deferent types of form work.

Introduction:

Requirements and Selection of Formwork - Formwork Materials- Timber, Plywood, Steel,Aluminum, Plastic, and Accessories. Horizontal and Vertical Formwork Supports.

Formwork Design:

Concepts, Formwork Systems and Design for Foundations, Walls, Columns, Slab and Beams.

Formwork Design for Special Structures:

Shells, Domes, Folded Plates, Overhead Water Tanks, Natural Draft Cooling Tower,Bridges.

Flying Formwork:

Table Form, Tunnel Form, Slip Form, Formwork for Precast Concrete, FormworkManagement Issues –Pre- and Post-Award.

Formwork Failures:

Causes and Case studies in Formwork Failure, Formwork Issues in Multi-Story BuildingConstruction.

REFERENCES:

1. Peurify, Formwork for Concrete Structures, McGraw Hill India, 2015.
2. Kumar Neeraj Jha, Formwork for Concrete Structures, Tata McGraw Hill Education, 2012.
3. IS 14687: 1999, False work for Concrete Structures - Guidelines, BIS.

COURSE OUTCOMES:

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

1. Select proper formwork, accessories and material.
2. Design the form work for Beams, Slabs, columns, Walls and Foundations.
3. Design the form work for Special Structures.
4. Understand the working of flying formwork.
5. Judge the formwork failures through case studies.

Mapping of COs with POs												Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3				3					3				3	
CO2	3				3					3				3	
CO3	3				3					3				3	
CO4	3				3					3				3	
CO5	3				3					3				3	

OPEN ELECTIVES

23CZCMOE35	COMPUTER APPLICATION IN CONSTRUCTION	L	T	P	C

	ENGINEERING AND PLANNING	3	0	0	3

COURSE OBJECTIVES:

- To evaluate Computer aided Cost Estimation.
- To know about the techniques of linear, dynamic and integer programming.
- To learn about Inventory models.
- To study about advanced planning and scheduling concepts.
- To learn about Sequencing problems.

Introduction

Overview of IT Applications in Construction – Construction process – Computerization in Construction – Computer aided Cost Estimation – Developing application with database software.

Optimization Techniques

Linear, Dynamic and Integer Programming - Branch and Bound Techniques – Application to Production Scheduling, Equipment Replacement, Material Transportation and Work Assignment Problems – Software applications.

Inventory Models

Deterministic and Probabilistic Inventory Models - Software applications.

Scheduling Application

PERT and CPM - Advanced planning and scheduling concepts – Computer applications – Case study.

Other Problems

Sequencing problems – Simulation – Enterprises – Introduction to ERP systems.

REFERENCES:

1. Boyd C Paulson, *Computer Applications in Construction*, McGraw-Hill, ©1995
2. Billy E Gillett, *Introduction to Operations Research-A Computer-Oriented AlgorithmicApproach*, McGraw-Hill, ©1990.
3. Leslie Feigenbaum, *Construction Scheduling with Primavera Project planner*, Prentice Hall, ©2002.

COURSE OUTCOMES:

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

1. Use Computer aided Cost Estimation.
2. Apply the techniques of linear, dynamic and integer programming.
3. Generate inventory models.
4. Understand advanced planning and scheduling concepts.
5. Develop skills on sequencing problems.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3		3									3	3		
CO2	3		3									3	3		
CO3	3		3									3	3		
CO4	3		3									3	3		
CO5	3		3									3	3		

23CZCMOE32	GEOGRAPHIC INFORMATION SYSTEM IN CONSTRUCTION ENGINEERING AND MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an information about the application of GIS software in construction projects.
- To Know about Geo reference data and data access.
- To Know about Data structure and Database Management system.
- To learn about Data Quality and its output..

Introduction to GIS

GIS – Definition – Components of GIS -Maps – Definition – Types of Maps – Characteristics of Maps – Map Projections –– Hardware, Software and Organizational Context – GIS software

Types of Data

Data Types – Spatial and Non-Spatial – Spatial Data – Points, Lines and areas– Non-spatial data – Types of Map scale- Nominal, Ordinal, Interval and Ratio – Digitizer – Scanner – Editing and Cleaning – Geo reference data- File and data access.

Data Structure

Raster and Vector Data Structure – Raster data storage – Methods of data compression-Run length, Chain and Block Coding – Vector Data Storage – Topology – Topological Models – Arc Node Structure – Surface Data – DEM – Grid DEM and TIN structure Applications of DEM- Database Management system

Data Quality and Output

Reclassification – Measurement – Buffering – Overlaying – SQL for Queries – Neighborhood and Zonal operations – Data Quality – Components of data quality - Sources of errors in GIS – Meta data- Output – Maps, Graphs, Charts, Plots , Reports – Printers – Plotters

Fields of application-construction management Parcel based, AM/FM applications examples –Case study.

REFERENCES:

1. Burrough P.A., "*Principles of GIS for Land Resources Assessment*", Oxford Publication, 2008.
2. Robert Laurini and Derek Thompson, "*Fundamentals of Spatial Information Systems*",Academic Press, 2006.
3. Anji Reddy, "*Remote Sensing and Geographical Information Systems*", BS Publications 2001
4. Srinivas M.G. (Edited by), "*Remote Sensing Applications*", Narosa Publishing House, 2001.
5. Rhind, D., "*Understanding of GIS, the ARC / INFO Method*", ESRI Press. 2000.

COURSE OUTCOMES:

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

1. Understand the application of GIS software in construction projects.
2. Analyze Geo reference data and data access.
3. Gain knowledge about data structure and database management system.
4. Assess the Data Quality and its output.
5. Apply in the field for management and from case studies.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3							2					3	
CO2	3	3							2					3	
CO3	3	3							2					3	
CO4	3	3							2					3	
CO5	3	3							2					3	

23CZCMOEXX	SHORING, SCAFFOLDING AND FORMWORK	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the detailed planning of formwork and materials associated with formwork.
- To learn about the design aspects of formwork under various requirements.
- To know the design of forms and shores.
- To evaluate the planning and erection aspects of form work for buildings.
- To know the latest methods of form construction.

Planning, Site Equipment and Plant for Form Work

Introduction - Forms for foundations, columns, beams walls etc., General objectives of formwork building - Planning for safety - Development of a Basic System - Key Areas of cost reduction - Planning examples. Overall Planning - Detailed planning - Standard units - Corner units - Pass units - Calculation of labour constants - Formwork hours - Labour Requirement - Overall programme - Detailed programme - Costing - Planning crane arrangements - Site layout plan - Transporting plant - Formwork beams - Scaffold frames - Framed panel formwork - Formwork accessories.

Materials Accessories Proprietary Products and Pressures

Lumber - Types - Finish - Sheathing boards working stresses - Repetitive member stress - Plywood - Types and grades - Jointing Boarding - Textured surfaces and strength - Reconstituted wood - Steel - Aluminum - Hardware and fasteners - Nails in Plywood - Allowable withdrawal load and lateral load. Pressures on formwork - Examples - Vertical loads for design of slab forms - Uplift on shores - Laterals loads on slabs and walls.

Design of Forms and Shores

Basic simplification - Beam formulae - Allowable stresses - Deflection, Bending - Lateral stability - Shear, Bearing - Design of Wall forms - Slab forms - Beam forms - Column forms - Examples in each. Simple wood stresses - Slenderness ratio - Allowable load vs length behaviour of wood shores - Form lining Design Tables for Wall formwork - Slab Formwork - Column Formwork - Slab props - Stacking Towers - Free standing and restrained - Rosett Shoring - Shoring Tower - Heavy Duty props.

Building and Erecting the Form Work

Carpentry Shop and job mill - Forms for Footings - Wall footings - Column footings - Sloped footing forms - Strap footing - Stepped footing - Slab form systems - Sky deck and Multiflex - Customized slab table - Standard Table module forms - Swivel head and uniportal head - Assembly sequence - Cycling with lifting fork - Moving with table trolley and table prop. Various causes of failures - ACI - Design deficiencies - Permitted and gradual irregularities.

Forms for Domes and Tunnels, Slip Forms and Scaffolds

Hemispherical, Parabolic, Translational shells - Typical barrel vaults Folded

plate roof details - Forms for Thin Shell roof slabs design considerations - Building the forms - Placing concrete - Form removed -Strength requirements -Tunnel forming components - Curb forms invert forms - Arch forms
- Concrete placement methods - Cut and cover construction - Bulk head method - Pressures on tunnels - Continuous Advancing Slope method - Form construction - Shafts. Slip Forms - Principles - Types - advantages - Functions of various components - Planning -Desirable characteristics of concrete - Common problems faced - Safety in slip forms special structures built with slip form Technique - Types of scaffolds - Putlog and independent scaffold -Single pole scaffolds - Truss suspended - Gantry and system scaffolds.

REFERENCES:

1. Austin, C.K., *Formwork for Concrete, Cleaver* -Hume Press Ltd., London, 1996.
2. Hurd, M.K., *Formwork for Concrete*, Special Publication No.4, American Concrete Institute,Detroit, 1996
3. Robert L. Peurifoy and Garold D. Oberlender, *Formwork For Concrete Structures*, McGraw - Hill , 1996.

COURSE OUTCOMES:

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

1. Have an idea about the detailed planning of formwork.
2. Understand the design aspects of formwork under various requirements.
3. Formulate the design of forms and shores.
4. Identify the planning and erection aspects of form work for buildings.
5. Share knowledge about the latest methods of form construction.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	VALUE ENGINEERING AND VALUATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide a basic information about value engineering.
- To learn about the various value analysis.
- To examine different methods of performing value engineering.
- To study about the types, purpose and factors affecting valuation.
- To learn about valuation report.

Value

Value - Meaning of value, basic and secondary functions, factor contributing to value such as

aesthetic, ergonomic, technical, economic: identifying reasons or unnecessary costs :

Value Analysis

10 Commandments of value analysis; value analysis team; principles of value analysis, elements of a job plan viz. orientation, Information, presentation. Implementation, follow up action, benefits of value analysis, various applications; assessing effectiveness of value analysis.

Life Cycle Costing

Life cycle costing – Forecasting of Capital as well as operating & maintenance costs, time value, present worth analysis, DCF methods, ROR analysis, sensitivity analysis. Different methods ofperforming value engineering.

Valuation

Types of value, purposes of valuation factors affecting value. Different methods of valuation for different types of assets such as land and building, horticulture, historical places.

Valuation Report

Valuation Report, contents, standard formats, Case study of any one Report.

REFERENCES:

1. Del Younke,*Value Engineering: Analysis And Methodology*
2. O.P.Khanna,*IndustrialEngg. & Mgt*., DhanpatRai Publ.
3. T.R.Banga, S.C.Sharma,*Industrial Organization &Engg. Economics*, Khanna Publ.
4. B.N Dutta,*Estimating and Costing in Civil Engineering: Theory and Practice*
5. M.Chakraborty,*Estimating, Costing Specifications & valuation in Civil Engineering*
6. G.S.Birdie,*Estimating and Costing*
7. CharotarRangwala,*Estimating and Costing*Publishedby Publishing House,
8. P.T.Joglekar,*Practical Information for Quantity Surveyors, Property valuers, ArchitectsEngineers andBuilders*, Pune,VidyarthiGrihaPrakashan, 2008 reprint.

COURSE OUTCOMES:

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

1. Know about value engineering.
2. Understand the various value analysis.
3. Analyze different methods of performing value engineering.
4. Explain about the types, purpose and factors affecting valuation.
5. Generate valuation report

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3					3	3		3			3	3	2	
CO2	3		3			3	3		3			3	3	2	
CO3	3		3			3	3		3			3	3	2	
CO4	3		3			3	3		3			3	3	2	
CO5	3		3			3	3		3			3	3	2	

23CZCMOEXX	ENERGY CONSERVATION TECHNIQUES INBUILDING CONSTRUCTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To evaluate energy production systems and energy economic analysis.
- To understand the environmental aspect and resource conservation.
- To introduce smart buildings and energy efficient design strategies.
- To study about the energy efficient and environment friendly building.
- To learn about the concepts of energy management of electrical equipment.

Introduction

Fundamentals of energy - Energy Production Systems - Heating, Ventilating and air conditioning - Solar Energy and Conservation - Energy Economic Analysis – Energy conservation and audits - Domestic energy consumption – savings -Energy use in buildings - Residential - commercial buildings.

Environmental

Energy and Resource conservation – Design of green buildings – Evaluation tools for building energy - Embodied and operating energy - Peak demand – Comfort and Indoor air quality - Visual and acoustical quality - Land, water and materials – Airborne emissions and waste management.

Design

Natural building design consideration - Energy efficient design strategies – Contextual factors

- Longevity and process Assessment –Renewable energy sources and design- Advanced building Technologies - Smart buildings - Economies and cost analysis.

Services

Energy in building design - Energy efficient and environment friendly building – Thermal phenomena - thermal comfort - Indoor Air quality - Climate, sun and Solar radiations - Psychometrics

- passive heating and cooling systems - Energy Analysis – Active HVAC systems - Preliminary Investigation - Goals and policies - Energy audit – Types of energy audit - Analysis of results - Energyflow diagram – Energy consumption/ Unit production - Identification of wastage - Priority of conservative measures - Maintenance of management programme.

Energy Management

Energy management of electrical equipment - Improvement of power factor - management ofmaximum demand - Energy savings in pumps - Fans - Compressed air systems - Energy savings in Lighting systems - Air conditioning systems – Applications.

REFERENCES:

1. Fuller Moore ,*Environmental Control Systems - Heating, Cooling, Lighting,* Tata McGraw-Hill,
   © 1993.
2. G Z Brown, Mark DeKay, Sun, Wind & Light , *Architectural Design Strategie*s, Wiley, ©2001
3. Cook, J, Award - *Winning passive Solar Design*, Mc Graw Hill, 1984.

COURSE OUTCOMES:

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

1. Have an idea about energy production systems and energy economic analysis.
2. Know the environmental aspect and resource conservation.
3. Share knowledge about smart buildings and energy efficient design strategies.
4. Get an exposure on the energy efficient and environment friendly building.
5. Understand the concepts of energy management of electrical equipment.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	COMPOSITE CONSTRUCTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the concept of composite structures and sandwich construction.
- To know about the design of composite members.
- To study about the types and design of connections.
- To know about the design of box girder bridges.
- To find out the seismic behaviour of composite structures.

Introduction

Introduction to steel - concrete composite construction - theory of composite structures -Introduction to steel - concrete - steel sandwich construction.

Design of Composite Members

Behaviour of composite beams, columns, design of composite beams, steel compositecolumns - design of composite trusses.

Design of Connections

Types of connections, Design of connections in the composite structures – shearconnections- Design of connections in composite trusses.

Composite Box Girder Bridges

Introduction - behaviour of box girder bridges - design concepts.

Case Studies

Case studies on steel-concrete composite construction in buildings – Seismic behaviour ofcomposite structures.

REFERENCES:

1. R. P. Johnson, *Composite Structures of Steel and Concrete: Beams, Slabs, Columns, andFrames for Buildings* - Page 1, Blackwell Publishing 2004.
2. Graham W Owens, P R Knowles, P J Dowling, *Steel Designers' Manual, Steel ConstructionInstitute* (Great Britain), Blackwell Scientific Publications, 1994.

COURSE OUTCOMES:

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

1. Assess the concept of composite structures and sandwich construction.
2. Formulate the design of composite members.
3. Identify the types and design of connections.
4. Formulate know about the design of box girder bridges.
5. Understand seismic behaviour of composite structures.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	ADVANCED CONSTRUCTION ENGINEERING TECHNIQUES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about design of underwater construction.
- To study about the construction techniques of high rise and large span structures.
- To study about the construction techniques of special structures like Silo, chimney, etc,.
- To learn about seismic retrofitting and strengthening techniques.
- To know about demolition and dismantling techniques.

Sub Structure Construction

Box jacking - Pipe jacking - Under water construction of diaphragm walls and basement - Tunneling techniques - Piling techniques - Driving well and caisson - sinking cofferdam - cable anchoring and grouting - Driving diaphragm walls, Sheet piles - Laying operations for built up offshore system - Shoring for deep cutting - Large reservoir construction - well points - Dewatering for underground open excavation.

Super Structure Construction for Buildings

Vacuum dewatering of concrete flooring – Concrete paving technology – Techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections – Erection techniques of tall structures, Large span structures – launching techniques for heavy decks – in-situ prestressing in high rise structures, Post tensioning of slab- aerial transporting – Handling and erecting lightweight components on tall structures.

Construction of Special Structures and Demolition

Erection of lattice towers - Rigging of transmission line structures – Construction sequence in cooling towers, Silos, chimney, sky scrapers - Bow string bridges, Cable stayed bridges – Launching and pushing of box decks – Construction of jetties and break water structures – Construction sequence and methods in domes – Support structure for heavy equipment and machinery in heavy industries – Erection of articulated structures and space decks.

Rehabilitation and Strengthening Techniques

Seismic retrofitting - Strengthening of beams - Strengthening of columns - Strengthening of slab - Strengthening of masonry wall, Protection methods of structures, Mud jacking and grouting for foundation – Micro piling and underpinning for strengthening floor and shallow profile - Sub grade water proofing, Soil Stabilization techniques.

Demolition

Demolition Techniques: Demolition by Machines, Demolition by Explosives, Advanced techniques using Robotic Machines, Demolition Sequence, Dismantling Techniques, Safety precaution in Demolition and Dismantling.

REFERENCES:

1. Jerry Irvine, *Advanced Construction Techniques*, CA Rocketr, 1984
2. Patrick Powers. J., *Construction Dewatering: New Methods and Applications*, John Wiley &Sons, 1992.
3. Peter.H.Emmons, "*Concrete repair and maintenance illustrated*", Galgotia Publications Pvt.Ltd., 2001.Press, 2008.
4. Robertwade Brown, *Practical foundation engineering hand book*, McGraw Hill Publications,1995.
5. Sankar, S.K. and Saraswati, S., *Construction Technology*, Oxford University Press, NewDelhi, 2008.

COURSE OUTCOMES:

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

1. Formulate the design of underwater construction.
2. Use the construction techniques of high rise and large span structures.
3. Use the construction techniques of special structures like Silo, chimney, etc,.
4. Achieve awareness about seismic retrofitting and strengthening techniques.
5. Learn about demolition and dismantling techniques.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	PREFABRICATED STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about planning and layout of prefabrication plant and IS Code specifications.
- To learn about prefabricated structures and its connections.
- To analyze the design of roof slab, Stair case, floor slab.
- To study about various types of wall.
- To study about industrial buildings and shell roofs.

Design Principles

General Civil Engineering requirements, specific requirements for planning and layout of prefabrication plant. IS Code specifications. Modular co-ordination, standardization, Disuniting of Prefabricates, production, transportation, erection, stages of loading and code provisions, safety factors, material properties, Deflection control, Lateral load resistance, Location and types of shear walls.

Reinforced Concrete

Prefabricated structures - Long wall and cross-wall large panel buildings, one way and two way prefabricated slabs, Framed buildings with partial and curtain walls, -Connections – Beam to column and column to column.

Floors, Stairs and Roofs

Types of floor slabs, analysis and design example of cored and panel types and two-way systems, staircase slab design, types of roof slabs and insulation requirements, Description of joints, their behaviour and reinforcement requirements, Deflection control for short term and long term loads, Ultimate strength calculations in shear and flexure.

Walls

Types of wall panels, Blocks and large panels, Curtain, Partition and load bearing walls, load transfer from floor to wall panels, vertical loads, Eccentricity and stability of wall panels, Design Curves, types of wall joints, their behaviour and design, Leak prevention, joint sealants, sandwich wall panels, approximate design of shear walls.

Industrial Buildings and Shell Roofs

Components of single-storey industrial sheds with crane gantry systems, R.C. Roof Trusses, Roof Panels, corbels and columns, wind bracing design. Cylindrical, Folded plate and hyper- prefabricated shells, Erection and jointing, joint design, hand book based design.

REFERENCES:

1. Koncz.T., *Manual of Precast Concrete Construction*, Vol.I II and III & IV Bauverlag, GMBH,1971.
2. Laszlo Mokk, *Prefabricated Concrete for Industrial and Public Structures*, AkademiaiKiado,Budapest, 2007.
3. Lewicki.B, Building with Large Prefabricates, Elsevier Publishing Company, Amsterdam/London/New York, 1998.
4. Structural Design Manual, Precast Concrete Connection Details, Society for the Studies in theuse of Precase Concrete, Netherland BetorVerlag, 2009.
5. Warszawski, A., Industrialization and Robotics in Building - A managerial approach, Harperand Row, 1990.

COURSE OUTCOMES:

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

1. Have an idea about the planning and layout of prefabrication plant and IS Codespecifications.
2. Identify prefabricated structures and its connections.
3. Generate the design of roof slab, Stair case, floor slab.
4. Know about various types of wall.
5. Gain knowledge about industrial buildings and shell roofs.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	PUBLIC HEALTH ENGINEERING STRUCTURES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know about water treatment and waste treatment systems.
- To evaluate structural designs – construction below ground level.
- To learn about the functional design of overhead water tanks.
- To learn about the functional aspects of ground level water retaining structures.
- To study about the design of conduits and appurtenances.

Introduction

Review of the principle of design in respect of water treatment and waste treatment systems – criteria considered important structurally in the case of each component – consideration of soil bearing capacity under different combinations of soil types.

Factors Relevant to Structural Design

Ultimate load theory – plastic analysis – consideration on impact due to live and dead loads – considerations of corrosion effects on structural aspects – structural designs – construction below ground level.

Design of Overhead Water Tanks

Functional design – structural design – architectural design – cost aspects.

Design of Ground Level Water Retaining Structures

Functional aspects – maintenance factors.

Miscellaneous Structural Works

Design of conduits and appurtenances – foundation and jointing works in pipe lines – prestressed concrete tanks – elevated steel tanks – rectangular and circular framed structures used in water supply and sewage treatment systems – construction of raw water intake towers.

REFERENCES:

1. Gray. C, *Reservoirs and Tanks*
2. Reynolds, R.C. *Designers Hand Book*.
3. Abeles and Turner, *Prestressed Concrete Designers Hand Book*.
4. Proceedings of the Refresher Course on *Public Health Engineering Structures*, Centre forEnvironmental Studies, Anna University, 1976.

COURSE OUTCOMES:

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

1. Get an exposure on water treatment and waste treatment systems.
2. Understand structural designs – construction below ground level.
3. Assess the design of overhead water tanks.
4. Understand the functional aspects of ground level water retaining structures.
5. Assess the design of conduits and appurtenances.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3			1				2					3	
CO2	3	3			1				2					3	
CO3	3	3			1				2					3	
CO4	3	3			1				2					3	
CO5	3	3			1				2					3	

23CZCMOEXX	RESEARCH METHODOLOGY	L	T	P	C
		2	0	0	2

COURSE OBJECTIVES

- To train the students towards identifying research problems
- To familiarise the students with technical paper and research proposal writing
- To familiarise the students with patenting
- To make the students understand the patent rights
- To familiarise the students with new developments in IPR

Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis,interpretation, Necessary instrumentations.

Effective literature studies approaches, analysis Plagiarism, Research ethics, Effective technical writing, how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee

Nature of Intellectual Property: Patents, Designs, Trade and Copyright - Process of Patenting and Development: technological research, innovation, patenting, and development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.

Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.

New Developments in IPR: Administration of Patent System. New developments in IPR; IPRof Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.

REFERENCES

1. Stuart Melville and Wayne Goddard, “Research methodology: an introduction for science &engineering students’”
2. Wayne Goddard and Stuart Melville, “Research Methodology: An Introduction” Ranjit Kumar,2nd Edition, “Research Methodology: A Step by Step Guide for beginners”
3. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd, 2007.
4. Mayall , “Industrial Design”, McGraw Hill, 1992.
5. Niebel , “Product Design”, McGraw Hill, 1974.
6. Asimov, “Introduction to Design”, Prentice Hall, 1962.
7. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “Intellectual Property in NewTechnological Age”, 2016.
8. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008.

COURSE OUTCOMES

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

1. Identify good research problems
2. Write sound technical papers and research proposals
3. Understand the concepts of patenting
4. Understand the patent rights
5. Utilise the new developments in IPR

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1				3		2				3	3			3	3
CO2				3		2				3	3			3	3
CO3				3		2				3	3			3	3
CO4				3		2				3	3			3	3
CO5				3		2				3	3			3	3

23CZCMOEXX	CONSTRUCTION PERSONNEL MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To know about the Leadership Power, Leadership Styles, Leadership in Administration.
- To provide a basic information about the stress and its causes, performance appraisal and time management.
- To learn about HRM.
- To study the Relations and Compensation Management
- To understand the Labors Training and Development.

Leadership, Interpersonal and Communication

Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. Introduction to Interpersonal Relations, Analysis Relations of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position. Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication. Group Dynamics - Importance of groups in organization, and Team Interactions in group, Group Building Decision Taking, Team Building, Interaction with the Team, How to build a good team.

Stress, Conflict, Performance, Time and Motivation

Introduction to Stress, Causes of Stress, Impact Management Stress, Managing Stress- Introduction to Conflict, Causes of Conflict, Management Managing Conflict- Introduction to

Performance Appraisal, Appraisal Vertical Appraisal, Horizontal Appraisal, 360º Performance Appraisal, Methods of improving Techniques of Performance Appraisal.

Time as a Resource - Identify Important Time Management Wasters - Individual Time Management Styles - Techniques for better Time Management- Introduction to Motivation, Relevance and types of Motivation - Motivating the subordinates - Analysis of Motivation.

Manpower Management

Human Resources Management- Importance of Human Resources, Sources of Personnel Staffing & Recruitments: Job Analysis, Job Specification, Recruitments Tests, Selection & Placement, Training: Need For Training, Training Objectives, Strategies and Methods Training Assessment, Performance Appraisal Compensation, Basic Pay, Variable Pay, Merit Rating, Job Evaluation. Human resources planning - Importance - HRP Process-Manpower -Evolution–difference between Personnel Management and HRM- Strategic HRM- role of a HR Manager - Estimation-Job analysis-Job Description-Job Specification. Recruitment-Sources of Recruitment-Selection Process-Placement and Induction-Retention of Employees.

Relations and Compensation Management

Strikes, Lockouts, Lay-offs, Grievance Functions, Meaning, Grievance Redressal Procedures, Collective Bargaining, Trade Unions. Overview of Statutory Measures for Labour Welfare- GrievanceProcedure-collective Bargaining-Settlement of Disputes. Compensation Management –Concepts and Components-Job Evaluation-Incentives and Benefits

Training and Development

Training and Development- Objectives and Needs-Training Process-Methods of Training– Tools and Aids -Evaluation of Training Programs. Labour Issues and Career Planning - Labour: Definition Of Labour And Labour Welfare, Contract Labour & Temporary Labour, Various Theories, Historical Development, Agencies For Labour Welfare. Career Planning- Succession Planning.

REFERENCES

1. 1. Carleton Counter II and Jill Justice Coulter, "*The Complete Standard Hand Book ofConstruction Personnel Management* ", Prentice Hall, Inc., New Jersey, 1989.
2. Memoria, C.B., "*Personnel Management* ", Himalaya Publishing Co., 1992.
3. Josy. J. Familaro, "*Handbook of Human Resources Administration* ", McGraw HillInternational Edition, 1987.
4. Andrew Dainty, Martin Loosemore, "*Human Resource Management in Construction Projects*",Routledge,2012
5. Sanjay Kumar and PushpaLata , "*Communication Skills*" , Oxford University Press.2011
6. Krishna Mohan, MeeraBanerji, "*Basic Managerial Skills*" E. H. McGrath, Eastern EconomyEdition, Prentice hall India.2014

COURSE OUTCOMES

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

1. Gain knowledgeaboutLeadership Power, Leadership Styles, and Leadership inAdministration.
2. Have an idea about the stress and its causes, performance appraisal and time management.
3. Understand the HRM.
4. Know about Relations andCompensation Management.
5. Learn about Labours Training and Development.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3		3			3	3	3	2	1			2	2
CO2	3	3		3			3	3	3	2	1			2	2
CO3	3	3		3			3	3	3	2	1			2	2
CO4	3	3		3			3	3	3	2	1			2	2
CO5	3	3		3			3	3	3	2	1			2	2

23CZCMOEXX	INDUSTRIES ORGANIZATIONAL PHSYCOLOGY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an information about the importance and scope of industrial and organizational psychology.
- To understand the types of psychology and its effect on the efficiency and productivity.
- To study Organizational Psychology
- To evaluate Individual and Group Behavior of workers
- To learn about Occupational Stress

Conceptual Awareness of Industrial Organizational Psychology

Introduction of the terms 'Industry' 'Organization' and 'Psychology.' Definition & Nature – Industrial Organizational Psychology - Importance & Scope of its application - How I/OPsychology is different - Psychological factors responsible for behavior of an individual at work place Industrial- Organizational Psychology on the job and in Everyday Life.

Characteristics Psychology

Types and characteristics of psychology Impacting factors and their effects on the behavior - Human psychology - Differentiating male & female psychology - Determining factors impacting work efficiency and productivity.

Organizational Psychology

Monitoring Industrial Organizational Psychology - Different tools for testing psychology - Problems with Using Psychological Tests - Measuring effectiveness of these tests - Usage of tests for improving the employee psychology, - Challenges for I-O Psychology

Workers Behavior

Individual and Group Behavior - Interaction as Individuals and as Groups - Determining factors for improving their psychology Group Dynamics - Characteristics of Group Dynamics - Necessary steps in Group Dynamics to enhance efficiency & productivity.

Occupational Stress

Approaches and Terminology – Occupational Stress Terminology – Occupational Stress Models – Workplace Stressors – Reducing the Impact of Workplace Stressors – Cross Cultural Occupational Stress Research.

REFERENCES

1. Anderson, N.; Ones, D.S.; Sinangil, H.K. &Viswesvaran, C. (Eds.). (2002). *Handbook of industrial, work and organizational psychology*, Volume 2: Organizational psychology. Thousand Oaks, CA: Sage Publications Ltd
2. Fred Luthans (2006) *Organisational Behavior* (11th Ed.) McGraw- Hill/Irwin.
3. Harrel Thomas W (1964). *Industrial Psychology* (Revised Edition) Oxford & IBH Publishing Co. India.
4. Koppes, L.L. (Ed.). (2007*). Historical perspectives in industrial and organizational psychology*. Mahwah, NJ: Lawrence Erlbaum Rogelberg, S.G. (Ed.). (2002).
5. Maier R F Norman (1970). *Psychology in Industry* (3rded.). Oxford & IBH Publishing Co.India.
6. Paul Hersey, Kenneth H. Blanchard, Dewey E. Johnson (2008) *Management of organizational behavior: leading human resources*, Pearson Prentice Hall.
7. Rogelberg, S.G. (Ed.). (2002). *Handbook of research methods in industrial and organizationalpsychology*. Malden, MA: Blackwell.

COURSE OUTCOMES:

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

1. Understand the importance and scope of industrial and organizational psychology
2. Know about the types of psychology and its effect on the efficiency and productivity.
3. Have an idea about Organizational Psychology
4. Manage Individual and Group Behavior of workers
5. Learn about Occupational Stress.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3		3			3	3	3	2	1			2	2
CO2	3	3		3			3	3	3	2	1			2	2
CO3	3	3		3			3	3	3	2	1			2	2
CO4	3	3		3			3	3	3	2	1			2	2
CO5	3	3		3			3	3	3	2	1			2	2

23CZCMOEXX	COMPOSITE MATERIALS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To familiarise the students with the constituents of composite materials.
- To train the students in designing with composite materials.

Introduction:

Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

Reinforcements:

Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.

Manufacturing of Metal Matrix Composites:

Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.

Manufacturing of Polymer Matrix Composites:

Preparation of Moulding compounds and prepress – hand layup method – Autoclave method

– Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.

Strength:

Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygro thermal failure. Laminate first play failure-insight strength; Laminate

strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

REFERENCES:

1. Cahn R.W. , Material Science and Technology – Vol 13 – Composites,– VCH, WestGermany.
2. WD Callister, Jr., Adapted R. Balasubramaniam, Materials Science and Engineering, An introduction, John Wiley & Sons, NY, Indian edition, 2007.
3. Hand Book of Composite Materials-ed-Lubin.
4. Chawla K.K., Composite Materials.
5. Composite Materials Science and Applications – Deborah D.L. Chung.
6. Danial Gay, Suong V. Hoa, and StephenW.Tasi , Composite Materials Design and Applications.

COURSE OUTCOMES:

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

1. Understand mechanical behavior of composites.
2. Familiar with manufacturing of polymer matrix composites.
3. Do the design with composites.
4. Know about the manufacturing of metal matrix composites.
5. Determine stresses and strains relation in composite materials.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
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CO2	3	3	1		3	2		2		3				2	
CO3	3	3	1		3	2		2		3				2	
CO4	3	3	1		3	2		2		3				2	
CO5	3	3	1		3	2		2		3				2	

23CZCMOEXX	COST MANAGEMENT OF ENGINEERING PROJECTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the strategic cost management processes.
- To familiarise the students with various quantitative techniques for cost managements.

Introduction and Overview of the Strategic Cost Management Process

Cost concepts in decision-making**;** relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database foroperational control; Provision of data for Decision-Making.

Project:

Meaning, Different types, why to manage, cost overruns centres, various stages of projectexecution: conception to commissioning. Project execution as conglomeration of technical and non technical activities. Detailed Engineering activities. Pre project execution main clearances and documents

Project team:

Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process

Cost Behavior and Profit Planning Marginal Costing:

Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost- Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis.

Budgetary Control:

Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.

Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportationproblems, Assignment problems, Simulation, Learning Curve Theory.

REFERENCES:

1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi
2. Charles T. Horngren and George Foster, Advanced Management Accounting
3. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher
5. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.

COURSE OUTCOMES:

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

1. Understand cost accounting knowledge, such as terminology and fundamental principlesand methods.
2. Plan project execution.
3. Plan project cost control.
4. Apply TQM practices.
5. Apply course material to new situations.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
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CO3	3			3		3	3	3		3					3
CO4	3			3		3	3	3		3					3
CO5	3			3		3	3	3		3					3

23CZCMOEXX	INDUSTRIAL SAFETY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students understand the importance of maintenance.
- To make the students understand the importance of safety.

Industrial safety:

Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc,Safety color codes. Fire prevention and firefighting, equipment and methods.

Fundamentals of maintenance engineering:

Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life ofequipment.

Wear and Corrosion and their prevention:

Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i. Screw down grease cup, ii.

Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types ofcorrosion, corrosion prevention methods.

Fault tracing:

Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler,vi. Electrical motors, Types of faults in machine tools and their general causes.

Periodic and preventive maintenance:

Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.

REFERENCES:

1. Higgins & Morrow, Maintenance Engineering Handbook, Da Information Services.
2. H. P. Garg, Maintenance Engineering, S. Chand and Company.
3. Audels, Pump-hydraulic Compressors, Mc grew Hill Publication.
4. Winterkorn, Hans, Foundation Engineering Handbook, Chapman & Hall London.

COURSE OUTCOMES:

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

1. Apply safety practices.
2. Inspect maintenance operations.
3. Trace faults in equipments.
4. Do event tree and fault tree analyse
5. Understand the concept and importance of repair recycle.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3		2	2		1	1	1	2					2
CO2	3	3		2	2		1	1	1	2					2
CO3	3	3		2	2		1	1	1	2					2
CO4	3	3		2	2		1	1	1	2					2
CO5	3	3		2	2		1	1	1	2					2

AUDIT COURSES

23CZCMAC18	STRESS MANAGEMENT BY YOGA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To achieve overall health of body and mind
- To overcome stress

Definitions of Eight parts of yog. (Ashtanga)
Yam and Niyam.
Do`s and Don't's in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha Shaucha, santosh, tapa, swadhyay, ishwarpranidhan
Asan and Pranayam
Various yoga poses and their benefits for mind & body
Regularization of breathing techniques and its effects-Types of pranayam

REFERENCES:

1. 'Yogic Asanas for Group Tarining-Part-I" :Janardan Swami YogabhyasiMandal, Nagpur
2. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama(Publication Department), Kolkata

COURSE OUTCOMES:

At the end of the course, Students will be able to:

1. Develop healthy mind in a healthy body thus improving social health also
2. Improve efficiency
3. Understand the various Yoga poses.
4. Know about the regulation of breathings.
5. Know about the types of pranayama.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3	3													3
CO2	3	3													3
CO3	3	3													3
CO4	3	3													3
CO5	3	3													3

23CZCMAC28	ENGLISH FOR RESEARCH PAPER WRITING	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand that how to improve your writing skills and level of readability
- Learn about what to write in each section
- Understand the skills needed when writing a Title

Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness.

Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticising, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction.

Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check.

key skills are needed when writing a Title, key skills are needed when writing an Abstract,

key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature,

skills are needed when writing the Methods, skills needed when writing the Results, skills areneeded when writing the Discussion, skills are needed when writing the Conclusions

useful phrases, how to ensure paper is as good as it could possibly be the first-time submission.

REFERENCES

1. Goldbort. R., Writing for Science, Yale University Press (available on Google Books), 2006.
2. Day. R., How to Write and Publish a Scientific Paper, Cambridge University Press, 2006.
3. Highman. N., Handbook of Writing for the Mathematical Sciences, SIAM, 1998.
4. Highman'sbook , Adrian Wallwork , English for Writing Research Papers, Springer New YorkDordrecht Heidelberg London, 2011

COURSE OUTCOMES:

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

1. Understand that how to improve your writing skills and level of readability
2. Learn about what to write in each section.
3. Understand the skills needed when writing a Title.
4. Understand the skills when writing the discussion
5. Ensure the good quality of paper at very first-time submission.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3							3							3
CO2	3							3							3
CO3	3							3							3
CO4	3							3							3
CO5	3							3							3

23CZCMAC34	CONSTITUTION OF INDIA	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand the premises informing the twin themes of liberty and freedom from a civil rightsperspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood inthe early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

History of Making of the Indian Constitution: History - Drafting Committee,(Composition&Working) - **Philosophy of the Indian Constitution:** Preamble - Salient Features

Contours of Constitutional Rights & Duties: Fundamental Rights - Right to Equality - Right to Freedom - Right against Exploitation - Right to Freedom of Religion - Cultural and EducationalRights - Right to Constitutional Remedies - Directive Principles of State Policy - Fundamental Duties.

Organs of Governance: Parliament – Composition - Qualifications and Disqualifications - Powers and Functions – Executive – President – Governor - Council of Ministers – Judiciary - Appointment and Transfer of Judges, Qualifications - Powers and Functions

Local Administration: District's Administration head: Role and Importance - Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation - Pachayatiraj: Introduction, PRI: ZilaPachayat - Elected officials and their roles, CEO ZilaPachayat: Position and role - Block level: Organizational Hierarchy (Different departments) - Village level: Role of Elected and Appointed officials - Importance of grass root democracy

Election Commission: Election Commission: Role and Functioning - Chief Election Commissioner and Election Commissioners - State Election Commission: Role and Functioning - Institute and Bodies for the welfare of SC/ST/OBC and women

REFERENCES

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

COURSE OUTCOMES:

At the end of the course, Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before thearrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP]under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of directelections through adult suffrage in the Indian Constitution.
4. Discuss the passage of the Hindu Code Bill of 1956.
5. Understand the role of election commission.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3								3		1			2	3
CO2	3								3		1			2	3
CO3	3								3		1			2	3
CO4	3								3		1			2	3
CO5	3								3		1			2	3

23CZCMACXX	DISASTER MANAGEMENT	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Learn to demonstrate a critical understanding of key concepts in disaster risk reduction
  andHumanitarian response.
- Critically evaluate disaster risk reduction and humanitarian response policy and practice frommultiple perspectives.
- Develop an understanding of standards of humanitarian response and practical relevance inspecific types of disasters and conflict situations.
- Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or thecountries they work.

Repercussions of Disasters And Hazards:

Introduction: Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.

Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.

Disaster Prone Areas In India:

Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-DisasterDiseases And Epidemics

Disaster Preparedness and Management:

Preparedness: Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation OfRisk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.

Risk Assessment:

Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation In Risk Assessmentand Warning, People's Participation in Risk Assessment. Strategies for Survival.

Disaster Mitigation:

Meaning, Concept and Strategies of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation and Non-Structural Mitigation, Programs Of Disaster Mitigation in India.

REFERENCES

1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies"'New Royal book Company.
2. Sahni, Pardeep Et.Al. (Eds.)," Disaster Mitigation Experiences And Reflections", PrenticeHall Of India, New Delhi.
3. Goel S. L., Disaster Administration And Management Text And Case Studies" ,Deep &DeepPublication Pvt. Ltd., New Delhi.

OURSE OUTCOMES:

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

1. Demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
2. Evaluate disaster risk reduction and humanitarian response policy and practice from multipleperspectives.
3. Understand the standards of humanitarian response and practical relevance in specific typesof disasters and conflict situations.
4. Understand the strengths of disaster management approaches, planning and programmingin different countries, particularly their home country or the countries they work in.
5. Understand the weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they workin.

	Mapping of COs with POs											Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3		3		3	3	3	3	3	2			2	3
CO2	3	3		3		3	3	3	3	3	2			2	3
CO3	3	3		3		3	3	3	3	3	2			2	3
CO4	3	3		3		3	3	3	3	3	2			2	3
CO5	3	3		3		3	3	3	3	3	2			2	3

23CZCMACXX	SANSKRIT FOR TECHNICAL KNOWLEDGE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To get a working knowledge in illustrious Sanskrit, the scientific language in the world.
- Learning of Sanskrit to improve brain functioning.
- Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancingthe memory power.
- The engineering scholars equipped with Sanskrit will be able to explore the huge knowledgefrom ancient literature.

Alphabets in Sanskrit - Past/Present/Future Tense - Simple Sentences Order

Introduction of roots

Technical information about Sanskrit Literature

Technical concepts of Engineering-Electrical, Mechanical -

Architecture, Mathematics

REFERENCES

1. "Abhyaspustakam" – Dr.Vishwas, Samskrita-Bharti Publication, New Delhi
2. "Teach Yourself Sanskrit" PrathamaDeeksha-Vempati Kutumb shastri, RashtriyaSanskritSansthanam, New Delhi Publication
3. "India's Glorious Scientific Tradition" Suresh Soni, Ocean books (P) Ltd., New Delhi.

COURSE OUTCOMES:

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

1. Understanding basic Sanskrit language
2. Ancient Sanskrit literature about science & technology can be understood
3. Being a logical language will help to develop logic in students
4. Understand the technical information about Sanskrit Literature
5. Understand the Technical concepts of other language.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3							3						2	3
CO2	3							3						2	3
CO3	3							3						2	3
CO4	3							3						2	3
CO5	3							3						2	3

23CZCMACXX	VALUE EDUCATION	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Understand value of education and self- development
- Imbibe good values in students
- Let the should know about the importance of character

Values and self-development –Social values and individual attitudes - Work ethics, Indian vision ofhumanism - Moral and non- moral valuation - Standards and principles - Value judgments.

Importance of cultivation of values - Sense of duty. Devotion- Self-reliance - Confidence,

Concentration – Truthfulness – Cleanliness Honesty, Humanity - Power of faith, National Unity –Patriotism - Love for nature - Discipline

Personality and Behavior Development - Soul and Scientific attitude - Positive Thinking. Integrityand discipline -Punctuality, Love and Kindness - Avoid fault Thinking - Free from anger, Dignity of labour - Universal brotherhood and religious tolerance - True friendship - Happiness Vs suffering,love for truth - Aware of self-destructive habits - Association and Cooperation - Doing best for savingnature.

Character and Competence –Holy books vs Blind faith - Self-management and Good health - Science of reincarnation - Equality, Nonviolence ,Humility, Role of Women - All religions and samemessage - Mind your Mind, Self-control - Honesty, Studying effectively.

REFERENCES

1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi

COURSE OUTCOMES:

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

1. Knowledge of self-development
2. Learn the importance of Human values
3. Developing the overall personality
4. Understand the self-destructive habits
5. Know about the self-management and good health

	Mapping of COs with POs											Mapping with PSOs			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3	PSO4
CO1	3					3				3	2			2	3
CO2	3					3				3	2			2	3
CO3	3					3				3	2			2	3
CO4	3					3				3	2			2	3
CO5	3					3				3	2			2	3

23CZCMACXX	PEDAGOGY STUDIES	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- Review existing evidence on the review topic to inform programme design and policy makingundertaken by the DfID, other agencies and researchers.
- Identify critical evidence gaps to guide the development. Syllabus Units Content Hours.

Introduction and Methodology: Aims and rationale, Policy background, Conceptual frameworkand terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework,Research questions - Overview of methodology and Searching.

Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.

Evidence on the effectiveness of pedagogical practices - Methodology for the in depth stage: quality assessment of included studies- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?- Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes and beliefs and Pedagogic strategies.

Professional development: alignment with classroom practices and follow-up support - Peer support - Support from the head teacher and the community - Curriculum and assessment - Barriersto learning: limited resources and large class sizes

Research gaps and future directions - Research design - Contexts - Pedagogy - Teacher education - Curriculum and assessment - Dissemination and research impact.

REFERENCES:

1. Ackers J, Hardman F (2001) Classroom interaction in Kenyan primary schools, Compare, 31(2): 245-261.
2. Agrawal M (2004) Curricular reform in schools: The importance of evaluation, Journal of Curriculum Studies, 36 (3): 361-379.
3. Akyeampong K (2003) Teacher training in Ghana - does it count? Multi-site teacher education research project (MUSTER) country report 1. London: DFID.
4. Akyeampong K, Lussier K, Pryor J, Westbrook J (2013) Improving teaching and learning ofbasic maths and reading in Africa: Does teacher preparation count? International JournalEducational Development, 33 (3): 272–282.
5. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education.Oxford and Boston: Blackwell.
6. Chavan M (2003) Read India: A mass scale, rapid, 'learning to read' campaign.
7. www.pratham.org/images/resource%20working%20paper%202.pdf.

COURSE OUTCOMES:

At the end of the course, Students will be able to understand:

1. Pedagogical practices being used by teachers in formal and informal classrooms indeveloping countries.
2. Evidence on the effectiveness of these pedagogical practices.
3. Teacher education (curriculum and practicum) and the school curriculum and guidancematerials that best support effective pedagogy.
4. The barriers to learning.
5. The research gaps and future directions.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3							3						2	3
CO2	3							3						2	3
CO3	3							3						2	3
CO4	3							3						2	3
CO5	3							3						2	3

23CZCMACXX	PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination

Neetisatakam-Holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) - Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)

Approach to day to day work and duties –ShrimadBhagwadGeeta: Chapter 2-Verses 41, 47,48, - Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35 - Chapter 18-Verses 45,

46, 48.

Statements of basic knowledge –Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 - Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of Role model. ShrimadBhagwadGeeta:

Chapter2-Verses 17, Chapter 3-Verses 36,37,42, - Chapter 4-Verses 18, 38,39 - Chapter18 – Verses 37,38,63

REFERENCES:

1. "Srimad Bhagavad Gita" by Swami Swarupananda Advaita Ashram (Publication Department),Kolkata.
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) by P.Gopinath, Rashtriya SanskritSansthanam, New Delhi.

COURSE OUTCOMES:

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

1. Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality andachieve the highest goal in life.
2. The person who has studied Geeta will lead the nation and mankind to peace and prosperity.
3. Study of Neetishatakam will help in developing versatile personality of students.
4. Understand the ability to do day to day duty and work.
5. Study of Neetishatakam will help in developing rise himself in society.

Mapping of COs with POs												Mapping with PSOs			
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3					3		3		3				2	3
CO2	3					3		3		3				2	3
CO3	3					3		3		3				2	3
CO4	3					3		3		3				2	3
CO5	3					3		3		3				2	3