DETAILED SYLLABI AND CURRICULUM OF

B.VOC. (HOSPITAL INSTRUMENTATION AND MANAGEMENT)

Directorate of Skill Development& Entrepreneurship

ANNAMALAI UNIVERSITY

ANNAMALAI UNIVERSITY
Directorate of Skill Development & Entrepreneurship
THREE-YEAR B.VOC. COURSES
FULL-TIME DEGREE COURSE
CHOICE BASED CREDIT SYSTEM
REGULATIONS AND SYLLABUS

1. **Condition for Admission:**

Candidates for admission to the **First Year** of the **Three-Year B.Voc. Degree Programme** shall be required to have passed the final examination of the plus 2 Higher Secondary Course conducted by the Board of Secondary Education, Tamil Nadu Government or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto, for **direct** admission to the **Second Year of B.Voc programme**, the candidates shall be required to have passed the **One-Year Diploma Programme having the National Skills Qualifications Framework (NSQF) level 5 in appropriate discipline** or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto and for **direct admission to** the **Third year of B.Voc programme** the candidates shall be required to have passed the **Two-Year Advanced Diploma Programme having NSQF level 6 in appropriate discipline** or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

2. **Courses of Study (B.Voc)**
    i. Airport Operations
    ii. Aqua Culture
    iii. Catering Technology and Hotel Management
    iv. Hospital Instrumentation and Management
    v. Mechatronics

3. **Eligibility for the Award of Diploma / Advanced Diploma / Degree:**

A candidate shall be eligible for the award of one-year Diploma if the candidate has satisfactorily undergone the prescribed courses of study of the first year of the three-year **B.Voc. programme** and has passed the prescribed examinations and has earned a minimum of 60 credits.

A candidate shall be eligible for the award of two-year Advanced Diploma if the candidate has satisfactorily undergone the prescribed courses of study of the first and second year if admitted in the **First Year** of the **Three-Year B.Voc. programme** orthe prescribed courses of study of the second year if admitted directly to **Second Year of the Three-Year B.Voc programme** and has passed the prescribed examinations and has earned a minimum of 120/60 credits as applicable.

A candidate shall be eligible for the award of Degree of B.Voc if the candidate has satisfactorily undergone the prescribed courses of study for all the three years **or** the prescribed courses of study of the second and third year if admitted directly to the **Second Year** of the **Three-Year B.Voc. programme** orthe prescribed courses of study of the third year if admitted directly to **Third Year of the Three-Year B.Voc**

programme and has passed the prescribed examinations and has earned a minimum of 180/120/60 credits as applicable.

3. Subject of Study:

The Subjects of study are given in Appendix I. The syllabi for the subjects are given in Appendix II

4. Scheme of Examinations:

 The scheme of Examinations is given in Appendix - I.

5. Choice Based Credit System:

The following formula should be used for conversion of time into credit hours.

- ➢ One Credit would mean equivalent of 15 periods of 60 minutes each, for theory, workshops/labs and tutorials;
- ➢ For internship/field work, the credit weightage for equivalent hours shall be 50% of that for lectures/workshops;
- ➢ For self-learning, based on e-content or otherwise, the credit weightage for equivalent hours of study should be 50% or less of that for lectures/workshops.

Each semester curriculum shall normally have a blend of theory, On-Job Training and practical courses. The total credits for the entire degree course will be 180. For the award of the degree a student has to

1) Earn a minimum of 180 credits,
2) Serve in the NSS or NCC for at least one year, and
3) Enroll as a student member of a recognized professional society.

6. Duration of the Programme:

A student is normally expected to complete the Diploma Programme in one year but in any case not more than three years from the time of admission.

A student is normally expected to complete the Advanced Diploma Programme in two/one year but in any case not more than four/three years from the time of admission as applicable.

A student is normally expected to complete the B.Voc Degree Programme in three/two/one year but in any case not more than five/four/three years from the time of admission as applicable.

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 Director, Centre for Skill Development   along with a late fee will be done up to the last working day. Registration for the project work shall be done only for the final semester.

8. Assessment:

The break-up of assessment and examination marks for theory subjects is as follows.

First assessment	: 10 marks
Second assessment	: 10 marks
Attendance	: 5 marks
End Semester Examination	: 75 marks

The break-up of assessment and examination marks for practical subjects is as follows:

First assessment (test)	: 15 marks
Second assessment (test)	: 15 marks
Maintenance of record book	: 10 marks
End Semester Examination	: 60 marks

The project work will be assessed for 40 marks by a committee consisting of the guide and a minimum of two members nominated by the Nodal Officer of the programme along with the Director, Centre for Skill Development. The Nodal officer of the programme along with the Director, Centre for Skill Development will nominate one of the committee members as the Chairman. The Nodal Officer may opt himself/herself be the Chairman. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

9. Substitute assessments:

A student, who has missed for genuine reasons accepted by the the Nodal Officer and the Director, Centre for Skill Development, one or more of the assessments of a course other than the 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 Nodal Officer within a week from the date of the missed assessment.

10. Student Counselors:

To help the students in planning their course of study and for general advice on the academic programme, the Nodal Officer of the Programme will attach a certain number of students to a member of the faculty who shall function as student counselor for those students throughout their period of study. Such student counselors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Director, Centre for Skill Development.

11. Class Committee:

The composition of the class committees from first to sixth semester will be as follows:

   i.   Course co-ordinators of the common courses, if any, who shall be appointed by the Director from among the staff members teaching the common course.
   ii. A project coordinator (in the sixth semester committee only), who shall be appointed by the Nodal Officer in consulatation with the Director, Centre for Skill Development from the project supervisors.
   iii. Teachers of individual courses.

One Professor or Associate Professor, preferably not teaching the concerned class, appointed as Chairman by the Director, Centre for Skill Development. The Nodal Officer or Director, Centre for Skill Development may opt to be a member or the Chairman.

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

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

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

12. Withdrawal from the Examination:

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

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 only for B.Voc Degree with the approval of the Dean on the recommendation of the Nodal Officer and the Director, Centre for Skill Development, 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 five years.

14. Attendance requirements:

To be eligible to appear for the examination in a particular semester, a student must put in a minimum of 75% of attendance in that semester. A student who withdraws from or does not meet the minimum attendance requirement in a semester must re-register for and repeat the semester. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

15. 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 as per the UGC guidelines. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average and cumulative grade point average, and prepare the grade cards.

Marks	Letter Grade	Grade Point
96 to 100 marks	Grade 'O' - Outstanding	10
90 to 95 marks	Grade 'A+' - Excellent	9
80 to 89 marks	Grade 'A' – Very Good	8
70 to 79 marks	Grade 'B+' – Good	7
60 to 69 marks	Grade 'B' – Above average	6
55 to 59 marks	Grade 'C' – Average	5
50 to 54 marks	Grade 'P' – Pass	4
< 50 marks	Grade 'F' – Fail	Re Appear (RA)
Not appearing	Grade 'AB' - Absent	AB – Absent
Withdraw from Examination	Grade 'W'	W – with drawal

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

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

A student who obtains letter grade RA in a course has to reappear for the examination in that course.

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

O - 10; A+ - 9; A - 8; B+ - 7; B - 6; C - 5; P - 4

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

A student can apply for revaluation of one or more of his/her examination answer papers within a week from the date of issue of grade sheet to the student on payment of the prescribed fee per paper. The application must be submitted to the Controller of examinations with the recommendation of the Director, Centre for Skill Development.

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

The results of the final semester will be withheld until the student obtains passing grade in all the subjects of all earlier semesters.

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 60/120/180 credits within one / two / three years respectively from the time of admission, pass all the courses in the first attempt and obtain a OGPA of 8.25 or above for all the courses from I to II, I to IV and I to VI semesters respectively for the Diploma / Advanced Diploma / Degree level.

For First class, the student must earn a minimum of 60/120/180 credits within three / five /seven semesters respectively from the time of admission and obtain a OGPA of 6.75 or above for all the courses from I to II, I to IV and I to VI semesters respectively for the Diploma / Advanced Diploma / Degree level.

For Second class, the student must earn a minimum of 60/120/180 credits within three / four /five years respectively from the time of admission for the Diploma / Advanced Diploma / Degree level.

For those students admitted directly to the Second year of B.Voc programme:

For First class with distinction, the student must earn a minimum of 60/120 credits within one /two years respectively from the time of admission, pass all the courses in the first attempt and obtain a OGPA of 8.25 or above for all the courses of III and IV and III to VI semesters respectively for the Advanced Diploma / Degree level.

For First class, the student must earn a minimum of 60/120 credits within three / five semesters respectively from the time of admission and obtain a OGPA of 6.75 or above

for all the courses of III and IV and III to VI semesters respectively for the Advanced Diploma / Degree level.

For Second class, the student must earn a minimum of 60/120 credits within three / four years respectively from the time of admission for the Advanced Diploma / Degree level.

For those students admitted directly to the Third year of B.Voc programme:

For First class with distinction, the student must earn a minimum of 60 credits within one year from the time of admission, pass all the courses in the first attempt and obtain a OGPA of 8.25 or above for all the courses of V and VI semesters for the Degree level.

For First class, the student must earn a minimum of 60 credits within three semesters respectively from the time of admission and obtain a OGPA of 6.75 or above for all the courses of V and VI semesters for the Degree level.

For Second class, the student must earn a minimum of 60 credits within three years from the time of admission for the Degree level.

16. Ranking of candidates:

The candidates who are eligible to get the **Diploma / Advanced Diploma / Degree** in First Class with Distinction will be ranked together on the basis of the OGPA for all the courses of study during the period of study.

The candidates passing with First class will be ranked next after those with distinction on the basis of OGPA all the subjects of study during the period of study.

17. Transitory regulations:

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

B.Voc (Hospital Instrumentation and Management) Three Year degree Course

SEMESTER –I

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC101	Communicative English	3	0	0	3	25	75	100	3
19HIMC102	Introduction to Computers	3	0	0	3	25	75	100	3
19HIMC 103	Life Coping Skill	3	0	0	3	25	75	100	3
19HIMC104	Fundamentals of Electrical Engineering	3	0	0	3	25	75	100	3
19HIMC105	Principles of Electronics	4	0	0	3	25	75	100	4
19HIMP 106	Language Laboratory	0	0	3	3	40	60	100	2
19HIMP 107	Electrical Engineering Laboratory	0	0	3	3	40	60	100	2
19HIMP 108	Electronics Laboratory	0	0	3	3	40	60	100	2
19HIMP 109	Computer Laboratory	0	0	3	3	40	60	100	2
19HIMT 110	Skill /OJ Training	0	0	6	3	40	60	100	6
	Total	16	0	18		325	675	1000	30

[L] – Lecture   **[T]** – Theory   **[P]** – Practical
[CA] – Continuous Assessment [**FE**] – Final Examination

SEMESTER –II

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC 201	*Soft Skill and Personality Development*	3	0	0	3	25	75	100	3
19HIMC 202	*Medical Physiology*	3	0	0	3	25	75	100	3
19HIMC 203	*Biosensors and Measurements*	3	0	0	3	25	75	100	3
19HIMC 204	*Analaog and Digital ICs*	3	0	0	3	25	75	100	3
19HIMC 205	*Biomedical Instrumentation*	4	0	0	3	25	75	100	4
19HIMP 206	*Soft Skill and personality Development Laboratory*	0	0	3	3	40	60	100	2
19HIMP 207	*Biosensors and Measurement Laboratory*	0	0	3	3	40	60	100	2
19HIMP 208	*Analog and Digital ICs Laboratory*	0	0	3	3	40	60	100	2
19HIMP 209	*Bioinstrumentation Laboratory*	0	0	3	3	40	60	100	2
19HIMT 210	*On Job Training (Medical Equipments)*	0	0	6	3	40	60	100	6
	Total	15	0	18		325	675	1000	30

SEMESTER –III

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC 301	Environmental Studies	3	0	0	3	25	75	100	3
19HIMC 302	Bio signal Conditioning Systems	3	0	0	3	25	75	100	3
19HIMC 303	Medical Diagnostic Equipments	3	0	0	3	25	75	100	3
19HIMC 304	Microprocessor and Microcontroller for Medical Systems	3	0	0	3	25	75	100	3
19HIMC 305	Basic Electrical & Electronic Measurements	4	0	0	3	25	75	100	4
19HIMP 306	Bio signal Conditioning Systems Laboratory	0	0	3	3	40	60	100	2
19HIMP 307	Electrical & Electronic Measurement Laboratory	0	0	3	3	40	60	100	2
19HIMP 308	Diagnostic Laboratory	0	0	3	3	40	60	100	2
19HIMP 309	Microprocessor & Micro controllerLaboratory	0	0	3	3	40	60	100	2
19HIMT 310	Skill /OJ Training	0	0	6	3	40	60	100	6
	Total	16	0	18		325	675	1000	30

SEMESTER –IV

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC 401	Hospital Management Systems	3	0	0	3	25	75	100	3
19HIMC 402	Therapeutic Instrumentation	3	0	0	3	25	75	100	3
19HIMC 403	Hospital Equipments	3	0	0	3	25	75	100	3
19HIMC 404	Radiology and Imaging Equipments	3	0	0	3	25	75	100	3
19HIMC 405	Patient and Device Safety	4	0	0	3	25	75	100	4
19HIMP 406	PCB Design Lab	0	0	3	3	40	60	100	2
19HIMP 407	Bio Measurement Laboratory	0	0	3	3	40	60	100	2
19HIMP 408	Hospital Equipment Laboratory	0	0	3	3	40	60	100	2
19HIMP 409	Medical Imaging Laboratory	0	0	3	3	40	60	100	2
19HIMT 410	On Job Training (Medical Equipments)	0	0	6	3	40	60	100	6
	Total	15	0	18		325	675	1000	30

SEMESTER –V

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC 501	Troubleshooting of Medical Equipments	3	0	0	3	25	75	100	3
19HIMC 502	Advanced Medical Imaging System	3	0	0	3	25	75	100	3
19HIMC 503	Medical Ethics and Standard	3	0	0	3	25	75	100	3
19HIME 504	Elective - I	3	0	0	3	25	75	100	3
19HIME 505	Elective - II	4	0	0	3	25	75	100	4
19HIMP 506	Equipment Skill Lab	0	0	3	3	40	60	100	2
19HIMP 507	Troubleshooting Lab	0	0	3	3	40	60	100	2
19HIMP 508	Surgical Equipment Lab	0	0	3	3	40	60	100	2
19HIMP 509	Advanced Bioinstrumentation Lab	0	0	3	3	40	60	100	2
19HIMT 510	On Job Training (Medical Equipments)	0	0	6	3	40	60	100	6
	Total	15	0	18		325	675	1000	30

SEMESTER –VI

Code	Subjects	Periods/Week			Exam Duration Hours	Marks		Total Marks	Credits
		L	T	P		CA	FE		
19HIMC 601	Design and Development of Medical Devices	3	0	0	3	25	75	100	3
19HIMC 602	Hospital Waste Management	3	0	0	3	25	75	100	3
19HIME 603	Elective – III	3	0	0	3	25	75	100	3
19HIME 604	Elective - IV	3	0	0	3	25	75	100	3
19HIMP 605	Design Lab	0	0	3	3	40	60	100	2
19HIMP 606	Bio simulation Lab	0	0	3	3	40	60	100	2
19HIMT 607	Project and Internship	0	0	12	3	40	60	100	16
	Total	12	0	18		220	480	700	30

19HIMC101 COMMUNICATIVE ENGLISH

Course Objective:

- To help students achieve proficiency in English
- To develop students professional communication skills to meet the demand in the field of global communication to enable them to acquire placement anywhere with ease and confidence.

Learning Outcomes :

- Students enhance their communicative skills in real life situations.
- Students will equip with oral and appropriate written communication skills.

UNIT I READING

Definition of reading, Levels of reading- Requirements of reading- Types of reading- Techniques of reading- Academic reading tips- Exercise

UNIT II WRITING

The Sentence, The Phrase, Kinds of Sentences, Parts of Sentence, Parts of speech, Articles-Types of Sentences, Time Management Tips-Test Preparation Tips, Tips for Taking Exams-Construction of Paragraph, Linkage and Cohesion-Academic Essay Writing-Thesis- Report Abstracts- Letter Writing- Memo, Cover Letter, Resume writing-Exercise

UNIT III LISTENING SKILLS

Types of Listening- Objectives- Active Listening- an Effective Listening Skill- Note Taking Tips -Barriers for Good Listening, Purpose of Listening, Outlines and Signposting- Gambits- Exercise

UNIT IV COMMUNICATION SKILLS

Communication Skills -Speaking skills, Definition- Barriers of Communication-Types of Communication-Exercise

UNIT V APTITUDE

Verbal and numerical aptitude-Notes to be made from listening short lectures. Adapting to corporate life- Corporate Etiquette – Grooming and Dressing-Organizing and Attending Meetings – Facing Interviews.

TEXT BOOKS

1. Dhanavel, S.P. "English and Communication Skills for Students of Science and Engineering", Orient Blackswan Ltd., 2009.
2. Meenakshi Raman and Sangeetha Sharama**,** "Technical Communication-Principles and Practice"; Oxford University Press, 2009.

REFERENCE BOOKS

1. LALA, PUSHP and Sanjay Kumar. 'Communicate or collapse: a handbook of effective public speaking, group discussions and interviews'. PHI Learning Pvt. Ltd., 2007.
2. Edgar Thorpe,'Course in Mental Ability and Quantitative Aptitude',Tata McGraw-Hill, 2003.
3. Edgar Thorpe. 'Test of Reasoning', Tata McGraw-Hill,2003.
4. H.M.Prasad,'How to prepare for Group Discussion and Interview'. Tata McGraw-Hill, 2001.
5. Career Press Editors, '101 Great Resumes', Jaico Publishing House,2003.
6. R.S. Aggarwal 'A Modern Approach to Verbal & Non-Verbal Reasoning',S.Chand& Co, 2004.
7. Mishra Sunita and Muralikrishna, 'Communication Skills for Engineers', 1st Edition. Pearson Education, 2004.

19HIMC102 INTRODUCTION TO COMPUTERS

Course Objective
- To familiarize the students with Fundamentals of Computer and IT applications

Learning Outcomes
- Students enhance their programming fundamentals
- Familiarizing with MS Office
- Handle various trends in computer communication

UNIT I INTRODUCTION TO COMPUTERS

Classification, History, Types of Computers. Elements of a Computer System: Block Diagram of The Computer System, Introduction to various units. Hardware: CPU, Memory, Input and Output devices, Auxiliary storage devices. Software: System and Application Software, Utility packages, configuration of Computer System Applications of Information Technology: Wide range of applications in: Home, Education and Training, Entertainment, Science, Medicine, Engineering etc.

UNIT II COMPUTER ACCESSORIES

Input Devices: Mouse, Keyboard, Light pen, Track Ball, Joystick, MICR, Optical Mark reader and Optical Character reader. Scanners, Voice system, Web, Camera.

Output Devices: Hard Copy Output Devices; Line Printers, Character Printers, Chain Printers, Dot-matrix Printers, Daisy Wheel Printer, Laser Printers, Ink jet Printers, Plotters, Soft Copy device-Monitor, Sound card and speakers.

Memory and Mass Storage Devices; Characteristics of Memory Systems; Memory Hierarchy; Types of Primary Memory; RAM and ROM; Secondary and Back-up; Magnetic Disks, Characteristics and classification of Magnetic Disk, Optical Disk, Magnetic Tape.

UNIT III MS WORD

Documentation Using MS-Word -Introduction to Office Automation, Creating & Editing Document, Formatting Document, Auto -text, Autocorrect, Spelling and Grammar Tool, Document Dictionary, Page Formatting, Bookmark, Advance Features of MS-Word-MailMerge, Macros, Tables, File Management, Printing, Styles, linking and embedding object, Template.

UNIT IV MS EXCEL & POWER POINT

Electronic Spread Sheet using MS-Excel -Introduction to MS-Excel, Creating & Editing Worksheet, Formatting and Essential Operations, Formulas and Functions, Charts, Advance features of MS-Excel -Pivot table & Pivot Chart, Linking and Consolidation.

Presentation using MS-PowerPoint: Presentations, Creating, Manipulating & Enhancing Slides, Organizational Charts, Excel Charts, Word Art, Layering art Objects, Animations and Sounds, Inserting Animated Pictures or Accessing through Object, Inserting Recorded Sound Effect or In-Built Sound Effect.

UNIT V COMPUTER COMMUNICATIONS

Introduction, Objectives. Basic of Computer Networks: Local Area Network (LAN), Wide Area Network (WAN). Internet: Concept of Internet, Applications of Internet, Connecting to the Internet, Troubleshooting, World Wide Web (WWW), Web Browsing Software, Popular Web Browsing Software.

Basics of E - mail: What is an Electronic Mail, Email Addressing, Using E - mails: Opening Email account, Mailbox: Inbox and Outbox, Creating and Sending a new E - mail, Replying to an E - mail message, Forwarding an E - mail message, Sorting and Searching emails.

TEXT BOOKS

1. Sinha, P.K. and Priti Sinha, "Computer Fundamentals", BPB, 2016
2. Steven Weikler, Office 2017 for the Begineers, Kindle Publication, 2016

REFERENCE BOOKS
1. Bokhari and Ahmad 'UNIX Operating System', Dhanpat Rai & Co, 2004.
2. Sathish Jain, Kratika and Geetha M, "Office 2010 Course Complete Book For Learning Better And Faster", BPB, 2016.

19HIMC103 LIFE COPING SKILLS

UNIT I SELF ESTEEM AND PERSONALITY DEVELOPMENT
Self esteem-importance of self esteem- positive self development- self acceptance of strengths and weakness- personality development- methods- do's and don'ts-skills to develop

UNIT II POSITIVE THINKING
Right perception of life- emphasize good things- transform from soft to tough minded individuals- weak to strong men/women

UNIT III MOTIVATION AND GOAL SETTING
Concept of motivation-energizing and directing efforts for goal- enhance motivation desires and aspirations- different types of goals- importance of pursuit of personal goals setting, goals- striving for goals

UNIT IV COPING WITH DEPRESSION, FEAR AND FAILURE
Depression-nature-symptoms and causes- ways to overcome depression- types of failure- understanding failures- handling fear-overcoming failure and fear-understanding anger- hindering anger to achieve goals- coping with failures

UNIT V LEADERSHIP
Leadership- Nature and types- characteristics of good leadership- leadership role courage and confidence.

TEXT BOOK
1. Alphonse, S.J. Xavier,' We shall overcome' ICRDCE publication, Chennai. 5th edition,2011.

REFERENCE BOOKS
1. Dale Carnegie, "The Leader in You", Simon, 2012
2. Robert Heller, "Effective Leadership (Essential Managers)", Dorling Kindersley, 2011
3. Stephen R Covey, "The Seven Habit of Highly Effective People", Kindle, 2015.

19HIMC104 FUNDAMENTALS OF ELECTRICAL ENGINEERING

Course Objective

➢ To enable the students to be equipped with the concepts of current electricity, passive components and electrical fundamentals

Learning Outcomes

✓ Students enhance fundamentals of electrical terminology
✓ Familiarizing with different electrical measuring instruments

UNIT I ELECTRICAL FUNDAMENTALS
Definition of Resistance, Voltage, Current, Power, Energy and their units. Temperature variation of resistance, Series - parallel resistance circuits, calculation of equivalent resistance, D.C. Supply – Ohm's law – Kirchoff's Law - Electric Cells: Primary cell, wet cell, dry cell, battery, Li - ion battery, series and parallel connections of cells, Secondary cells, Lead Acid Cell, Discharging and recharging of cells, preparation of electrolyte, care and maintenance of secondary cells. Lighting effect of electric current, filaments used in lamps, and Tube light, LED, their working and applications.

UNIT I CAPACITOR AND INDUCTORS

Capacitors: Capacitor and its capacity, Concept of charging and Discharging of capacitors, Types of Capacitors and their use in circuits, Series and parallel connection of capacitors, Energy stored in a capacitor. Electromagnetic Effects: Permanent magnets and Electromagnets, their construction and use, Polarities of an electromagnet and rules for finding them. Faraday's Laws of Electromagnetic Induction, Dynamically induced e.m.f., its magnitude and induction, inductance and its unit. Mutually induced e. m. f. , its magnitude and direction, Energy stored in an inductance. Force acting on a current carrying conductor in magnetic field, its magnitude and direction, Principles and construction of dynamo.

UNIT III AC CIRCUITS

A. C Circuits: Generation of A. C. voltage, its generation and wave shape. Cycle, frequency, peak value, R. M. S. value, form factor, crest factor, Phase difference, power and power factor, A. C. Series Circuits with (i) resistance and inductance (ii) resistance and capacitance and(iii) resistance inductance and capacitance, Q factor of R. L. C. series circuits.

UNIT IV TRANSFORMERS

Single Phase Transformer: Construction, principle, e. m. f equation, transformation ratio, various losses in transformation, testing of transformer with polarity testing, equivalent Circuit.

UNIT V MEASUREMENTS

Measurements: Voltage, current and power measurements, Ammeter, Voltmeter, Watt meter, connection diagram and uses, 2 wattmeter methods.

TEXT BOOK

1. Theraja B.L., "Fundamentals of Electrical Engineering and Electronics", S.Chand, 2006

REFERENCE BOOKS

1. Gupta B.R and Vandana Singhal, "Electrical Sciences", S.Chand, 2008
2. Gupta B.R, "Fundamentals of Electrical, Electronics and Instrumentation Engineering", S.Chand, 2013.

19HIMC105 PRINCIPLE OF ELECTRONICS

Course Objective
➢ To provides comprehensive idea about working principle, operation and characteristics of analog electronic devices.

Learning Outcomes
✓ Students gain knowledge on various semiconductor devices
✓ Understands the working of Electronic measuring devices

UNIT I BASICS OF SEMICONDUCTOR

Semiconductor materials, Metals and semiconductors and Photo - electric emission. N - type and P - type semiconductor, Effects of temperature on Conductivity of semiconductor. PN junction diode, depletion layer, Forward & Reverse bias, V - I Characteristic, Effects of temperature, Zener diode, Photo diode, LED, Tunnel Diode, Varactors Diodes, Schottky Diodes, Types and applications of diode. Diode as a rectifier, Half wave and full wave rectification, Zener diode Regulator. Introduction to Filters, Clippers, Clampers.

UNIT II BIPOLAR TRANSISTOR

Transistor construction & operation of N- P- N & P - N - P. Common base (CB), common emitter (CE), common collector (CC) configurations. Biasing of transistors, V - I characteristics of CB, CE & CC, comparison of CB, CE & CC. Configuration with respect to input & output dynamic resistance, current gain and leakage current, α, β,

γrelation. Application of CB, CE & CC configurations. Transistor as an amplifier (simple form), Transistor D. C load line.

UNIT III FET and UJT

Field Effect Transistor: JFET construction, principle and operation. MOSFET construction, principle and operation. Characteristics of JFET & MOSFET, relation between them. Definition of drain resistance, transconductance, amplification factor. JFET as a switch, typical application of JFET & MOSFET. Uni-junction Transistor: Construction, principles of operation & characteristics of UJT. Equivalent circuit. Comparison between FET and UJT. Typical application of UJT.

UNIT IV AMPLIFIERS AND OPOTOELECTRONIC

Transistor Amplifier and Applications: Introduction, Single and Multi - stage amplifiers, Introduction to Oscillators: Thyristor Construction, principle of operation and characteristics of SCR, DIAC, TRIAC and their uses. Opto Electronics: Elementary idea of LDR, LED, Photo Diode, Photo Transistor, Solar cell and Opto Coupler.

UNIT V ELECTRONIC MEASUREMENT

Cathode Ray Oscilloscope (CRO) - construction and principle of measurement of voltage, current, frequency and phase by oscilloscope. Electronic voltmeters and Ammeters – analog and digital. Digital multimeters, Audio oscillators, signal generators and frequency counter.

TEXT BOOKS:
1. Donald A Neaman, "Semiconductor Physics and Devices", Tata McGraw Hill Inc. 2007.
2. Thyagarajan T, SendurChelvi K.P, Rangaswamy T.R, "Engineering Basics: Electrical, Electronics and Computer Engineering", New Age International, 2007.
3. Somanathan Nair B, Deepa S.R, "Basic Electronics", I.K. International Pvt. Ltd., 2009.

REFERENCE BOOKS:
1. Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.
2. Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory" Pearson Prentice Hall, 2008.
3. Thomas L. Floyd, "Electronic Devices", Pearson Education, 9th Edition, 2011.
4. R.K. Rajput, "Basic Electrical and Electronics Engineering", Laxmi Publications, 2007.

19HIMP106 SOFT SKILL LABORATORY
1. Improving pronunciation through tongue twisters.
2. Just a minutes session: Speaking Extempore for one minutes on given topics
3. Conversation classes on contemporary issues
4. Reading aloud of newspaper headlines and important articles.
5. Mannerism or Etiquette.
6. Group Discussion
7. Letter drafting
8. Report writing on a topic
9. Writing of corporate CVs
10. PPT presentation on selected issues
11. Tips to face the interviews
12. Mock Interview sessions

19HIMP107 COMPUTER LABORATORY

1. Different components of Taskbar
2. Create Desktop icons & Folder and Files on Desktop
3. Run Application such as Notepad, MS Paint
4. Change Mouse properties in Windows
5. Connecting to the Internet, applying browsers software such as chrome, Internet Explorer
6. Applying software download
7. Create E-mail ID in a mail server, sending E-mail and working with Inbox
8. Create Bio data in word
9. Formatting text in Word
10. Create excel database, apply auto sum
11. Create presentation file with multiple slides
12. Apply slide transition and animation
13. Importing and exporting of files
14. Conversion of file from one format to other (.doc to pdf, .jpeg to pdf, etc)
15. Exercises on Powerpoint

19HIMP108 ELECTRICAL ENGINEERING LABORATORY

1. Introduction to Multimeter (Analog & Digital) and its use as Voltmeter (For AC & DC), Ammeter (For AC & DC) and Ohmmeter.
2. Measurement of resistor and capacitor by using color code.
3. Idea of variable resistance, project board & power supply.
4. Measurement of resistance by voltage drops method.
5. Voltage divider theorem
6. Current Divider theorem
7. Concept of bread board and PCB
8. Series & Parallel combination of resistances.
9. Practical on Ohm's Law.
10. Practical on KVL & KCL.
11. Residential wiring – Fuses, Switches and Indicators
12. Earthing procedures
13. Troubleshooting of basic electrical wirings
14. Characteristics of Transformer
15. Measurement of Voltage, Current and Power
16. Practice on House Wiring
17. Practice on Fixing Electrical Switches, Plugs, Three pin tops.
18. Practice on Fuse changes and ground checking

19HIMP109 ELECTRONICS LABORATORY

1. Study of electronic components- active & passive, Electronic Instruments: CRO, Function generator, Power Supply, Multi-meter, IC tester
2. Characteristics of PN Diode
3. Characteristic of Zener diode.
4. Design of half wave rectifier ckt (Ripple factor determination).
5. Design of Full wave rectifier ckt (Ripple factor determination).
6. Characteristic of transistor (CB /CE /CC) type.
7. Design of transistor Amplifiers
8. Characteristic of JFET.
9. Characteristic of MOS-FET.
10. Characteristic of UJT.
11. Characteristics of LDR
12. Characteristics of TRAIC
13. Introduction to OrCAD schematic capture tool, Simulation of simple electronic circuit.
14. Identifying the components and its location on the PCB, soldering of active and passive components, Testing the assembled circuit for correct functionality

19HIMT110 SKILL TRAINING

1. Communication Skill Activities
2. Identification of Various electronic components
3. Design of electronic circuits
4. Practice on House Wiring
5. Practice on Fixing Electrical Switches, Plugs, Three pin tops.
6. Practice on Fuse changes and ground checking
7. Practice on bread boards
8. PCB assembly and testing
9. Troubleshooting of electronic circuits
10. ECG wave identification
11. Hands on training on use of Multimeter, CRO and test lamps
12. Identification and description of all anatomical structures.
13. Measurement of pulse
14. Measurement of BP

19HIMC201 SOFT SKILL AND PERSONALITY DEVELOPMENT

Course Objective

➢ To enhance holistic development of students and improve their employability skills.

Learning Outcomes
✓ Enhance the students Communication ability
✓ Developing the professionals with idealistic, practical and moral values.
✓ Enhance their inter personal skills and be an effective goal oriented team player.

UNIT I LISTENING SKILLS
Barriers to listening; effective listening skils; feedback skills. Attending telephone calls; note taking. Activities: Listening exercises - Listening to conversation, News and TV reports. Taking notes on a speech / lecture.

UNIT II SPEAKING AND CONVERSATIONAL SKILLS
Components of a meaning fuIl and easy conversation; understanding the cue and making appropriate responses; forms of polite speech; asking and providing information on general topics. The study of sounds of English, stress and intonation. Situation based Conversation in English.

UNIT III ESSENTIALS OF SPOKEN ENGLISH
Activities, Making conversation and taking turns, Oral description or explanation of a common object, situation or concept, giving interviews.

UNIT IV PRESENTATION SKILL
Oral Presentation with / without audio visual aids. Group Discussion. Listening to any recorded or live material and asking oral questions for listening comprehension.

UNIT V PERSONALITY DEVELOPMENT
Attitude :Factors influencing Attitude, Challenges and lessons from Attitude. Change Management: Exploring Challenges, Risking Comfort Zone, Managing Change. Motivation: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators.

TEXT BOOKS
1. Fredrick H. Wentz, "Soft skills Training - A workbook to develop skills for employment", Createspace, 2012.
2. Barun K. Mitra, "Personality Development and Soft skills", Oxford University Press, 2016.

REFERENCE BOOKS
1. Covey Sean, "Seven Habits of Highly Effective Teens", Fireside Publishers, 1998.
2. Carnegie Dale, "How to win Friends and Influence People", Simon & Schuster, 1998.

19HIMC202 MEDICAL PHYSIOLOGY
Course Objective
➢ To understand clearly and identify the various parts of the human body, their anatomical position, their functions and how these can be used in the design of effective biomedical systems.

Learning Outcomes
  To gain knowledge about basics of human body, cell, and blood
✓ To understand functioning of the various systems of body

UNIT I INTRODUCTION TO HUMAN BODY, CELL, BLOOD
Overview of organ systems, Basic terminologies (Directional, regional, planes, feedback) - Cell: Different types of cells, Cell Structure and its organelles -Functions of each

component in the cell - Membrane – transport across membrane - Origin of cell membrane potential - Action potential and propagation -Blood-Composition-RBC, WBC and Platelets.

UNIT II CARDIOVASCULAR AND RESPIRATORY SYSTEMS

Structure of heart -Circulation types - Cardiac cycle- Volume and pressure changes - ECG - Heart sounds - Blood pressure -Regulation of BP - Parts of respiratory system, Mechanics of respiration - Carbon dioxide and oxygen transport - Regulation of respiration - Volumes and capacities of lung, Types of hypoxia

UNIT III NERVOUS SYSTEM AND MUSCULOSKELETAL SYSTEM

Nerve cell anatomy -Functions of nervous system - Brain anatomy and hemispheres – Meninges - Cerebra Spinal Fluid-Circulation and Absorption-Spinal cord anatomy - Reflexaction-PNS - Skeletal System -Functions -Anatomy of long bone –Formation, growth and repair - Structural and functional classification of joints - Functions of muscular system –

Types of muscles - Sliding Filament. Model - Neuromuscular junction - Physiology of muscle contraction.

UNIT IV DIGESTIVE AND EXCRETORY SYSTEM

Digestive system-Organization -Movements of GI tract - Digestion at various parts (Mouth to Large Intestine) - Accessory organs of Digestion (Salivary glands, Liver, Pancreas, Gall Bladder)– Defecation - Excretory System - Functions of urinary system – Microanatomy and functions of nephron - Physiology of urine formation – Micturition

UNIT V SPECIAL ORGANS AND ENDOCRINE GLANDS

Eyes-retina Layers, Visual Pathway - Internal ear-Physiology-Auditory Pathway - Sense of Taste - Sense of Smell, touch - Endocrine glands-different glands and their hormones - Pituitary, Thyroid Parathyroid glands-Secretions – Maintenance of Calcium homeostasis - Maintenance of glucose homeostasis

TEXTBOOK:
1. Arthur C, Guyton, John Hall.E, 'Textbook of Medical Physiology", W.B.Saunders Company, 2006

REFERENCE BOOKS:
1. Sarada Subramanyam, Madhavan Kutty. K and Singh. H.D, "Text Book of Human Physiology",   S. Chand. 1996.
2. Ranganathan T S, "Text Book of Human Anatomy", S.Chand,1996.

19HIMC203 BIOSENSORS AND MEASUREMENTS

Course Objective
➢ To gain knowledge about the measuring instruments and the methods of measurement.

Learning Outcomes
✓ Understands basic idea of measurements and the errors associated with measurement.
✓ Acquire knowledge about the various types of transducers, signal generators and analyzers.
✓ Gains knowledge on functioning of the various measuring instruments, displaydevices and application on the biomedical devices.

UNIT I - MEASUREMENT SYSTEM AND BASICS OF TRANSDUCER

Measurements and generalized measurement system: Static characteristics, accuracy, precision, linearity, hysteresis, threshold, dynamic range- Dynamic Characteristics- calibration, standards and AC/DC bridges, wheat stone bridge, Kelvin, Maxwell. Transducer: Basics, Classification, Characteristics and Choice, POT, Thermistor, Thermocouple, Temperature compensation.

UNIT II - MEASUREMENT OF NON-ELECTRICAL QUANTITIES
LVDT, Strain gauges, Transducer: Pressure, Capacitive, Inductive, Electrochemical, Piezo-electric, Hall effect, Opto-electronic Digital encoding/digital, Fiber-optic, Flow and liquid level, and Electrochemical transducer.

UNIT III - SIGNAL GENERATORS AND SIGNAL ANALYZER
Signal generator: AF, Pulse, AM, FM, Function, and Sweep frequency generator, Signal analyzer Wave, Spectrum, Logic, and Distortion analyzer.

UNIT IV - DIGITAL DATA DISPLAY AND RECORDING SYSTEM
DVM and millimeters, Frequency, Period measurement, Time interval and pulse width measurement, Graphic recorders-strip chart, X-Y recorder, Magnetic tape recorder, CRO basics: CRT, General purpose oscilloscope, Dual trace, Dual beam, Sampling oscilloscope, Digital storage oscilloscope.

UNIT V - MEDICAL APPLICATIONS OF SENSORS
Gas sensor, Microbial sensor, electro analytical sensor, Enzyme based sensor-Glucose sensor, Electronic nose- halitosis, Advances in sensor technology: Lab-on-a-chip, Smart sensor, MEMS and Nano sensor.

TEXT BOOKS
1. Albert D.Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2007.
2. Ernest O Doebelin and Dhanesh N Manik, "Measurement systems, Application and Design", McGraw-Hill, 2007.

REFERENCE BOOKS
1. Renganathan S, "Transducer engineering", Allied Publishers Limited, 2003
2. Murty DVS, "Transducer and instrumentation", PHI, 2008.
3. Manoj Kumar Ram, Venkat R. Bhethanabolta, "Sensors for chemical and biological applications", CRC press, 2010
4. Patranabis D, "Sensors and transducers", PHI, 2004.
5. Sawhney A.K, "A course in electrical and electronic measurements and instrumentation", Dhanpat Rai & Co (P) Ltd, Educational and Technical Publishers, 1996.

19HIMC204 ANALOG AND DIGITAL ICs

Course Objective
➢ To acquire the knowledge about the characteristics and operation of various analog and digital ICs

Learning Outcomes
✓ Students equip with design of analog circuits
✓ Understand the digital logic circuits and sequential circuits
✓

UNIT I OPERATIONAL AMPLIFIERS
The characteristics of Ideal Operation – slew rate, offset voltage, bias current, CMRR, bandwidth- equivalent circuit of an op-Amp – virtual ground concept – Linear applications of op-amp –inverting and non-inverting amplifier, summing, subtracting, averaging amplifier - voltage to current converter – current to voltage converter – Differential amplifiers – differentiator and integrator. Non-linear applications – comparator - Schmitt Triggers – Precision diode half wave and full wave rectifiers – Average detectors – peak detector

UNIT II ACTIVE FILTERS AND SIGNAL GENERATOR
Active filters (first and second order) – Low pass, high pass, band pass filters, band reject filters (notch filters). Oscillators - RC Phase shift and Wein-bridge. Waveform generators - Square, triangular and saw tooth.

UNIT III TIMER, PLL AND DATA CONVERTERS

555 Timer (internal diagram) and its applications – monostable multivibrator, astable multivibrator. Phase Locked Loop (565 - block diagram approach) and its applications - Frequency multiplication, Frequency translation, voltage to frequency and frequency to voltage converters. DAC – Binary weighted DAC and R-2R DAC. ADC – single slope and dual slope ADCs, successive approximation ADC

UNIT IV NUMBER SYSTEMS AND LOGIC GATES

Decimal, Binary, Octal and Hexadecimal Numbers.-Conversion between these number systems.-Complements: rs and (r-1)s complements.- subtraction using complements – Encoding number and characters using Binary digits. –Binary Coded Decimal –Gray code - Binary to Gray code conversion –ASCII Code. Logic gates – Truth tables – NOT, AND, OR, NOR, NAND, XOR, XNOR - Boolean Laws and theorems – Solving Boolean expressions, Truth Tables and Logic circuits – The Karnaugh Map – half adder, full adder, Multiplexers and De-multiplexers -Decoders and encoders. Coding of Combination Circuits in Verilog.

UNIT V REGISTERS AND COUNTERS

Flip Flops – RS, D, T, and JK Flip Flops –Characteristic equations, exciting tables – JK Master –Slave flip-flop – Universal shift register. Design of modulo-N counters – counter design using state diagram- sequential circuit design with Verilog.

TEXT BOOKS:

1. Ramakant A. Gayakwad , "Op-amp and Linear ICs", Prince Hall, 1994
2. Morris Mano M , "Digital Logic and Computer design", Prentice Hall 1994.

REFERENCE BOOKS:

1. Robert B.Northrop, 'Analysis and Application of Analog Electronic Circuits to Biomedical Instrumentation', CRC Press, 2004.
2. Sergio Franco, 'Design with Operational Amplifiers and analog Integrated circuits', Tata McGraw-Hills, 2002.

19HIMC205 MEDICAL INSTRUMENTATION

Course Objective

➢ To gain basic knowledge about Bio potentials, Bio electrodes and bioamplifier and to give a complete exposure of various recording mechanism and to understand the basic principles, working of biomedical instruments.

Learning Outcomes

✓ Students understand the characteristics of bio-amplifiers and different types of recorders.
✓ Gains knowledge to measure various physiological parameters and able to design simple biomedical sensors
✓ Acquire the importance of instrumentation concerned with measuring various parameters and the principle of working and gain knowledge on usage of instruments in hospitals and servicing.

UNIT I BIO ELECTRODES AND BIOCHEMICAL SENSORS

Components of Medical Instrumentation – System Origin of Bio potential: Action Potential, Nernst Equation, Goldman equation, Hodgkin- Huxley model – Electrode electrolyte interface, Half-cell potential, Polarisable and Non-polarisable electrodes – Skin electrode interface – Bio-electrodes: Surface-, Micro-. Needle electrodes- Equivalent circuits of electrodes – Biochemical-, and Transcutaneous- electrodes: pH, pO2, pCO2 - Ion sensitive Field effect Transistors.

UNIT II BIO AMPLIFIERSAND BIOELECTRIC SIGNALS

Bio amplifiers- Carrier Amplifier, - Isolation Amplifier - Differential amplifier - Chopper Amplifier - Instrumentation Amplifier - Bioelectric signals (ECG, EMG,EEG, EOG & ERG) and their characteristics - Electrodes for ECG, EEG and EMG -Einthoven

triangle, Standard 12-lead configurations - ECG Machine – EMG machine – 10-20 electrodes placement system for EEG - EEG machine – Heart sound and characteristics, PCG.

UNIT III PATIENT MONITORING SYSTEMS AND BIOTELEMETRY

Measurement of Blood pressure – Direct Methods and Indirect Methods –Temperature - Respiration rate - Heart rate measurement - Apnea detectors -Oximetry -Pulse oximeter, Ear oximeter - Computerized patient monitoring system– Bedside, Central Monitoring system – Biotelemetry: Basics components, andits different types.

UNIT IV CARDIAC MEASUREMENTS AND DEVICES

Cardiac output Measuring techniques – Dye Dilution method, Thermo dilution method BP method - Blood Flow measuring Techniques: Electromagnetic Type –Ultrasound Blood Flow meter, Laser Doppler Blood Flow meter – Cardiac Arrhythmias Plethysmography - Cardiac Pacemakers – Defibrillator: AC-, and DC- types - Heart-Lung Machine (HLM) – Oxygenators

UNIT V ANALYTICAL EQUIPMENTS

Chemical Fibro sensors, Fluorescence sensors - Glucose Sensor - Blood cell counters - Coulter counter, Electrical Impedance Method, Optical Method -Colorimeter, Spectrophotometer, Flame photometer – Chromatography – Mass Spectrometer – Electrical hazard – Micro- and Macro- shock - Patient safety procedures

TEXTBOOKS:
1. Geoddes L.A, and Baker L.E, "Principles of Applied Biomedical Instrumentation" ,John Wiley, 1989.
2. Khandpur R.S, "Hand-book of Biomedical Instrumentation", Tata McGrawHill, 2003.
3. Leslie Cromwell, J. Fred Weibell, A. Erich Pfeiffer. "Biomedical Instrumentation and Measurements", Prentice-Hall India, 1997

REFERENCE BOOKS:
1. R. Stuart, MacKay, "Bio-Medical Telemetry: Sensing and Transmitting Biological Information from Animals and Man", Wiley-IEEE Press, 1968.
2. John G. Webster, "Medical Instrumentation application and design", JohnWiley, 1997.

19HIMP206 PERSONALITY DEVELOPMENT LABORATORY

1. Classroom technique to improve the soft skills
2. Surprise writing on current issues
3. General grooming sessions to face the interview
4. Group discussions
5. Motivational classes to improve communication and confidence power
6. Team project on personality development
7. Presentation through visual aids
8. News reading
9. Dialogue delivery
10. Change project

19HIMP207 BIOSENSORS AND MEASUREMENT LABORATORY

1. Measure the resistivity of material using Kelvin Double Bridge
2. Measurement of Frequency by Wien Bridge using Oscilloscope
3. Characteristics of Pulse sensor
4. Measurement of Pressure
5. Measurement of cardiac output
6. Isolation of bio-signal (EMG / ECG) using analog circuits.
7. Measurement of galvanic skin resistance.

8. Measurement of heart sound using electronic stethoscope.
9. Measurement of temperature
10. Characteristics of optical transducer for SpO2 measurement

19HIMP208 ANALOG AND DIGITAL ICs LABORATORY

1. Design of Amplifiers using Op-amp
2. Characteristics of Instrumentation Amplifiers
3. Design of Low Pass Filter
4. Design of High Pass Filter
5. Design of Band Pass Filter
6. Design of Multivibrators
7. Design of Schmitt traigger
8. Design of timer circuits
9. Characteristic of PLL
10. Study of Gates & Flip-flops.
11. Half Adder and Full Adder.
12. Magnitude Comparator (2-Bit).
13. Encoders and Decoders.
14. Multiplexer and Demultiplexer.
15. Code Converters.

19HIMP209 BIOMEDICAL INSTRUMENTATION LABORATORY

1. Real time acquisition of ECG, EEG & EMG and analysis
2. Analysis of abnormal ECG wave pattern using ECG Simulator
3. Real time patient monitoring system
4. Pulse oximetry
5. Acquisition of Heart sounds using PCG
6. BP measuring techniques
7. Glucose sensor
8. Differentiating Arteries and veins using Doppler ultrasonography
9. Heart Lung machine model – study
10. Pacemaker, Defibrillator Models – Study
11. Determination pulmonary function using spirometer (using mechanical system).
12. Measurement of respiration rate using thermister /other electrodes.
13. Measurement of pulse rate using photoelectric transducer & pulse counting for known period.
14. Detection of QRS component from ECG signals using analog circuits.
15. Measurement of heart rate using F-V converter.
16. Measurement of blood pH.

19HIMP210 MEDICAL EQUIPMENT TRAINING

1. Communication Skill Activities
2. Personality Developmental Activities
3. Team activities
4. Understanding of Various Medical Instruments
5. Installation of Medical Instruments
6. Calibration of Hospital Instruments
7. Measurement of Physiological Parameters
8. Testing of Equipments
9. PMR operation of Instruments

19HIMC301 ENVIRONMENTAL STUDIES

UNIT I : ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II: CHEMISTRY OF ENVIRONMENTAL POLLUTANTS

Definition of pollution; pollutants; classification of pollutants; solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring pollutants, concept of biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants, organometallic compounds, acid mine drainage, causes of soil pollution and degradation; effect of soil pollution on environment, control strategies.

UNIT III:AIR POLLUTION

Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs) and control measures; indoor air pollution: sources and effects on human health. Noise pollution: sources and permissible ambient noise levels; effect on communication, impacts on life forms and humans, control measures, Radioactive material and sources of radioactive pollution.

UNIT IV: FRESHWATER AND MARINE POLLUTION

Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides); water borne diseases; concept and working of effluent treatment plants (ETPs). Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management; existing challenges and management techniques (planning, construction, environmental monitoring of coastal zones), thermal pollution and its effects.

UNIT V: POLLUTION CONTROL

Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors, membrane bioreactor neutralization, ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors,

hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi.

TEXT BOOKS:
1. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2006. Environmental and Pollution Science. Elsevier Academic Press.
2. Purohit, S.S. & Ranjan, R. 2007. Ecology, Environment & Pollution. Agrobios Publications.

REFERENCE BOOKS:
1. Gurjar, B.R., Molina, L.T. & Ojha C.S.P. 2010. Air Pollution: Health and Environmental Impacts. CRC Press, Taylor & Francis.
2. Hester, R.E. & Harrison, R.M. 1998. Air Pollution and Health. The Royal Society of Chemistry, UK.
3. Park, K. 2015. Park's Textbook of Preventive and Social Medicine (23rd edition). Banarsidas Bhanot Publishers.
4. Vesilind, P.J., Peirce, J.J., & Weiner R.F. 1990. Environmental Pollution and Control.Butterworth-Heinemann, USA.

19HIMC 302 BIOSIGNAL CONDICTIONING SYSTEM

UNIT – I BIOSIGNALS
Nature of Bio Electricity: Bioelectric Currents, Nernst Potential, Diffusion Potential, Actionpotential, Detection of Bio electric events, bio-electrode and electrode-skin interface.

UNIT II AMPLIFIERS
Instrumentation amplifiers, Bridge Amplifiers. Bioelectric Amplifiers: - Properties desired, Isolation Amplifiers:-Battery Powered, Carrier, Optically Coupled, Current Loading, Chopper Stabilized amplifier, Input Guarding.

UNIT III REGULATORS
PLL - Basic principles & applications. Voltage regulators-Voltage Regulators,Design of Series Voltage Regulator- 723 switching regulators, Voltage regulator ICs – 78XX and79XXseries , 8038 Function generator chip applications.

UNIT IV SAFETY INSTRUMENTATION
Interference and instability of biomedical signals. Electrical and magnetic components – leadsas path of resistance – minimizing interference. Introduction – Physiological effects microshock. Macro shock – electrical accidents in hospitals – Electrical Hazards – SafetyMeasures.

UNIT V MEDICAL APPLICATIONS OF LINEAR AND DIGITAL INTEGRATEDCIRCUITS
Application of Linear and digital integrated circuits – Digital thermometer, pulseoximetry, Blood pressure, Portable ECG measurement, Automatic ExternalDefibrillator, Digital X-Ray, Endoscopy, Blood glucose monitor .

TEXT BOOKS
1. Roy Choudhury and Shail Jain, "*Linear Integrated circuits*", New Age International, 4th edition, 2010.
2. Coughlin & Driscoll, "*Operational Amplifiers & Linear Integrated Circuits*", Prentice Hall of India, 6th edition, 2003

REFERENCE BOOKS
1. Gayakwad A.R, *Op-Amp and "Linear Integrated circuits"*, Prentice Hall of India, 4th edition, 2003
2. Joseph J. Carr & John M. Brown, Introduction to Biomedical Equipment Technology, 4th edition, Pearson Education Pvt. Ltd,
3. *Geddas I.A and Baker I.JF. Principles of applied biopmedical instrumentation", John Wiley and Sons,1992.*

19HIMC303 MEDICAL DIAGNOSTIC EQUIPMENTS

UNIT I BIOMEDICAL RECORDER

Basic Measurement system, ECG-Lead configuration-Instrumentation set-up **-** effects of artifacts. EEG **-** 10-20 Electrodes configuration **-** Instrumentation **-** recording of Evoked potentials, EMG **-** Measurement of nerveconduction velocity. ERG, EOG, PCG, Echocardiography.

UNIT II PULMONARY FUNCTION MEASUEMENT

Respiratory volumes and capacities, Compliance and related pressure, Spirometer,Pneumotachometer-different types, Measurement of respiration rate-impedance pneumograph/ plethysmograph, apnea detector.

UNIT III FLOW METERS

Flow meters and CO2 Measurement, Electromagnetic flow meters, Ultrasonic Blood flow meters, LaserDoppler Blood flow meters, NMR Blood flow meters. Indicator Dilution method, Dye dilution method, Thermal dilutionmethod.

UNIT IV PATIENT MONITORING SYSTEMS

BP measurement **-** Direct and indirect method, pulse rate analysis, temperature measurement, RespirationRate, Biomedical applications, Central monitoring system. Endoscope , Laparoscopy, Oximetry.

UNIT V GENERAL PURPOSE EQUIPMENTS

Basic Audiometer **-** Pure tone & speech, Conventional hearing aids, Basic Spirometry. Auto Refractometer, Dioptron, Retinoscope.

TEXT BOOKS
1. Cromwell, Biomedical Instrumentation & Measurements Prentice-hall of India private limited, 2011.
2. Carr & Brown, Introduction to Biomedical Equipment Technology, 2001.
3. R. AnandaNatarajan, Biomedical Instrumentation & Measurements, PHI Publication, 2011.

REFERENCE BOOKS:
1. Alan. H. Tumadadiffe, Introduction to Visual optics, 1987.
2. David. B. Henson, Optometric Instrumentation,1983.
3. John G. Webster, Medical Instrumentation, John Wiley & Sons,.2007.
4. Guyton & Hall, Textbook of Medical Physiology, 2010.
5. R. S. Khandpur, Hand Book of Biomedical instrumentation, Tata McGraw Hill Publication, 2005.

19HIMC304MICROPROCESSOR AND MICROCONTROLLER FOR MEDICAL SYSTEMS

UNIT I - **MICROPROCESSOR-8085**

Evolution & Importance of microprocessor, Microprocessor-8085: Introduction,feature, architecture, pin diagram, addressing mode, instruction set, timing diagram,interrupt-Programming exercise

UNIT II - MICROPROCESSOR-8086

Microprocessor-8086: Introduction, comparison with microprocessor-8085, feature,architecture, pin diagram, addressing mode, instruction set, minimum- and maximummode,assembler directives and operators, interrupts- Programming exercise

UNIT III - PERIPHERAL DEVICES

Interfacing: Memory- and I/O- interfacing- Programmable Peripheral Interface (PPI)-8255: Pin diagram, block diagram, and operating modes-ProgrammableCommunication Interface (PCI)-8251 USART: Pin diagram, block diagram, andcommand word- Programmable Interrupt Controller (PIC)-8259A: Pin diagram, block diagram, interrupt sequence, and cascading- Keyboard/Display Controller-8279: Pindiagram, block diagram, operating modes.

UNIT IV - MICROCONTROLLER-8051

Introduction to 8 bit microcontroller, bus configuration, architecture of 8031/8051,Signal descriptions of 8051, Register set of 8051, Memory- and I/O Interfacing:Interrupts, instruction set, and addressing mode- Simple programs

UNIT V - APPLICATIONS IN MEDICINE

Mobile phone based bio signal recording, microprocessor based vision architecturefor integrated diagnostic helping devices, Microprocessor based remote healthmonitoring system: Concept and systems, and system operation.

TEXT BOOKS

1. Ramesh S.Gaonkar "*Microprocessor architecture, programming and its application with 8085*", Penram Int. Pub. (India), Fifth edition, 2002.
2. Roy A.K, Bhurchandi K.M," "*Intel Microprocessors Architecture, Programming and Interfacing*", McGraw Hill International Second Edition, 2006.

REFERENCE BOOKS

1. Muhammad Ali Mazidi and Janica Gilli Mazidi, "*The 8051 microcontroller and embedded systems*", Pearson Education, Fifth edition, 2003.
2. Rafiquzzaman M. "*Microprocessors - Theory and Applications*" Intel and Motorola, Prentice Hall of India Pvt. Ltd, Second edition, 2001.
3. Douglas V.Hall "*Microprocessors and Interfacing programming and hardware*", Tata McGraw Hill, Fourth Edition, 2003.
4. Nagoor kani A, "*Microprocessors and Microcontrollers*" Tata McGraw Hill, second Edition, 2012.

19HIMC305 BASIC ELECTRICAL AND ELECTRONIC MEASUREMENT

UNIT I BASIC MEASUREMENT SYSTEM

Measurement and generalized measurement system, static and dynamic characteristics, units and standards of measurements, errors analysis, moving iron meters, dynamometer, wattmeter, multimeter, true rms meters, D.C. and A.C. potentiometers, Measurement of high voltage, Measurement of power in polyphase circuits.

UNIT II DATA DISPLAY AND RECORDING SYSTEM

Electronic multimeter, current measurement with analog electronic instruments, chopper stabilized amplifier for measurement of very low voltage and currents, graphic recorders, Cathode Ray Oscilloscopes- Block Schematic, Principles and applications. Dual Trace and Dual Beam Oscilloscopes, sampling oscilloscope, Digital Storage Oscilloscope.

UNIT III SIGNAL GENERATOR AND ANALYSIS

Function Generators, RF Signal Generators, Sweep Generators, Frequency Synthesizer, Wave Analyzer, Harmonic Distortion Analyzer, Spectrum Analyzer.

UNIT IV DIGITAL INSTRUMENTS
Comparison of analog & digital techniques, digital voltmeter, mutlimeter, frequency counters and time interval, extension of frequency range, measurement errors.
UNIT V DATA ACQUISITION SYSTEMS
Elements of digital data acquisition system, interfacing of transducers, multiplexing, Computer controlled instrumentation: IEEE 488 Bos. Optical Power Measurement, Optical Time Domain Reflectometer.

19HIMP306 BIOSIGNAL CONDITIONING SYSTEMS LAB

1. Characteristics of OP AMP 741
2. Operational Amplifier as Summer and subtractor
3. OP-AMP as differentiator and Integrator
4. Design and Development of Instrumentation Amplifier
5. Squaring Circuit
6. Design and Development of Signal conditioning circuit
7. OP-AMP based Filter
8. Characteristics of PLL
9. Design of Voltage regulators
10. 555 based timer circuits
11. Design of ECG amplifier
12. Design of comparators

19HIMP307 Diagnostic Instruments Lab

1. ECG monitoring system
2. Spirometer
3. Heart rate monitor
4. Phonocardiogram monitor
5. Multi parameter monitoring system
6. Respiration rate apnea monitor
7. EMG monitor
8. EEG monitor
9. Audiometer
10. Blood flow monitor
11. Nerve conduction Measurement
12. BP measurement

19HIMP308 MICROPROCESSOR AND MICROCONTROLLER FOR MEDICAL SYSTEMS LAB

1. 8085 and 8051 assembly language programming exercises
2. Addition and subtraction of 8 bit numbers, 16 bit numbers
3. Multi byte subtraction
4. Multiplication and division of two 8 bit numbers
5. Sorting numbers in ascending order and descending order
6. Block data transfer - forward and reverse order
7. Sum of series of N numbers
8. Code conversion Decimal to Hexadecimal and Hexadecimal to Decimal
9. Stepper motor control
10. Interfacing of Analog to digital (ADC) and Digital to Analog converter (DAC)
11. Interfacing of traffic light control systems, Keyboard/ Display Interface
12. Checking various clocks and timers of microcontroller

13. Reduce code size by using different commands
14. Simple Digital Voltmeter using 8051.
15. Digital lock using AT89C2051 with LCD and keypad assembly.
16. Data acquisition system using 8051.
17. Temperature controlled Fan.
18. Microcontroller based caller ID.
19. Bio medical monitoring system.
20. Basic programming using keil.

19HIMP309ELECTRICAL AND ELECTRONIC MEASUREMENT LAB

1. Instrument workshop- observe the construction of PMMC, Dynamometer, Electro thermal and Rectifier type instrument, Oscilloscope and digital multimeter
2. Use of CRO & DSO with Function generators
3. Use of Analog and Digital multimeter for AC and DC measurements
4. Calibrate moving iron and electrodynamometer type ammeter/volmeter by potentiometer Calibrate dynamometer type Wattmeter by potentiometer
5. Calibrate A.C. energy meter
6. Measure the resistivity of material using Kelvin Double Bridge
7. Measurement of Power using Instrument transformer
8. Measurement of Power in Polyphase circuits
9. Measurement of Frequency by Wien Bridge

19HIMC401 HOSPITAL MANAGEMENT SYSTEMS

UNIT I HOSPITAL ORGANIZATION
Distinction between Hospital and Industry, Challenges in Hospital Administration - Classification of hospitals, role of hospital in healthcare, location and environment of hospital, wards, intensivecare units, admitting department, medical record department, centralized sterilization and supply department, pharmacy, food services,laundry and linen services, house-keeping, evaluation of hospital services.

UNIT II PLANNING AND DESIGNING OF MEDICAL SERVICES
Outpatient service, inpatient service, emergency service, clinical laboratories, radiologyservices, radiation therapy department, surgical department, critical care department, nursing department, operation theatre, CSSD,nursing services, blood banks.

UNIT III PLANNING AND DESIGNING OF ENGINEERING SERVICES
Engineering department, Maintenance department, clinical (biomedical) engineering,preventive maintenance of equipments, electrical system, power supply system, air condition system, water supply and sanitary system,centralized gas supply system, telecommunication system, environmental control, safety and security system, fire safety and threat alarmsystem, hospital waste disposal system.

UNIT IV HOSPITAL MANAGEMENT AND INFORMATION SYSTEM
Role of HMIS, functional areas, modules forming HMIS, HMIS and internet, PACS,radiology information system, health information system, centralized data record system, computerized patient records, computer assistedpatient education and healthcare information, material management, disaster management.

UNIT V REGULATION AND PLANNING OF NEW HOSPITAL
FDA regulation, accreditation for hospitals, Quality system – Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004 – Features of ISO 9001 – ISO 14000 – Environment Management Systems.

NABA, JCI, NABL. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care – Medical Audit – Hazard and Safety in a hospital Setup

TEXT BOOKS
1. R.C.Goyal, "Hospital Administration and Human Resource Management", Prentice Hall of India, Fourth Edition, 2006.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management", Tata McGraw Hill, New Delhi, Fifth Reprint 2007.

REFERENCE BOOKS
1. William A. Reinke,"Health Planning For Effective Management", Oxford University Press.1988
2. Arnold D. Kalcizony & Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011.

19HIMC402 THERAPEUTIC INSTRUMENTATION

UNIT I INSTRUMENTS FOR CARDIOLOGY
Cardiac Pacemakers - Need for Cardiac Pacemaker **-** External Pacemakers - implantable Pacemakers **-**Recent Developments in Pacemaker system analyzer. Cardiac Defibrillators -Need for a Defibrillator – DCDefibrillator - Implantable Defibrillators **-** Pacer-cardio vector - defibrillator analysis.

UNIT II INSTRUMENTS FOR SURGERY
Instruments for surgery - principle of surgical diathermy - surgical diathermy machine - safety aspects inElectro-Surgical diathermy Units. Physiotherapy and electrotherapy equipment - High frequency heat therapy – shortwave Diathermy - Microwave diathermy - Ultrasonic therapy unit **-** Pain relief through Electrical Stimulation **–** BladderStimulators **-** Cerebellar Stimulators.

UNIT III HAEMODIALYSIS
Haemodialysis Machines - Function of the kidneys - Artificial Kidney **-** Dialyzers - Membrances ofhaemodialyzers - Haemodialysis machines - Portable Kidney machines. Lithotripters **-** The stone disease problem -First lithotripter machine **-** modern lithotripter systems - Extracorporeal Shockwave Therapy

UNIT IV PULMONARY AND RADIOTHERAPY INSTRUMENTS
Anesthesia Machine **-** Need for Anesthesia **-** Anesthesia machine - Electronics in Anesthesia machine.Radiotherapy Equipment - Development of Betatron, chemotherapy,Heart lung Machine.

UNIT VRESPIRATORY INSTRUMENTS .
Instrumentation for measuring the mechanics of breathing – Spirometer -Lung Volume and vital capacity, measurements of residual volume, Pneumotachometer – Airway resistance measurement, Whole body Plethysmograph, Intra-Alveolar and Thoracic pressure measurements, Apnoea Monitor. Types of Ventilators – Pressure, Volume, and Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators.

TEXT BOOKS
1. John G. Webster, Biomedical Instrumentation, Wiley Publications.2007.

REFERENCE BOOKS
1. R. S. Khandpur, Handbook of biomedical Instrumentation, Tata McGraw Hill Publication company Ltd, New Delhi, 1997.
2. Joseph J. Carr, John Michael Brown, Introduction to Biomedical Equipment Technology 4th edition, Pearson Education.2001.

19HIMC403 HOSPITAL EQUIPMENT

UNIT I MEDICAL INSTRUMENTATION
Overview of Biomedical Instrumentation system – Types of biomedical equipments – Analytical, Diagnostic, Therapeutic and Surgical equipments – calibration of medical devices and testing of biomedical equipments, Electrical classification of Biomedical Equipments

UNIT II ANALYTIC EQUIPMENTS
Flame photometers, Introduction to Spectro photometers, Beer lambert law,Colorimeters, Blood gas analyzers –Electrodes for pH, pO2 and pCO2. Hb meter, Blood cell counters, Auto analyzers,Radio Immuno Assay and ELISA techniques. Principles and techniques of sterilization–Autoclave, Sterrad. Chromatography – Gas and liquid Chromatographs – Principle and applications. Mass spectroscopy, flow cytometry–Principles and applications. Electrophoresis – Principles and applications.

UNIT III PATIENT MONITORING SYSTEM
Bed-side monitors, Central station monitors, Computerized arrhythmia monitors, Cardio scope, Ambulatory monitors, Neonatal monitors,Holter monitoring, Infant Warmer, Neonatal Incubator, Infusion pump, syringe pump,Cardiotocograph – Methods of monitoring fetal heart rate.

UNIT IV OPERATION THEATER EQUIPMENTS
Surgical Light, Operating Table, C Arm, Craniotomy,ElectrosurgicalMachines (ESU),Electrosurgical analysers,Surgical aspirator,Anesthesia machine, Anesthesia gas,Anesthesia gas monitor, Surgical microscope.

UNIT V SENSORY MEASUREMENT
Psychophysiological Measurements – polygraph, basal skin resistance (BSR), galvanic skin resistance (GSR), Sensory responses - Audiometers –Pure tone, Speech and Mask audiometers, Bekesy audiometers, Tympanometers. Hearing aids, Cochlear implants, Ear moulds. Densitometers – Principle and applications.

TEXT BOOKS
1. L.A.Geddes & L.E.Baker, "Principles of Applied Biomedical Instrumentation", Wiley India Pvt.Ltd, Third Edition, 1989.
2. R.S. Khandpur ,"Handbook of Biomedical Instrumentation", Second Edition, Tata McGraw Hill, 2003.

REFERENCE BOOKS
1. R.S. Khandpur, "Handbook of Analytical Instruments", Tata McGraw Hill,1989
2. John G.Webster, "Medical Instrumentation: Application and Design", Wiley India Pvt.Ltd, Third Edition, 2002.
3. Chanderlekha Goswami ,"Handbook of Biomedical Instrumentation", Manglam Publications, 2010.

19HIMC404 RADIOLOGY AND IMAGING EQUIPMENTS

UNIT I X-RAY MACHINE
Physics and production of X-ray, Stationary and rotating anode tube, tube enclosure, rating charts of X-ray tubes,Conventional electrical circuit of X-ray machine, High voltage generation, High frequency generators, Control circuits-high voltagecontrol, filament control and tube current, starter, exposure timing, Automatic exposure control, Collimators and Grids, mammographicand dental X-ray machines, portable and mobile X-ray units.

UNIT II X-RAY IMAGE AND RADIOTHERAPY
X-ray film, Film sensitometry, Radiographic film image formation, dark room accessories-developerand fixer, image quality factors, detector quantum efficiency,

MTF, Image intensifier, Digital radiography, safety protocol and doses,Dose equivalent and REM, Radiotherapy principles, dose measurement and treatment planning.

UNIT III FLUOROSCOPIC IMAGING SYSTEM

Digital fluoroscopy-c-arm system, Digital subtraction angiography(DSA). Angiography, Cine Angiography, Digital subtraction Angiography. Mammography

UNIT IV COMPUTED TOMOGRAPHY

Principles of tomography, CT Generations, X- Ray sources- collimation- X- Ray detectors-Viewing systems- spiral CT scanning – Ultra fast CT scanners. Advantages of computed radiography over film screen radiography: Time, Image quality, Lower patient dose, Differences between conventional imaging equipment and digital imaging equipment: Image plate, Plate readers, Image characteristics, Image reconstruction techniques- back projection and iterative method. Spiral CT, 3D Imaging and its application.

UNIT V MAGNETIC RESONANCE IMAGING

Fundamentals of magnetic resonance- Interaction of Nuclei with static magnetic field and Radio frequency wave- rotation and precession – Induction of magnetic resonance signals – bulk magnetization – Relaxation processes T1 and T2. Block Diagram approach of MRI system- system magnet (Permanent, Electromagnet and Super conductors), generations of gradient magnetic fields, Radio Frequency coils (sending and receiving), and s19HIM coils, Electronic components, fMRI.

TEXT BOOKS

1. J.J.Carr & J.M.Brown, "Introduction to Biomedical Equipment Technology" Pearson Education, Asia.
2. Steve Webb, The Physics of Medical Imaging‖, Adam Hilger, Philadelpia, 1988.
3. R.Hendee and Russell Ritenour,"Medical Imaging Physics", Fourth Edition, William, Wiley-Liss, 2002.

REFERENCE BOOKS

1. Gopal B. Saha,"Physics and Radiobiology of Nuclear Medicine", Third edition Springer, 2006.
2. B.H.Brown, PV Lawford, R H Small wood, D R Hose, D C Barber, "Medical physics and Biomedical Engineering", CRC Press, 1999.
3. Myer Kutz, "Standard handbook of Biomedical Engineering and design", McGraw Hill, 2003.
4. P.Ragunathan,"Magnetic Resonance Imaging and Spectroscopy in Medicine Concepts and Techniques",Paperback – Import, 2007

19HIMC405 PATIENT AND DEVICE SAFETY

UNIT I BASICS OF RELIABILITY AND CONCEPT OF FAILURE

Reliability and Safety Testing: Reliability – Types of reliability – Reliability optimization & assurance – Reliability's effect on medical devices – The concept of failure – Causes of failure – Types of Failures in Medical devices – Safety testing – Device specific safety goals

UNIT II SAFETY AND RISK MANAGEMENT

Failure assessment and Documentation – Visual inspection: External & Internal visual inspection – Measurement – Safety parameters, Function test - Risk Management: Safety and risk management – Risk, Deciding on acceptable risk, Factors important to medical device risk assessment – Risk management – Tools for risk estimation – Liability – Manufacturer's and physician's responsibilities

UNIT III ENVIRONMENTAL & ECOLOGICAL SAFETY

Devices Handling, Environmental & Ecological Safety: Safe medical devices – Handling and operation – Medical Application safety – Usability – Clinical assessment –

Environmental safety – Interference with the environment – Environmental conditions, Impact on the environment – Ecological safety

UNIT IV MECHANICAL AND ELECTRICAL SAFETY

Mechanical and Electrical Safety: Safety Mechanics – Electrical Safety – Biological aspect – Limitation of Voltages - Macroshock and Microshock – Earth and Protection – Leakage currents – Magnetic fields and compatibility – Basic assumptions in safety technology – Safety classes

UNIT V MEDICAL DEVICES STANDARDS, REGULATIONS

Medical Standards and Regulations – Device classification – Registration and listing – Declaration of conformance to a recognized standard – Investigational Device Exemptions (IDEs) – Institutional Review Boards (IRBs) – IDE format – Good laboratory practices (GLPs) – Good manufacturing practices (GMPs) – Human factors – Design control

TEXT BOOKS

1. Richard Fries, "Reliable Design of Medical Devices – Second Edition", CRC Press, Taylor & Francis Group, 2006.
2. Norbert Leitgeb "Safety of Electro-medical Devices Law – Risks – Opportunities" Springer Verlog/Wein, 2010.

REFERENCE BOOKS

1. Bertil Jacobson and Alan Murray, "Medical Devices Use and Safety", Elsevier Limited, 2007.
2. Gordon R Higson, "Medical Device Safety – The regulation of Medical Devices for Public Health and Safety", IOP Publishing Limited, Bristol and Philadelphia, 2002.
3. Shayne Cox Gad, "Safety Evaluation of Medical Devices" Second Edition, Marcel Dekker Inc., 2002.
4. Case Studies of Medical Device Adverse Events, Saudi Food and Drug Authority, 2007
5. Michael Wiklund, Jonathan Kendler, Alison Strochlic, "Usability Testing of Medical Devices", Second edition, CRC Press, Taylor and Francis Group, 2015.

19HIMC501 TROUBLESHOOTING OF MEDICAL EQUIPMENTS

UNIT I TESTING OF ELECTRICAL EQUIPMENTS

AC, DC power supply, Grounding, shielding, Guarding, insulation testing, insulation resistance measurement, Types of Circuit Breakers, Rating – Testing of circuit breakers –Transformer testing- Earthing –Earth wires - Earthing of appliances –contactor, relay testing–CT and PT, Panel wiring- Megger-Testing equipment and instruments.

UNIT II TESTING OF ELECTRONIC COMPONENTS

Troubleshooting of PCB boards, Calibration of analog and digital sensor probe, Display interface, DC Power supply design, testing, Safe electrical practice, Cables and standard, Fuse.

UNIT III TESTING OF SURGICAL EQUIPMENT

Functions and operating procedure-Testing and maintenance of Heart lung machine, surgical lights, ventilator, patient monitor, anesthesia machine, dialyzer, surgical tools.

UNIT IV TROUBLESHOOTING OF EQUIPMENTS

X-ray machines, Troubleshooting of ECG recorders, incubator, baby warmer, infusion pumps, annual maintenance, contract requirements, vendor services, quality and safety standards.

UNIT V LIFE CYCLE MANAGEMENT OF MEDICAL EQUIPMENT

Cost of the medical equipment, maintenance cost, replacement analysis, managing equipment service, decision making, extracting optimal benefit from medical equipment over its life cycle. Case study.

TEXT BOOKS
1. B.S. Dhillon, "Medical Device Reliability and Associated Areas", CRC Press, UK, 2000.
2. Joseph. J Carr, John M Brown, Introduction to Biomedical Equipment Technology, John Wiley& Sons, New York,4thedition, 2008.
3. Keith Willson, Keith Ison, Slavik Tabakov, "Medical equipment management", CRC Press, UK, 2014.

REFERENCE BOOKS
1. Jenny Dooley,John Lehnert Virginia Evans, "Career Paths: Medical Equipment Repair", Express Publishing, UK,2018
2. Shakti Chatterjee, Aubert Miller, "Biomedical Instrumentation systems", Cengage Learning Technology & Engineering, 2010.
3. David Herres, "Troubleshooting and Repairing Commercial Electrical Equipment", McGraw Hill Professional edition, 2013.
4. R. S. Khandpur, "Troubleshooting Electronic Equipment" 1st Edition, McGraw Hill, 2007

19HIMC502 ADVANCED MEDICAL IMAGING SYSTEM

UNIT I BASICS OF NUCLEAR MEDICINE
Radioactivity and interaction of radiation; Alpha, Beta and gamma emission, Laws of radioactive decay, Mechanisms of radioactive delay, Radiation intensity and exposure, Decay schemes and energy levels, Compton scattering, Pair productions, Particle interactions

UNIT II PET AND SPECT IMAGING
Introduction to emission tomography, basic physics of radioisotope imaging Compton cameras for nuclear imaging, PET scanner principles, SPECT, Computer techniques in fast acquisition Analytic image reconstruction techniques, Attenuation, scatter compensation in SPECT spatial compensation in SPECT.

UNIT III ULTRASONIC IMAGING
Production of ultrasound – properties and principles of image formation, capture and display – principles of A-mode, B-mode and M-mode display – Doppler ultra sound and color flow mapping – applications of diagnostic ultra sound.

UNIT IV INFRA-RED IMAGING
Physics of thermography – imaging systems – pyroelectric Videocon camera clinical thermography – liquid crystal thermography.

UNIT V OTHER IMAGING TECHNIQUES
Optical coherence tomography (OCT): Introduction and its medical applications - Advances in image resolutions - Speed in Picture Archiving and Communication Systems (PACS) in medical imaging.

TEXT BOOKS
1. Simon Cherry, James Sorenson, Michael Phelps. "Physics in Nuclear Medicine", Elsevier Saunders, 4th Edition, 2012.
2. John Ball and Tony Price Chesney's, "Radiographic Imaging". Blackwell Science Limited, U.K. 2006.
3. Farr, "The Physics of Medical Imaging", AdemHilger, Bristol & Philadelphia, 2007.
4. Joseph Bronzino. "The Physics of Medical Imaging". Second edition.2005.

REFERENCE BOOKS
1. M. Analoui, J.D. Bronzino, D.R.Peterson, "Medical Imaging: Principles and Practices", CRC Press, 2012.
2. S. Webb, "Physics of Medical Imaging", Taylor & Francis, 2010.
3. T. Farncombe, K. Iniewski, "Medical Imaging: Technology & Applications", CRC Press, 2013.

4. J.S. Benseler, "The Radiology Handbook: A pocket guide to medical imaging", Ohio University Press, 2006.

19HIMC503 MEDICAL ETHICS AND STANDARDS

UNIT I INTRODUCTION TO MEDICAL ETHICS
Definition of Medical ethics, Scope of ethics in medicine, American medical Association code ofethics, CMA code of ethics- Fundamental Responsibilities, The Doctor and the Patient, The Doctorand the Profession, Professional Independence, The Doctor and Society.

UNIT II MEDICAL STANDARDS
Evolution of Medical Standards – IEEE 11073 - HL7 – DICOM – IRMA - LOINC – HIPPA –Electronics Patient Records – Healthcare Standard Organizations – JCAHO (Join Commission on Accreditation of Healthcare Organization) - JCIA (Joint Commission International Accreditation) - Evidence Based Medicine - Bioethics.

UNIT III HOSPITAL ACCREDITATION STANDARDS
Accreditation - JCI Accreditation & its Policies. Patient centered standards, Healthcare Organization management standards -Indian Perspective.

UNIT IV HOSPITAL SAFETY STANDARDS
Life Safety Standards- Protecting Occupants, Protecting the Hospital From Fire, Smoke, and Heat, Protecting Individuals From Fire and Smoke, Providing and Maintaining Fire Alarm Systems, Systems for Extinguishing Fires Environment of Care Standards- Minimizing EC Risks, Smoking Prohibitions, Managing Hazardous Material and Waste, Maintaining Fire Safety Equipment, Features, Testing, Maintaining, and Inspecting Medical Equipment.

UNIT V MEDICAL EQUIPMENT SAFETY STANDARDS
General requirements for basic safety & essential performance of medical equipment. IEC 60601standards- Base Standard-general requirement of electrical medical devices, Collateral Standards EMC radiation protection &programmable medical device system, Particular Standards-type ofmedical device

TEXT BOOKS
1. JohnnaFisher, "Biomedical Ethics: A Canadian Focus." Oxford University Press Canada 2009.
2. Ben Mepham,"Bioethics-—An Introduction for the biosciences",Oxford, 2008.
3. Domiel A Vallero, "Biomedical Ethics for Engineers", Elsevier Pub.1st edition, 2007.

REFERENCE BOOKS
1. Joint Commission Accreditation Standards for Hospitals, 2nd edition 2003.
2. NilsHoppe and Jose Miola, "Medical law and Medical Ethics", Cambridge University Press2014.
3. Robert M Veatch," Basics of Bio Ethics", Second Edition. Prentice- Hall,Inc, 2003
4. Physical Environment Online: A Guide to The Joint Commissions Safety Standards, HCPro, Inc.2010
5. Mohan Bansal, "Medical informatics", Tata Mc Graw Hill Publishing Ltd, 2003.

19HIMC601 DESIGN AND DEVELOPMENT OF MEDICAL DEVICES

UNIT I MEDICAL DEVICES
Medical devices- Clinical needs-medical devices vs medical instruments-dataacquisition systems-medical electrical stimulator-cardiac electrical conductionstandardleads-clinical needs-system description and diagram.

UNIT II –CARDIAC DEVCES

Two arrhythmia classes- heart failure-tissue response to stimulation voltage-systemdescription and diagram-temporary cardiac pacing-tachyarrhythmia's-cardiac arrestcardiopulmonaryresuscitation-defibrillation mechanism and threshold-systemdescription and diagram.

UNIT III - HEART VALVES AND FUNCTIONAL ELECTRICAL STIMULATOR
Cardiac mechanisms-blood coagulations-clinical needs-system description anddiagram-spinal nerves-electrical stimulation-system description and diagramemergingtechnologies.

UNIT IV - INTRAOCULAR LENS IMPLANTS AND TOTAL HIP PROSTHESES
Ocular physiology-ultrasound-clinical needs-system description and diagram-hipphysiology-wear mediated osteolysis-clinical needs-system description and diagram

UNIT V - ARTIFICIAL PANCREAS
Blood glucose regulation-compartment models-clinical needs-artificial pancreasrequirements-system description and diagram

TEXT BOOKS
1. Gail Baura, "Medical Device Technologies: A Systems Based Overview Using Engineering", Elsevier science, 2002
2. Martin Culjat, Rahul Singh, Hua Lee, "Medical Devices: Surgical and Image-Guided Technologies", John Wiley & Sons, Reinaldo perez, "Design of medical electronic device", Elsevier science, 2002.
3. Richard C. Fries, "Handbook of Medical Device Design", Marcel Dekker AG, 2nd edition 2005.

REFERENCE BOOKS
1. Anthony Y. K. Chan, "Biomedical device technology: principles and design", Charles C Thomas, 2008.
2. Theodore R. Kucklick, "The Medical Device Ramp-D Handbook", Taylor & Francis Group LLC, 3rd edition 2013.
3. David Prutchi, Michael Norris, "Design and Development of Medical Electronic Instrumentation: A Practical perspective of the design, construction and test of medical devices", John Wiley & Sons, 2005.

19HIMC602 HOSPITAL WASTE MANAGEMENT

UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS
Healthcare Hazard Control : Introduction, Hazard Control, Hazard Control Management, Hazard Control Responsibilities, Addressing Behaviors, Hazard Control Practice, Understanding Hazards, Hazard Analysis, Hazard Control and Correction, Personal Protective Equipment, Hazard Control Committees, Hazard Control Evaluation, Hazards, System Safety, Ergonomics. Understanding Accidents: Accident Causation Theories, Human Factors, Accident Deviation Models, Accident Reporting, Accident Investigations, Accident Analysis, Organizational Functions That Support Accident Prevention, Workers' Compensation, Orientation, Education, and Training.

UNIT II BIOMEDICAL WASTE MANAGEMENT
Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling, collection, storage and transportation, treatment and disposal.

UNIT III HAZARDOUS MATERIALS
Hazardous Materials : Hazardous Substance Safety, OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Hazardous Waste Operations and Emergency Response Standard, Respiratory Protection.

UNIT IV FACILITY SAFETY

Facility Safety : Introduction, Facility Guidelines Institute, Administrative Area Safety, Slip, Trip, and Fall Prevention, Safety Signs, Colors, and Marking Requirements, Scaffolding, Fall Protection, Tool Safety, Machine Guarding, Compressed Air Safety, Electrical Safety, Control of Hazardous Energy, Permit Confined Spaces, OSHA Hearing Conservation Standard, Heating, Ventilating, and Air-Conditioning Systems, Assessing IAQ, Landscape and Grounds Maintenance, Fleet and Vehicle Safety.

UNIT V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY

Healthcare Immunizations, Centers for Disease Control and Prevention, Disinfectants, Sterilants, and Antiseptics, OSHA Bloodborne Pathogens Standard, Tuberculosis, Healthcare Opportunistic Infections, Medical Waste. Patient Safety: An Organizational Function, Errors and Adverse Events, Safety Cultures, Patient-Centered Healthcare, Quality Improvement Tools and Strategies, Healthcare-Associated Infections, Medication Safety.

TEXT BOOKS:

1. Tweedy, James T., Healthcare hazard control and safety management-CRC Press_Taylor and Francis (2014).
2. Anantpreet Singh, Sukhjit Kaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd (2012).

REFERENCE BOOKS:

1. R.C.Goyal, ―Hospital Administration and Human Resource Management‖, PHI – Fourth Edition, 2006
2. V.J. Landrum, ―Medical Waste Management and disposal‖, Elsevier, 1991

<center>**LIST OF ELECTIVES**</center>

<center>**1. HUMAN ASSISTIVE DEVICES**</center>

UNIT I HEART LUNG MACHINE AND ARTIFICIAL HEART
Condition to be satisfied by the H/L System. Different types of Oxygenators, Pumps, Pulsatile and Continuous Types, Monitoring Process, Shunting, The Indication for Cardiac Transplant, Driving Mechanism, Blood Handling System, Functioning and different types of Artificial Heart, Mock test setup for assessing its Functions

UNIT II CARDIAC ASSIST DEVICES
Synchronous Counter pulsation, Assisted through Respiration Right Ventricular Bypass Pump, Left Ventricular Bypass Pump, Open Chest and closed Chest type, Intra-Aortic Balloon Pumping Veno Arterial Pumping, Prosthetic Cardio Valves, Principle and problem, Biomaterials for implantable purposes, its characteristics and testing. Case study.

UNIT III ARTIFICIAL KIDNEY
Indication and Principle of Haemodialysis, Membrane, Dialysate, Different types of heamodialysers, Monitoring Systems, Wearable Artificial Kidney, Implanting Type-Modeling and analysis. Case study.

UNIT IV PROSTHETIC AND ORTHODIC DEVICES
Hand and Arm Replacement - Different Types of Models Externally Powered Limb Prosthesis Feedback in Orthodic System, Functional Electrical Stimulation, Haptic Devices

UNIT V RESPIRATORY , HEARING AIDS AND VISION
Intermittent positive pressure, Breathing Apparatus Operating Sequence, Electronic IPPB unit with monitoring for all respiratory parameters. Types of Deafness, Hearing Aids- Construction and Functional Characteristics.Classification of Visual Impairments, Prevention and cure of visual impairments, Visual Augmentation, Assistive devices for the visual impaired

TEXT BOOKS
1. Albert M.Cook and Webster J.G., Therapeutic Medical Devices, Prentice Hall Inc., New Jersey, 1982
2. John. G . Webster – Bioinstrumentation - John Wiley & Sons (Asia) Pvt Ltd, 2004.

REFERENCE BOOKS
1. Kolff W.J., Artificial Organs, John Wiley and Sons, New York, 1979.
2. Andreas.F.Von racum, Hand book of bio material evalution, Mc-Millan publishers, 1980.
3. Gray E Wnek, Gray L Browlin – Encyclopedia of Biomaterials and Biomedical Engineering – Marcel Dekker Inc New York 2004.

<center>**2. AMBULATORY SERVICE SYSTEM**</center>

UNIT I PATIENT MONITORING SYSTEMS
Monitoring System - artifacts-denoising techniques- Advancements in Wireless patient Monitoring system- Case study.

UNIT II DESIGN OF AMBULANCE
Vehicle design- ambulance train- disaster relief squad- regulation for patienttransportation- Case study.

UNIT III LIFT MECHANISM
Design of lift mechanism for patient-design of lift in ambulance- computer basedsystems- Case study.

UNIT IV DESIGN OF MOBILE DIAGNOSTIC EQUIPMENT
Devices with battery backup- mobile X-ray unit- nursing medical gas handling-regulations-GPS in ambulance networked services- Case study.

UNIT V ACCIDENT CARE SYSTEMS

Automated alert system- smart safety systems-fire protection –maintenance and regulation-Accreditation for ambulance service – case study

TEXT BOOKS

1. David Tse and Pramod Viswanath, "Fundamentals of Wireless Communication", Cambridge University Press, 2005.
2. Andreas F. Molisch, "Wireless Communications, 2nd Edition, John Wiley & sons, USA, 2010.

REFERENCE BOOKS

1. Jochen Schiller, "Mobile Communications", Addison Wesley Publishers, 2000.
2. Yi-Bing Lin and ImrichChlamtac, "Wireless and Mobile Network Architecture", John Wiley and Sons, New Delhi, 2nd Edition, 2001.
3. Feher K., "Wireless Digital Communications", Prentice Hall of India, New Delhi, 1995.

3. ICU AND CRITICAL CARE EQUIPMENT

UNIT I ICU EQUIPMENT

Suction apparatus, Different types; Sterilizers, Chemical, Radiation, Steam for small and larger units. Automated drug delivery systems, Infusion pumps, closed loop control infusion system, implantable infusion system.

UNIT II CRITICAL CARE EQUIPMENT

Hemodialysis Machine, Different types of Dialyzers, Membranes, Machine controls and measurements. Heart Lung Machine, different types of oxygenators, peristaltic pumps, Incubators.

UNIT III OPERATION THEATRE EQUIPMENT

Surgical diathermy, Instruments for operation. Anesthesia Equipment, Humidification, Sterilization aspects, Boyles apparatus.

UNIT IV CENTRALISED SYSTEMS

Centralized Oxygen, Nitrogen, Air supply & Suction. Centralized Air Conditioning, Operation Theatre table & Lighting

UNIT V PATIENT SAFETY

Patient electrical safety, Types of hazards, Natural protective mechanisms against electricity, Leakage current, Inspection of grounding and patient isolation, Hazards in operation rooms, ICCU and IMCUs, Optocouplers and Pulse transformers.

TEXT BOOKS

1. Khandpur,R.S,"Handbook of Biomedical Instrumentation ",Second Edition. Tata Mc Graw Hill Pub. Co., Ltd. 2003
2. John, G. Webster. Medical Instrumentation, Application and Design. Second Edition. John Wiley & sons, Inc., NewYork. 2008.

REFERENCE BOOKS

1. Joseph Dubovy, Introduction to Biomedical.Mc Graw Hill Co.1978
2. Terry Bahil.A, Biomedical and Clinical Engineering. Prentice Hall Inc.1981

4.HOSPITAL AUTOMATION

UNIT I HOSPITAL SYSTEM AUTOMATION

Electrical Supply - power generator, maintenance, battery-maintenance and troubleshooting, energy conservation and monitoring system- Case study.

UNIT II MEDICAL GAS PRODUCTION

Automation in dryer, compressor, air conditioning, lighting, heating systems.

UNIT III AUTOMATION IN PIPING

Monitoring of flow -Leakage test- prevention and safety automation.

UNIT IV INSTRUMENTATION SYSTEMS

limit switches, sensors, controllers, control room, central monitoring station-alarm system –regulation and standards. Case study.

UNIT V OFFICE AUTOMATION

Tools for data retrieval, RFID in medical record -surveillance system in hospital- case study.

TEXT BOOKS

1. Khandpur. R. S., "Handbook of Biomedical Instrumentation", Prentice Hall of India, New Delhi, 2003.
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education India, Delhi, 2008.

REFERENCE BOOKS

1. Curtis Johnson, D., "Process Control Instrumentation Technology", Prentice Hall of India, 2006.
2. John V. Grimaldi and Rollin H. Simonds., Safety Management, All India Travelers Book seller, New Delhi, 1989.
3. N.V. Krishnan, Safety in Industry, Jaico Publisher House, 1996.

5.TELEMEDICINE

UNIT I INTRODUCTION TO TELEMEDICINE

History and Evolution of telemedicine, Functional diagram of telemedicine system, Essential Parameters for Telemedicine, Delivery Modes in Telemedicine , Benefits and Limitations of Telemedicine.

UNIT II ETHICAL , SECURITY AND LEGAL ASPECTS OF TELEMEDICINE

Confidentiality, patient rights and consent: confidentiality and the law, the patient-doctor relationship, access to medical records, consent treatment - data protection &security, jurisdictional issues, intellectual property rights, Security in Telemedicine systems – Access control, Fire wall, Encryption, Authentication, Digital certificate, Digital Timestamp

UNIT III TELEMEDICAL TECHNOLOGY

Principles of Multimedia - Text, Audio, Video, data, PSTN, POTS, ANT, ISDN, Internet, Wireless Communication - GSM satellite, and Micro wave, Modulation techniques, Types of Antenna, Satellite communication, Mobile hand-held devices and mobile communication. Internet technology and telemedicine using worldwide, Video and audio conferencing

UNIT IV DATA SECURITY AND STANDARDS

Encryption, Cryptography, Mechanisms of encryption, phases of Encryption, Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN)

UNIT V APPLICATIONS

Telemedicine access to health care services – health education and self-care. · Introduction to robotics surgery, Telesurgery. Teleradiology, Telepathology – e health and cyber medicine.

TEXT BOOKS

1. Olga Ferrer Roca, M.SosaIudicissa , "Hand book of Telemedicine", IOS press, 2002.
2. Norris.A.C, "Essentials of Telemedicine and Telecare", John Sons & Ltd, 2002.

REFERENCE BOOKS

1. R.S.Khandpur "Telemedicine Technology and Applications (mhealth, Telehealth and ehealth)", PHI Learning Pvt.Ltd, Delhi 2017.
2. Wootton, R., Craig, J., Patterson, V., "Introduction to Telemedicine. Royal Society of Medicine" Press Ltd, Taylor & Francis 2006.
3. Latifi, R. "Current Principles and Practices of Telemedicine and e-Health" IOHS Press, Washington DC, 2008.

4. Bashshur, R.L., Shannon G.W. "History of Telemedicine", New Rochelle NY: Mary Ann Liebert Publishers, 2009.
5. Victor Lyuboslavsky, "Telemedicine and Telehealth 2.0: A Practical Guide for Medical Providers and Patients", CreateSpace Independent Publishing Platform; 1 edition (November 3, 2015)

6. INTERNET OF THINGS

UNIT I FUNDAMENTALS OF IoT
Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II IoT PROTOCOLS
IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III DESIGN AND DEVELOPMENT
Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES
Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS
Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TEXTBOOK
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCE BOOKS
1. Arshdeep Bahga, Vijay Madisetti, —Internet of Things – A hands-on approach‖, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols‖, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), —Architecting the Internet of Things‖, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
   https://www.arduino.cc/
   https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

7. BIOMATERIALS AND ARTIFICIAL ORGANS

OBJECTIVE: To understand the principles and biology underlying the design of implantsand artificial organs.

UNIT I BIOMATERIAL PROPERTIES

Biomaterial –definition, Material characterization – Mechanical, thermal, Phasediagrams, Surface properties, Structure and properties of naturally occurring materials - Collagen, Bone, Teeth, Skin, Causes of failure - micro cracks, crazing, fatigue. Technologies of biomaterials processing - Surface coatings methods

UNIT II CLASSES OF BIOMATERIALS

Different classes of materials used in medicine - Polymers – Synthesis -Mechanical and Thermal properties - Polyesters – Polyacrylates - Polyanhyrides -Biodegradable Polymers – Hydrogels – Elastomer – Dendrimers. Metals -Stainless steel - Cobalt-Chromium alloy - Titanium alloys. Ceramics and Bioglasses –non-absorbable bio-ceramics - biodegradable ceramics –bio reactive ceramics - deterioration of ceramics - Other Bioactive materials, Composites as biomaterials

UNIT III SOFT AND HARD TISSUE APPLICATIONS

Sutures, Wound dressings, artificial skin - Drug delivery devices – Cardiovascular medical devices – Heart valves, Assist devices-Stent and grafts, Orthopedicfixation devices – Internal – External - Joints, Total Hip Arthroplasty – Evolution-Design.

UNIT IV MATERIAL RESPONSE

Material and Tissue interaction, biological environment and host response - Inflammation, Wound Healing and Foreign Body Response - Failure mechanisms; corrosion, fracture, degradation of Implanted Materials –Polymers, Metals, ceramics.

UNIT V BIOMATERIAL TESTING AND ARTIFICIAL ORGANS

Testing of biomaterials: In-vitro, in-vivo preclinical tests - biocompatibility –methods for improvement, surface modification of materials - implant retrieval and evaluation. Artificial Heart, eye and ear implants, artificial pancreas, ophthalmic implantation, dental implantation, insulin administration devices, extracorporeal artificial organs, neural prostheses.

TEXTBOOKS:

1. Joon Bu Park, S.Roderic, Lakes, 'Biomaterials', Springer-Verlag, New YorkInc., 2010.
 2.A Ratner, and B. D S.Hoffman,. 'Biomaterials Science: An Introduction toMaterials in Medicine', Academic Press; 3 edition,November 8, 2012.

REFERENCE BOOK:

1. Chua, .J.Y Chena, L.P Wanga., N.Huang, 'Plasma-surface modification of biomaterials', Materials Science and Engineering: R: Reports, Vol.36, No.5,pp143-206, March 2002.

8. NEURAL NETWORKS AND FUZZY LOGIC

OBJECTIVE: To impart knowledge on various soft computing techniques like ANN andfuzzy logic.

UNIT I INTRODUCTION TO NEURAL NETWORKS

 Introduction to Artificial Neural Networks and Biological Neuron: Fundamental concepts of –weights, biases and thresholds-linear separability-common activation functions-learning rules and learning methods of ANN-single layer feed forward network-multilayer feed forward network**.**

UNIT II NEURAL NETWORK ARCHITECTURES AND ALGORITHMS

Mucullochpitts neuron-Hebb net-Perceptron- Back propagation neural net-Hopfield net Hamming net–Kohonenself organizing maps-Adaptive resonance theory**.**

UNIT III APPLICATIONS OF NEURAL NETWORKS

Dynamic Back propagation for bio system identification and control -pattern recognition -image processing -biological sequence alignment and drug design -robotics and sensors - information retrieval systems -natural language processing.

UNIT IV FUZZY SETS AND RELATIONS

Fuzzy Sets: Basic definition– set-theoretic operations – membership functions – fuzzy rules and fuzzy reasoning – fuzzy relations –composition of fuzzy relations –fuzzy relation equations -arithmetic operations on fuzzy numbers -fuzzy inference systems – Mamdani fuzzy models – Sugeno fuzzy models – input space partitioning and fuzzy modelling.

UNIT V FUZZY SYSTEMS

Fuzzification methods - defuzzification methods- Fuzzy rule base- fuzzy logic controller-Mamdani and Sugeno type Fuzzy systems**.** Adaptive neurofuzzy inference systems**-** GA in adaptive fuzzy system.

TEXT BOOKS:
1. LaureneFausett, 'Fundamentals of Neural Networks', Prentice- Hall, New Jersey, 3rd edition, 2008.
2. Timothy J. Ross, 'Fuzzy logic with Engineering applications', McGraw Hill, New York, 3rd edition, 2010.

9. MEDIEMBEDDED SYSTEMS AND RTOS

OBJECTIVE: To impart knowledge Mediembedded system and associated RTOS

UNIT I OVERVIEW OF EMBEDDED SYSTEM

Features of Embedded System – categories – requirements- challenges and issues - applications of Embedded Systems in biomedical systems and health care systems. Software: Source code – object code and assembler using high level language– fetch and execute operation of CPU – instruction set–addressing modes – basic operation–microcontroller arithmetic and condition code register- program flow control using looping and branching.

UNIT II STACK SUBROUTINES

Stack to store data– subroutines– modular programming using subroutine and subroutine operation. Interrupts and Resets: Concepts of interrupts– interrupt vectors– interrupt operation- hardware interrupts and resets– software and CPU controlled interrupts.

UNIT III EMBEDDED HARDWARE

Hardware: Bus– tri state logic- address encoding- different modes of operation– different memory technology (RAM EPROM, FLASH, CONFIG, and INIT). Serial sub system: Asynchronous communication system- serial communication interface- SCI registers– serial peripheral interface– SPI topologies and applications–SPI software and error handling.

UNIT IV MICROCONTROLLER PIC16

Microchip PIC16 family: PIC16F873 processor – features – architecture – memory organization – register file map – I/O ports – Port A,B and C – Data EEPROM and flash program memory – Asynchronous serial port – SPI mode – I²C mode. ARM family of

microcontrollers: Introduction– ARM Architecture– Instruction formats–ARM derivatives– Programming with ARM Embedded Controllers – software tools for ARM – GNU C- Keil – Peripheral interfacing - ARM applications– General features of ARM7, ARM9, ARM Cortex.

UNIT V EMBEDDED OPERATING SYSTEMS

Embedded Real Time Software Design - Embedded operating system – comparison with general purpose OS – Real Time Operating System (RTOS) – tasks – kernel – RT scheduling – interrupt processing – memory management using RTOS – synchronization – message queues – control blocks – porting of RTOS to the target board – comparison and study of various RTOS like Windows CE, Embedded Linux, cos, QNX, VXWORKS, Nucleus. Embedded system for biomedical applications: Hospital database applications– Biosignal analysis– Hospital automation.

TEXT BOOKS:
1. G.J. Lipovsk, 'Single and Multiple Chip Microcomputer Interfacing', Prentice Hall, 1988.
2. W.J. Tompkins & J.G. Webster, 'Interfacing Sensors to the IBM PC', Prentice Hall, Englewood Cliffs, NJ, 1988.

REFERENCE BOOKS:
1. *John* B. *Peatman, 'Design with PIC Microcontrollers'*, Prentice Hall, 1998.
2. David Seal, 'ARM Architecture Manual', Addison-Wesley,2nd edition, 2000.
3. Raj kamal, 'Embedded systems', Tata McGraw Hill, 2003.

10. MODELING OF PHYSIOLOGICAL SYSTEMS

OBJECTIVE: To impart knowledge on nonparametric and electric circuit modelling ofphysiological system

UNIT I BIOLOGICAL CONTROL SYSTEM

Biological control system - similarities and differences - components of living control system- Model and Analog- system properties- resistance- storage- distributed and lumped systems. Mathematical approach- electrical analogues. Approaches to modelling: Mathematical modelling - classification of models - characteristics of models. Purpose of physiological modeling and signal analysis - linearization of nonlinear models -model formulation –identification -validation and Simulation Different approaches of modeling physiological systems -linear modeling -distributed modeling -nonlinear modeling- time-varying modeling.

UNIT II NONPARAMETRIC MODELING

Volterra models – Wienermodels -efficient volterra kernel estimation -analysis of estimation errors. Parametric modeling: Basic parametric model forms -estimation procedures -Volterra kernels of nonlinear differential equations -discrete-time volterra kernels of NARMAX models -from Volterra kernel measurements to Parametric models – equivalencebetween continuous and Discrete -parametric models.Introduction to various process controls like cardiac rate - blood pressure - respiratory rate -blood - glucose regulation - pharmacokinetic modeling-compartmental models - blood-tissue models.

UNIT III EQUIVALENT CIRCUIT MODEL

Electromotive, resistive and capacitive properties of cell membrane - change in membrane potential with distance - voltage clamp experiment - voltage dependent

membrane constant and simulation of the model - model for strength-duration curve - model of the whole neuron - Huxley model of isotonic muscle contraction -modeling of EMG - motor unit firing - amplitude measurement - motor unit and frequency analysis.

UNIT IV PHYSIOLOGICAL MODELING

Electrical analog of blood vessels - model of systematic blood flow - model of coronary circulation - transfer of solutes between physiological compartments by fluid flow - counter current model of urine formation - model of Henles loop -linearized model of the immune response - Germ, Plasma cell, Antibody, system equation and stability criteria.

UNIT V ELECTRICAL MODEL OF PHYSIOLOGICAL SYSTEMS

Electrical circuit model of oxygenation:A model of immune response to disease (Block Diagram) -modelling of multi input/multi output systems: The two-input case - Applications of two-input modelling to physiological systems - Multi-input case spatiotemporal and spectrotemporal modelling. Respiratory system: Modeling oxygen uptake by RBC and pulmonary capillaries mass balancing by lungs - gas transport mechanism of lungs and O_2 and CO_2 transport in blood and tissues.

TEXT BOOKS:

1. T.David. Westwick, Robert E. Kearney, 'Identification of Nonlinear Physiological Systems', Wiley-IEEE Press, 2003.
2. C.Michael. K. Khoo,'Physiological Control Systems -Analysis, simulation and estimation', Prentice Hall of India, 2001.
3. J.*Enderle*, S.*Blanchard*, J. *Bronzino, 'Introduction to Biomedical Engineering*, Academic Press', 3rd edition, 2012

REFERENCE BOOKS:

1. Suresh.R.Devasahayam, 'Signals & Systems in Biomedical Engineering', Springer,2000.
2. V.Z. Marmarelis, 'Advanced methods of physiological system modeling', Springer,1999.

11. COMPUTERS IN MEDICINE

OBJECTIVE: To familiarize the student with use of computers in medicine

UNIT I INTRODUCTION

Computer hardware and software - programming languages - use in medical field - need of computing hospitals - cost effectiveness - help of computerization to physicians.

UNIT II PATIENT DATA BASE MANAGEMENT

Computerized medical records - security. Computer in clinical laboratory -database approach - automated clinical laboratory and analysis - computerized specimen analysis - analysis of ECG, EEG and EMG. Chromosome analysis by computer - computerized cytology and histogram - automated scanning for cervical cancer.

UNIT III MEDICAL IMAGING

Basics of computer assisted medical imaging :Nuclear medicine - digital subtraction radiography – computerized ultra sonography – X-ray, CT, Nuclear magnetic resonance. Basics of computer assisted medical decision making - general model algorithms - fuzzy set theory - cognitive set theory - cognitive models - QMR, KES and TIA.

UNIT IV COMPUTER IN INTENSIVE CARE UNITS

Metabolic balance up keeping- pulmonary function evaluation- Cardio vascular evaluation- Computer assisted therapy- computer for case of renal disorders.

UNIT V COMPUTER AIDS

Computer aids for the handicapped: Basic discussion with examples- introduction to computer assisted instruction in medicine- ISDN in medicine.

REFERENCE BOOK:

1. R.D. Lele, 'Computers in medicine', Tata McGraw-Hill Publishing Company Limited, 2nd reprint, 2008.

12. TISSUE AND STEM CELL ENGINEERING

OBJECTIVE: To familiarize the student with tissue and stem cell engineering

UNIT I TISSUE

Definition- structure- organization and types. Vascularity and angiogenesis - basic wound healing - cell migration - therapeutic and in-vitro testing.

UNIT II CELL

Cell-Types – differentiations - different kind of matrix - cell-cell interaction. Cell culture: expansion – transfer - storage - characterization. Molecular biology: Cell signalling molecules - hormone - growth factor and delivery in tissue engineering. Cell attachment: differential cell adhesion - receptor-ligand binding - cell surface markers.

UNIT III TRANSPLANTS

Scaffold and transplant: Biomaterials for tissue engineering -degradable materials (collagen, silk and polylactic acid) – porosity - mechanical strength - 3-D architecture - cell incorporation. Tissues for replacing bone – cartilage – tendons – ligaments - skin and liver.Basic transplant immunology - stems cells – introduction -haematopoiesis.

UNIT IV CASE STUDIES

Case study: Cell transplantation for liver – musculoskeletal - cardiovascular and neural systems. Ethical - FDA and regulatory issues of tissue engineering.

UNIT V STEM CELLS

Origin, characterization, potential applications of human stem cells- Protocols for isolation and identification of stem cells – Differentiation of cells from human- neurospheres into neurons –astrocytes and oligo-dendrocytes –Immuno-labelling. Gene therapy: immune rejection in stem cell therapy – new therapy for autoimmune disease – prenatal diagnosis of genetic abnormalities using fetal CD34+ stem cells.

TEXT BOOKS:

1. Sameul E Lynch, De Robertis, J Geng, 'Tissue Engineering', Elsevier, 3rd Edition, 2007.
2. Clemens van Blitterswijk, 'Tissue Engineering', Academic Press, 2008

REFERENCE BOOKS:

1. Robert. P.Lanza, Robert Langer & William L. Chick, 'Principles of Tissue Engineering', Academic Press,2007.
2. B. Palsson, J.A. Hubbell, R.Plonsey and J.D. Bronzino, 'Tissue Engineering', CRC Press, 2003.

13. TRANSPORTATION IN LIVING SYSTEMS

OBJECTIVE: To familiarize the student with various transportation mechanisms in livingsystems

UNIT I INTRODUCTION

Organization of the human body – cells – tissues - different organs. Heat transport: Body temperature regulation based on thermostat principle and its operation

UNIT II TRANSPORTATION PHENOMENA

Transportation in tissues - muscle, skin and other organs in different environmental temperatures. Transportation of fluids: Blood transport through internal organs – urogenitary - cardio pulmonary and central nervous system.

UNIT III GASTRO INTESTINE SYSTEM

Diffusion – osmosis - electro osmosis - ultra filtration -reverse osmosis through natural membrane and artificial synthetic membranes.

UNIT IV LYMPH

Transportation through internal organs, urogenitary, cardio pulmonary, central nervous and gastro intestine systems. Problems on lymph transfer in human body.

UNIT V MASS TRANSFER

Mass transfer - Constituents of blood, urine, mass transfer in kidney, skeletal, nervous, gastro intestine and cardio pulmonary systems. Comparison with artificial organs.

TEXT BOOKS:

1. David O.Cooney, 'An introduction to fluid, heat & mass transport process- Principles', Vol.1, Marcel Dekker Inc., Newyork, 1976.
2. William F. Ganong,'Review of Medical Physiology', McGraw-Hill Medical; 22nd edition, 2005.

REFERENCE BOOK:

1. Charles Herbert Best, Norman Burke Taylor, John Burnard West, Best and Taylor's,'Physiological basis of medical practice',Williams and Wilkins, Baltimore, 12th edition, 1991.

14 TELEMEDICINE

OBJECTIVE: To familiarize the student with various aspects of telemedicine

UNIT I TELEMEDICINE AND TELECARE

Telemedicine, Telehealth and Telecare: History of telemedicine- Main phases of telemedicine- Pre electronic telemedicine. Electronic telemedicine Technical Requirements - Type of information and standards, audio, data, Fax, Video Types of communications and networking- networking architecture. POTS, ISDN, ATM Other Fixed networks- Air/airless communications, RF, Microwaves, Satellite, GSM, CDPD (Cellular Digital Packet Data). Acquisition/ displays- Acquisition systems Cameras, Scanners, Other medical specialized acquisition system.

UNIT II DISPLAY SYSTEMS

Display systems: Analogue devices, LCD, Laser displays, Holographic representations, Virtual screen devices Computation / storage systems: Magnetic, Mixed, Optical (laser) devices (only brief description required).

UNIT III APPLICATIONS OF TELEMEDICINE

Telemedicine applications: Teleradiology: Basic parts of a teleradiography system, Image acquisition and management, display, communication, interpretation

Telepathology: Applications, requirements, security and confidentiality tools, telequantitation at distance. Telecytology: Applications, Telecardiology: requirements, portable solutions Telehome- Care Home based applications, Teleoncology: Applications, Telesurgery, telepsychiatry, Teledermatology techniques.

UNIT IV INTERNET IN TELEMEDICINE

Basic concepts - Security – secure socket layer – Firewalls – proxies. Personal Communication, Medical data sharing needs for telemedicine -Internet problems, distant training, teleworking and telecasting. Ethical and legal aspects of telemedicine: confidentiality, patient rights and consent-ethical and legal aspects of internet-telemedical malpractice.

UNIT V TELEMEDICINE CONSTRAINTS

Constraints for the wide spread use of telemedicine: Constraints linked to economy, social acceptance Strategic planning for telemedicine implementation. Analysis of the present situation and the demand objective and strategies- Plan of implementation, Forces affecting technology transfer scenarios for telemedicine.

TEXT BOOKS:

1. Olga Ferrer, Roca M. Sosa, Marcelo C, 'Handbook of telemedicine', IOS Press, 3rd edition, 2002.
2. Ling Guan, 'Multimedia image and video processing', CRC Press 2000.
3. Thorsten M Buzug, Heinz Handels, Dietrich Holz, 'Telemedicine: Medicine and Communication', Springer Verlag, 2001.

REFERENCE BOOK:

1. Douglas V. Goldstein, 'e-Healthcare: Harness the power of Internet, e-commerce and e-care', Jones and Barlett Publishers, 2000.

15. BIO INFORMATICS

OBJECTIVE: To impart knowledge on various aspects of bioinformatics

UNIT I BASIC CONCEPTS OF MOLECULAR BIOLOGY

Cells - Chromosomes, DNA, RNA, Proteins, Central dogma of molecular biology, Genomes and Genes - Genetic code, Transcription, Translation and Protein synthesis. Web based genomic and proteomic databases: NCBI, Gen Bank.

UNIT II SEQUENCE ALIGNMENTS

Dot plot-Pair-wise sequence alignments - local and global -Sequence similarity and distance measures - Smith-Waterman algorithm, Needleman-Wunchalgorithm, Multiple sequence alignment –Sum-of-Pairs measure - Star and tree alignments – PAM and BLOSUM, Phylogenetic analysis.

UNIT III GENE EXPRESSIONS

Informational view of Spectrograms- Identification of Microarray image analysis. Genomic data:Genomic Signal Processing- DNA protein coding regions- Gene expression- Microarrays,

UNIT IV GENE STRUCTURE

Gene structure in Prokaryotes and Eukaryotes:Molecular Structure Prediction- Basic concepts and terminologies related to molecular structures- Basic molecular Visualization-RNA secondary structure prediction- Protein folding problem- Protein Threading- Protein Visualization- Introduction to Drug Discovery.

UNIT V SOFTWARE TOOLS

Use of Tools for basic and specialized sequence processing such as: BLAST, FASTA, RasMol, Phylip, ClustalW.

TEXT BOOKS:

1. Setubal, Meidanis, 'Introduction to Computational Molecular Biology', Thomson: Brooks/Cole, International Student Edition, 2003
2. Jean-Michel Claverie, Cedric Notredame, 'Bioinformatics - A Beginners Guide', Wiley-Dreamtech India Pvt Ltd, 2nd edition, 2007.
3. Lesk, 'Introduction to Bioinformatics', Oxford University Press, Indian Edition, 3rd edition, 2008.
4. Higgins and Taylor,Des Higgins, Willie R. Taylor,'Bioinformatics: Sequence, structure and databanks', Oxford University Press, Indian Edition, 2003

REFERENCE BOOKS:

1. Bryan P. Bergeron, 'Bioinformatics Computing', Prentice hall of India, 2003
2. Jiang, Xu and Zhang, 'Current topics in Computational Molecular Biology', Ane Books, New Delhi, 2004.