

ACADEMIC REGULATIONS  
COURSE STRUCTURE AND DETAILED SYLLABUS  
FOR  
BIO MEDICAL ENGINEERING

For B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2012-2013)

REGULATION : R12



J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY

(Autonomous)

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**J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

**Academic Regulations 2012 for B. Tech (Regular)**

(Effective for the students admitted into I year from the Academic Year 2012-2013 onwards)

**1. Award of B.Tech. Degree**

A student will be declared eligible for the award of the B. Tech. Degree if he fulfils the following academic regulations:

i. **Pursued a course of study for not less than four academic years and not more than eight academic years.**

ii. **Register for 200 credits and secure 200 credits**

**2.** Students, who fail to fulfill all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech course.

**3. Courses of study**

The following courses of study are offered at present for specialization for the B. Tech. Course:

Branch Code	Branch
01	Civil Engineering
02	Electrical and Electronics Engineering
03	Mechanical Engineering
04	Electronics and Communication Engineering.
05	Computer Science and Engineering
11	Bio-Medical Engineering
12	Information Technology
25	Mining Engineering

and any other course as approved by the authorities of the JBIET from time to time.

**4. Credits**

	I Year		Semester	
	Periods / Week	Credits	Periods / Week	Credits
Theory	03	06	03	03
	02	04	--	--
Practical	03	04	03	02
Drawing	02T/03D	04	03 06	02 04
Mini Project	--	--	--	02
Comprehensive Viva Voce	--	--	--	02
Seminar	--	--	6	02
Project	--	--	15	10

## 5. Distribution and Weightage of Marks

- i. The performance of a student in each semester / I year shall be evaluated subject –wise with a maximum of 100 marks for theory and 75 marks for practical subject. In addition, Industry oriented mini-project, seminar and project work shall be evaluated for **50, 50 and 200** marks respectively.
- ii. For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.
- iii. For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for subjective paper) and 75 marks for end examination. There shall be two internal tests in a Semester.

For theory subjects, the distribution shall be 25 marks for internal evaluation ( **Midterm exams (20marks) + Assignment (5marks))and 75 marks for end examination**. There shall be altogether four assignments (Each assignment consisting of 6 questions from every two units of syllabus)set by the teacher from the whole syllabus of the subject

The pattern of question paper shall consist of two parts namely Part-A and Part-B out of which the candidate has to answer Part-A compulsorily and from Part-B, the candidate has to answer three questions out of five questions given. The Part-A i.e. question no.1 consists of sub questions, which are based on fundamentals and concept testing nature. These questions may of the following type:

- a. Short answer questions for which answer is two to three sentences
- b. Multiple choice questions
- c. Fill in the blanks
- d. True/False type

Any sub question may carry a maximum of 1 or 2 marks. Altogether candidate has to answer 4 questions out of 6 questions but question no.1 of Part-A is compulsory. The time allocated for the mid term examination is 2 hours. There shall be 2 Mid Term Examinations( 1<sup>st</sup> Mid shall be from 1-4 Units and 2<sup>nd</sup> Mid shall be from 5-8 Units)

The Internal Evaluation is for 25 marks (20 for Mid term Examination and 5 Marks for Assignment), the average of these two shall be considered as the final marks for Internal Evaluation secured by the candidate.

However, for **first year**, there shall be 3 mid term examinations (Each for 20 Marks) and 3 Assignments (Each for 5 Marks) , [1st mid shall be from 1-2 units, 2nd mid from 3-5 units and 3rd mid shall be from 6-8 units]. There shall be altogether six assignments (Each assignment consisting of 6 questions from every unit of syllabus)set by the teacher from the whole syllabus of the subject.

The Internal Evaluation is for 25 marks (20 for Mid term Examination and 5 Marks for Assignment), the average of these three shall be considered as the final marks for Internal Evaluation secured by the candidate.

The question paper shall contain 6 questions, 1 in Part-A and 5 in Part-B. The candidate shall have to answer Part-A compulsorily and shall have to answer any three questions from remaining five questions of Part-B. The Part-A i.e. question no.1 consists of sub questions, which are based on fundamentals and concept testing nature. These questions may of the following type:

- a. Short answer questions for which answer is two to three sentences
- b. Multiple choice questions
- c. Fill in the blanks
- d. True/False type

Any sub question may carry a maximum of 1 or 2 marks. Altogether candidate has to answer 4 questions out of 6 questions.

- iv. For practical subjects there shall be a continuous evaluation during the semester for 25 sessional marks and 50 end examination marks. Out of the 25 marks for internal, day-to-day work in the laboratory shall be evaluated for 15 marks and internal examination for practical shall be evaluated for 10 marks conducted by the concerned laboratory teacher. The end examination shall be conducted with external examiner and laboratory teacher. The external examiner shall be appointed by the Chief Controller of Examinations.
- v. For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing) and estimation, **the distribution shall be 25 marks for internal evaluation (15 marks for day-to-day work and 10 marks for subjective paper)** and 75 marks for end examination. There shall be two internal tests in a Semester and average of the two shall be considered for the award of marks for internal tests. However in the I year class, there shall be three tests and the average of the three mid term examinations will be taken into consideration.
- vi. There shall be an industry-oriented mini-Project, in collaboration with an industry of their specialization, to be taken up during the vacation after III year II Semester examination. However, the mini project and its report shall be evaluated with the project work in IV year II Semester. The industry oriented mini project shall be submitted in report form and should be presented before the committee, which shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of mini project and a senior faculty member of the department. There shall be no internal marks for industry oriented mini project.
- vii. There shall be a seminar presentation in IV year II Semester. For the seminar, the student shall collect the information on a specialized topic and prepare a technical report, showing his understanding over the topic, and submit to the department, which shall be evaluated by the Departmental committee consisting of Head of the department, seminar supervisor and a senior faculty member. The seminar report shall be evaluated for 50 marks. There shall be no external examination for seminar.
- viii. There shall be a Comprehensive Viva-Voce in IV year II semester. The Comprehensive Viva-Voce will be conducted by a Committee consisting of (i) Head of the Department (ii) two Senior Faculty members of the Department. The Comprehensive Viva-Voce is aimed to assess the students' understanding in various subjects he / she studied during the B.Tech course of study. The Comprehensive Viva-Voce is evaluated for 100 marks by the Committee. There are no internal marks for the Comprehensive viva-voce.
- ix. Out of a total of 200 marks for the project work, 50 marks shall be for Internal Evaluation and 150 marks for the End Semester Examination. The End Semester Examination (viva-voce)

shall be conducted by the same committee appointed for industry oriented mini project. In addition the project supervisor shall also be included in the committee. The topics for industry oriented mini project, seminar and project work shall be different from each other. The evaluation of project work shall be conducted at the end of the IV year. The Internal Evaluation shall be on the basis of two seminars given by each student on the topic of his project.

#### **6. Attendance Requirements:**

- i. A student shall be eligible to appear for College End examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.
- ii. Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- iii. Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester or I year may be granted by the College Academic Committee.
- iv. A student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester / I year, as applicable. They may seek re-admission for that semester / I year when offered next.
- v. Students whose shortage of attendance is not condoned in any semester / I year are not eligible to take their end examination of that class and their registration shall stand cancelled.
- vi. A stipulated fee shall be payable towards condonation of shortage of attendance.

#### **7. Minimum Academic Requirements:**

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.6

- i. A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory or practical design or drawing subject or project if he secures not less than 35% of marks in the end examination and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together.
- ii. A student shall be promoted from II to III year only if he fulfils the academic requirement of **37**credits from one regular and one supplementary examinations of I year, and one regular examination of II year I semester irrespective of whether the candidate takes the examination or not.
- iii. A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of total **62** credits from the following examinations, whether the candidate takes the examinations or not.
  - a. Two regular and two supplementary examinations of I year.
  - b. Two regular and one supplementary examinations of II year I semester.
  - c. One regular and one supplementary examinations of II year II semester.
  - d. One regular examination of III year I semester.
- iv. A student shall register and put up minimum attendance in all 200 credits and earn the 200 credits. Marks obtained in all 200 credits shall be considered for the calculation of percentage of marks.
- v. Students who fail to earn 200 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech course and their admission shall stand cancelled.

#### **8. Course pattern:**

- i. The entire course of study is of four academic years. The first year shall be on yearly pattern and the second, third and fourth years on semester pattern.
- ii. A student eligible to appear for the end examination in a subject, but absent at it or has failed in the end examination may appear for that subject at the supplementary examination.
- iii. When a student is detained due to lack of credits / shortage of attendance he may be re-admitted when the semester / year is offered after fulfilment of academic regulations, whereas the academic regulations hold good with the regulations he was first admitted.

#### 9. Award of Class:

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

Class Awarded	% of marks to be secured	From the aggregate marks secured for the best 200 Credits.
First Class with Distinction	70% and above	
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

#### 10. Minimum Instruction Days:

The minimum instruction days for each semester / I year shall be 90/180 clear instruction days.

11. There shall be no branch transfers after the completion of admission process.

#### 12. General:

- i. Where the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.
- ii. The academic regulation should be read as a whole for the purpose of any interpretation.
- iii. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the JBIET is final.
- iv. The JBIET may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the JBIET.

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**Academic Regulations for B. Tech. (Lateral Entry Scheme)**

(Effective for the students getting admitted into II year from the Academic Year 2011-2012 and onwards)

1. The Students have to acquire 150 credits from II to IV year of B.Tech. Program (Regular) for the award of the degree.  
Register for **150** credits and secure **150** credits.

2. Students, who fail to fulfil the requirement for the award of the degree in 6 consecutive academic years from the year of admission, shall forfeit their seat.

3. The same attendance regulations are to be adopted as that of B. Tech. (Regular).

4. **Promotion Rule:**

**A student shall be promoted from third year to fourth year only if he fulfils the academic requirements of 37 credits from the examinations.**

- a. Two regular and one supplementary examinations of II year I semester.
- b. One regular and one supplementary examinations of II year II semester.
- c. One regular examination of III year I semester.

5. **Award of Class:**

After a student has satisfied the requirements prescribed for the completion of the program and is eligible for the award of B. Tech. Degree he shall be placed in one of the following four classes:

First Class with Distinction	70% and above	From the aggregate marks secured for 150 Credits. (i.e. II year to IV year)
First Class	Below 70% but not less than 60%	
Second Class	Below 60% but not less than 50%	
Pass Class	Below 50% but not less than 40%	

(The marks in internal evaluation and end examination shall be shown separately in the marks memorandum)

6. All other regulations as applicable for B. Tech. Four-year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

## MALPRACTICES RULES

### DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the University.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet	Expulsion from the examination hall and



	or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject

		and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

### Malpractices identified by squad or special invigilators

1. Punishments to the candidates as per the above guidelines.
2. Punishment for institutions : (if the squad reports that the college is also involved in encouraging malpractices)
  - (i) A show cause notice shall be issued to the college.
  - (ii) Impose a suitable fine on the college.
  - (iii) Shifting the examination centre from the college to another college for a specific period of not less than one year.

**J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY  
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**B. TECH. BIOMEDICAL ENGINEERING**

**I YEAR COURSE STRUCTURE**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T/P/D</b>	<b>C</b>
6751001	English	2	-	4
6751002	Mathematics - I	3	1	6
6751008	Mathematical Methods	3	1	6
6751004	Engineering Physics	2	1	4
6751005	Engineering Chemistry	2	-	4
6751006	Computer Programming & Data Structures	3	-	6
6751007	Engineering Drawing	2	3	4
6751628	Computer Programming Lab.	-	3	4
6751629	Engineering Physics / Engineering Chemistry Lab.	-	3	4
6751630	English Language Communication Skills Lab.	-	3	4
6751619	IT Workshop / Engineering Workshop	-	3	4
	<b>Total</b>	<b>17</b>	<b>18</b>	<b>50</b>

**II YEAR I SEMESTER COURSE STRUCTURE**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T/P/D</b>	<b>C</b>
6753033	Applied Biochemistry	3	1	3
6753009	Electronic Devices & Circuits	4	0	4
6753030	Fundamental of Electrical Engineering	3	1	3
6753021	Signals and Systems	4	1	4
6753034	Anatomy and Physiology	4	1	4
6753035	Bioelectricity and Electrodes	3	1	3
6753614	Electronic Devices and Circuits Lab	0	3	2
6753615	Medical Sciences Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>

**II YEAR II SEMESTER COURSE STRUCTURE**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T/P/D</b>	<b>C</b>
6754004	Environmental Studies	3	1	3
6754010	Switching Theory and Logic Design	4	0	4
6754021	Pulse and Digital Circuits	4	1	4
6754026	Basic Clinical Sciences I	4	1	4
6754027	Biotransducers and Applications	4	1	4
6754615	Pulse and Digital Circuits Lab	0	3	2
6754616	Transducers Lab	0	3	2
6754617	Basic Simulation Lab	0	3	2
	<b>Total</b>	<b>19</b>	<b>13</b>	<b>25</b>

**J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY  
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**B. TECH. BIOMEDICAL ENGINEERING**

**III YEAR I SEMESTER**

**COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
6755015	Managerial Economics and Financial Analysis	4	0	4
6755047	Principles of Communications	4	1	4
6755048	Digital Signal Processing	4	1	4
6755043	Analog and Digital IC Applications	3	1	3
6755049	Basic Clinical Sciences – II	3	1	3
6755050	Biofluids and Mechanics	3	1	3
6755617	Advanced English Communication Skills Lab	0	3	2
6755618	Analog and Digital IC Applications Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>

**III YEAR II SEMESTER**

**COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
	<b>Open Elective</b>	4	0	4
6756046	Hospital System Management			
6756051	Intellectual Property Rights			
6756014	Nanotechnology			
6756047	Biological Control Systems	3	1	3
6756048	Biomedical Signal Processing	4	1	4
6756049	Medical Imaging Techniques	4	1	4
6756050	Biomedical Equipment	4	1	4
6756617	Biomedical Equipment Lab	0	3	2
6756618	Biomedical Signal Processing Lab	0	3	2
6756619	Medical Imaging Techniques Lab	0	3	2
	<b>Total</b>	<b>19</b>	<b>13</b>	<b>25</b>

**IV YEAR I SEMESTER**

**COURSE STRUCTURE**

Code	Subject	L	T/P/D	C
6757078	Image Processing and Pattern Recognition	3	1	3
6757079	Rehabilitation Engineering	3	1	3
6757039	Computer Networks	4	0	4
6757080	Microprocessors and Microcontrollers	4	1	4
	<b>Elective – I</b>	3	1	3
6757081	Artificial Intelligence			
6757082	Artificial Neural Networks			
6757083	Telemedicine			
	<b>Elective – II</b>	4	1	4
6757045	Embedded & Real Time Systems			
6757084	VLSI Design			
6757041	DSP Processors & Architecture			
6757614	Microprocessors and Microcontrollers Lab	0	3	2
6757615	Image Processing Lab	0	3	2
	<b>Total</b>	<b>21</b>	<b>11</b>	<b>25</b>

**IV YEAR II SEMESTER****COURSE STRUCTURE**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T/P/D</b>	<b>C</b>
	<b>Elective – III</b>	3	1	3
6758058	Biomaterials			
6758059	Transportation Phenomena in living systems			
6758060	Physiological Systems Modeling			
	<b>Elective – IV</b>	3	1	3
6758061	Robotics and Automation			
6758062	Medical Informatics			
6758063	Quantitative Engineering Physiology			
6758019	Reliability Engineering	3	0	3
6758628	Industry Oriented Mini Project	0	0	2
6758629	Seminar	0	6	2
6758630	Major Project	0	15	10
6758631	Comprehensive Viva	0	0	2
	<b>Total</b>	<b>9</b>	<b>23</b>	<b>25</b>

**Note :** All End Examinations (Theory and Practical) are of three hours duration.  
T - Tutorial      L – Theory      P – Practical      C – Credits

**J.B.INSTITUTE OF ENGINEERING & TECHNOLOGY  
(AUTONOMOUS)**

**I Year B.Tech. BME.  
6751001**

<b>L</b>	<b>T/P/D</b>	<b>C</b>
<b>2</b>	<b>-/-</b>	<b>4</b>

**ENGLISH**

**1. INTRODUCTION:**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competence of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks. In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

The text for non-detailed study is for extensive reading/reading for pleasure by the students. Hence, it is suggested that they read it on their own with topics selected for discussion in the class. The time should be utilized for working out the exercises given after each section, as also for supplementing the exercises with authentic materials of a similar kind for example, from newspaper articles, advertisements, promotional material etc.. *However, the stress in this syllabus is on skill development and practice of language skills.*

**2. OBJECTIVES:**

- a. To improve the language proficiency of the students in English with emphasis on LSRW skills.
- b. To equip the students to study academic subjects with greater facility through the theoretical and practical components of the English syllabus.
- c. To develop the study skills and communication skills in formal and informal situations.

**3. SYLLABUS:**

**Listening Skills:**

Objectives

1. To enable students to develop their listening skill so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening so that can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language to be able to recognise them, to distinguish between them to mark stress and recognise and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

**Speaking Skills:**

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students to express themselves fluently and appropriately in social and professional contexts.

- Oral practice
- Describing objects/situations/people
- Role play – Individual/Group activities (Using exercises from all the nine units of the prescribed text: *Learning English : A Communicative Approach.*)
- Just A Minute(JAM) Sessions.

**Reading Skills:**

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.

- Skimming the text
- Understanding the gist of an argument
- Identifying the topic sentence
- Inferring lexical and contextual meaning
- Understanding discourse features
- Recognizing coherence/sequencing of sentences

**NOTE :** *The students will be trained in reading skills using the prescribed text for detailed study. They will be examined in reading and answering questions using 'unseen' passages which may be taken from the non-detailed text or other authentic texts, such as magazines/newspaper articles.*

### **Writing Skills :**

#### Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.

- Writing sentences
- Use of appropriate vocabulary
- Paragraph writing
- Coherence and cohesiveness
- Narration / description
- Note Making
- Formal and informal letter writing
- Editing a passage

### **4. TEXTBOOKS PRESCRIBED:**

In order to improve the proficiency of the student in the acquisition of the four skills mentioned above, the following texts and course content, divided into **Eight Units**, are prescribed:

#### *For Detailed study*

**1 First Text book entitled “Enjoying Everyday English”, Published by Sangam Books, Hyderabad**

#### *For Non-detailed study*

**1. Second text book “Inspiring Speeches and Lives”, Published by Maruthi Publications, Guntur**

### **A. STUDY MATERIAL:**

#### **UNIT-I**

- a. Sir C.V. Raman (Detail) A pathbreaker in the saga of Indian Science. (**Detail**)
- b. Leading a team and Work brings Solace ( from Wings of Fire)  
--University Press

#### **UNIT-II**

- a. The Connoisseur (Detail)
- b. Mother Theresa (Non-detail)

#### **UNIT-III**

- a. Kalpana Chawla “ Inspiration” (Detail)
- b. Sam Pitroda (Non-detail)

#### **UNIT-IV**

- a. Bubbling Well Road (Detail)
- b. I have a dream-Martin Luther king(Non-detail)

#### **UNIT-V**

- a. The Cuddalore Experience(Detail)
- b. Amartya kumar Sen(Non-detail)

## UNIT-VI

### a. Youth, Awake, Arise- STOP NOT TILL

Swami Vivekananda Institute of Human Excellence,

### b. John F. Kennedy (Non-detail)

## UNIT-VII

### Exercises on;

Reading & Writing Skills

Reading Comprehension

Letter Writing

Essay Writing

## UNIT-VIII

### Exercises on Remedial Grammar;

Common errors in English

Subject-Verb agreement

Tense aspect

Vocabulary development-Synonyms, Antonyms, One word substitutes, Prefixes-Suffixes, Idioms, Phrases, Words often confused

## REFERENCES :

1. **Innovate with English: A Course in English for Engineering Students**, edited by T Samson, Foundation Books
2. English Grammar Practice, **Raj N Bakshi, Orient Longman.**
3. **Effective English**, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson
4. Handbook of English Grammar & Usage, **Mark Lester and Larry Beason, Tata Mc Graw –Hill.**
5. Spoken English, **R.K. Bansal & JB Harrison, Orient Longman.**
6. Technical Communication, **Meenakshi Raman, Oxford University Press**
7. Objective English **Edgar Thorpe & Showick Thorpe, Pearson Education**
8. Grammar Games, **Renuolcuri Mario, Cambridge University Press.**
9. Murphy's English Grammar with CD, **Murphy, Cambridge University Press.**
10. Everyday Dialogues in English, **Robert J. Dixon, Prentice Hall India Pvt Ltd.,**
11. ABC of Common Errors **Nigel D Turton, Mac Millan Publishers.**
12. Basic Vocabulary **Edgar Thorpe & Showick Thorpe, Pearson Education**
13. Effective Technical Communication, **M Ashraf Rizvi, Tata Mc Graw –Hill.**
14. An Interactive Grammar of Modern English, **Shivendra K. Verma and Hemlatha Nagarajan, Frank Bros & CO**
15. A Communicative Grammar of English, **Geoffrey Leech, Jan Svartvik, Pearson Education**
16. Enrich your English, **Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,**
17. A Grammar Book for You And I, **C. Edward Good, MacMillan Publishers.**



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**MATHEMATICS – I**

**UNIT-I : Sequences - Series**

Basic definitions of Sequences and Series – Convergence and divergence – Ratio test – Comparison test – Integral test – Cauchy's root test – Raabe's test – Absolute and conditional convergence

**UNIT-II : Differential equations of first order and their applications**

Overview of differential equations – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law natural growth and decay, orthogonal trajectories and geometrical applications.

**UNIT-III : Higher Order Linear differential equations and their applications**

Linear differential equations of second and higher order with constant coefficients, RHS term of the  $f(X)=e^{ax}$ ,  $\cos ax$ , and  $x^n$ ,  $e^{ax} V(x)$ ,  $x^n V(x)$  method of variation of parameters. Applications bending of beams, Electrical circuits, simple harmonic motion.

**UNIT-IV : Laplace transform and its application to Ordinary differential equations**

Laplace transform of standard functions – Inverse transform – first shifting theorem, Transforms of derivatives and integrals – Unit step function – second shifting theorem – Dirac's delta function-Convolution theorem-Periodic function – differentiation and integration of transforms-Application of Laplace transforms to ordinary differential equations.

**UNIT-V : Function of Single Variable**

Rolle's Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – Generalized mean value theorem (all theorems without proof) Functions of several variables – Functional dependence – Jacobian – Maxima and Minima of functions of two variables with constraints and without constraints.

**UNIT-VI : Application of Single variable**

Radius, Centre and Circle of Curvature-Evolutes and Envelopes Curve tracing – Cartesian, polar and parametric curves.

**UNIT-VII : Integration & its applications**

Riemann Sums, integral Representation for lengths, Areas, Volumes and Surface areas in Cartesian and polar coordinates, multiple integrals – double and triple integrals – change of order of integration – change of variable.

**UNIT-VIII : Vector Calculus**

Vector Calculus: Gradient-Divergence-Curl and their related properties, Potential function – Laplacian and second order operators. Line integral – work done – surface integrals-Flux of a vector valued functions.

Vector integrals theorem: Green's –Stock's and Gauss's Divergence Theorems (Statement & their verification).

**TEXT BOOKS:**

1. Engineering Mathematics by B.V.Ramana
2. Engineering Mathematics-I by T.K.V. Iyanar & B.Krishna Gandhi & Others, S.Chand

**REFERENCES:**

1. Engineering Mathematics-I by D.S.Chandrasekhar, Priso Books Pvt. Ltd.
2. Engineering Mathematics-I by G.Shankar Rao, I.K.International Publications.
3. Advanced Engineering Mathematics by Jain and S.R.K. Iyengar, Narosa Publications.
4. A text Book of KREYSZIG'S Engineering Mathematics, (Original KREYSZIG'S) WILEY Publications.
5. Engineering Mathematics-I by P.B.Bhaskara Rao, S.K.V.S.Rama chary, M.Bhujanga Rao,
6. Engineering Mathematics-I by C.Shankaraiah, VGS Booklinks.

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**MATHEMATICAL METHODS**

**UNIT-I : Solution for linear systems**

Matrices and Linear systems of equations: Elementary row transformations- Rank-Echelon form, Normal forms– Solution of Linear Systems – Direct Methods – LU Decomposition – LU Decomposition from Gauss Elimination – Solution of Tridiagonal Systems- Solution of Linear Systems.

**UNIT-II : Eigen values & Eigen Vectors**

Eigen values, Eigen vectors – properties, Cayley-Hamilton – Theorem (with Proof) – Inverse and powers of a matrix by Cayley-Hamilton theorem – Diagonalization of matrix. Calculation of powers of matrix – Model and spectral matrices.

**UNIT-III : Linear Transformations**

Real matrices – Symmetric, skew – symmetric, orthogonal, Linear Transformation – Orthogonal Transformation. Complex matrices: Hermitian, Skew-Hermitian and Unitary – Eigen values and Eigen vectors of complex matrices and their properties. Quadratic forms- Reduction of quadratic form to canonical form – Rank – Positive, Negative definite – semi definite – index – signature- Sylvester law, Singular value decomposition.

**UNIT-IV : Solution of Non – linear Systems**

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton Raphson Method.

**Interpolation:**

Introduction – Errors in Polynomial Interpolation – Finite differences – Forward Difference – Backward difference – Central difference – Symbolic relations and separation of symbols – Difference Equations – Differences of polynomial – Newton’s formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae – Interpolation with unevenly spaced points

**UNIT-V : Curve fitting & Numerical Integration**

Curve fitting: Fitting a straight line – Second degree curve-exponential curve-power curve by method of least squares.

Numerical Differentiation – Simpson’s 3/8 Rule, Gaussian Integration.

**UNIT-VI : Numerical solution of IVP’s in ODE**

Numerical solution of Ordinary Differential equations: Solution by Taylor’s series-Picard’s Method of successive Approximations – Euler’s Method- Runge-Kutta Methods –Predictor-Corrector Methods

**UNIT-VII :Fourier Series-Fourier Transform**

Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval- even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms, Parseval’s formula.

**UNIT-VIII : Z-Transform & Partial differential equations**

Z-Transform-Properties-Damping rule-shifting rule-Initial & Final value theorems-convolution theorem –solution of difference equation by Z-transform -Introduction and Formation of partial equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and nonlinear (Standard type) equations.

**TEXT BOOKS:**

1. Engineering Mathematics by B.V.Ramana
2. Mathematical Methods by T.K.V. Iyanar & B.Krishna Gandhi & Others, S.Chand.

**REFERENCES:**

1. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
2. Mathematical Methods by G.Shankar Rao, I.K.International Publications, N.Delhi.
3. Mathematical Methods by V.Ravindranath, Etl, Himalaya Publications.
4. A text Book of KREYSZIG’S Mathematical Methods, Dr.A.Ramakrishna Prasad, WILEY Publications.
5. Mathematical Methods by P.B.Bhaskara Rao, S.K.V.S.Rama chary, M.Bhujanga Rao, B.S. Publications.
6. Mathematical Methods byK.V.Suryanarayana Rao by Scitech Publication.

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**ENGINEERING PHYSICS**

**Unit-I Physical Optics:**

1. Interference: Types of Interferences, Interference in thin films (reflected light) - Newton's rings.
2. Diffraction: Types of diffraction, Frounhoffer's Diffraction at a single slit, double slit and diffraction grating (N-slits).
3. Polarization: Introduction to polarization, Malus law, double refraction, Nicol's prism, Brewster's law  
Applications of Interference, Diffraction & Polarization in industry.

**UNIT-II Crystallography –XRD methods**

4. Crystallography : Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Diamond and hcp Structures, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems.
5. X-ray Diffraction: Basic Principles, Bragg's Law, Laue Method, Powder Method, Applications of X- ray Diffraction.

**UNIT-III Defects in Crystals & Principles of Quantum Mechanics**

6. Defects in Crystals: Point Defects: Vacancies, Substitution, Interstitial, Frenkel and Schottky Defects, Concentration of vacancies at given temperature, concentration of Schottky & Frenkel defects, Qualitative treatment of line (Edge and Screw Dislocations) Defects, Burger's Vector, Surface Defects and Volume Defects. (Qualitative treatment)
7. Principles of Quantum Mechanics: Waves and Particles, de Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, G. P. Thomson Experiment, Heisenberg's Uncertainty Principle, application of quantum mechanics in information security, Physical Significance of the Wave Function, Schrödinger's Time Independent Wave Equation - Particle in One Dimensional Potential Box.

**UNIT-IV Band Theory of Solids**

8. Band Theory of Solids: Drawbacks of Classical free Electron theory, Quantum Free electron theory, Fermi energy and Density of States, Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semi Conductors & Insulators, Concept of Effective Mass of an Electron and Hole.
9. Semiconductor Physics: Fermi Level in Intrinsic and Extrinsic Semiconductors, Intrinsic Semiconductors and Carrier Concentration, Extrinsic Semiconductors and Carrier Concentration, Equation of Continuity, Direct & Indirect Band Gap Semiconductors, Hall Effect.

**UNIT-V Acoustics of Building & Acoustic Quieting and Ultrasonics**

10. Basic Requirement of Acoustically Good Hall, Reverberation and Time of Reverberation, Sabine's Formula for reverberation Time (Quantative treatment), Measurement of Absorption Coefficient of a Material, Factors Affecting The Architectural Acoustics and their Remedies.

**Ultrasonics:**

Concept of ultrasonics wave generation, Different methods of generation of Ultrasonic's (Piezostriktion and Magnetostriction) , concept of NDT & Applications.

**UNIT-VI Dielectric and Magnetic Properties**

11. Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic (Quantitative) and Orientation Polarizations (Qualitative) and Calculation of Polarizabilities - Internal Fields in Solids, Clausius-Mossotti Equation, Piezo-electricity, Pyro-electricity and Ferro-electricity.
12. Magnetic Properties: Permeability, Field Intensity, Magnetic Field Induction, Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro Magnetism on the basis of Hysteresis Curve, Soft and Hard Magnetic Materials, Properties of Anti-Ferro and Ferri Magnetic Materials, Ferrites and their Applications, Concept of Superconductivity, Meissner Effect, Magnetic Levitation, Applications of Superconductors.

#### **UNIT-VII Lasers and Fiber Optics**

13. Lasers: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Meta-stable State, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers.

14. Fiber Optics: Constructions and Principle of Optical Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers and Refractive Index Profiles, Attenuation in Optical Fibers, Application of Optical Fibers.

#### **UNIT-VIII Nanotechnology**

15. Introduction to Nanotechnology, Surface to Volume Ratio, Quantum Confinement, properties of Nanomaterials, Synthesis methods: Bottom-up Fabrication: Sol-gel, Precipitation, Combustion Methods; Top-down Fabrication: Chemical Vapour Deposition, Physical Vapour Deposition, Pulsed Laser Vapour Deposition Methods, Characterization: Difference between Optical Microscopy and Electron Microscopy, XRD&TEM,SEM, scanning Probe Microscopy (AFM & STM), Applications of Nanomaterials.

#### **TEXT BOOKS:**

1. Applied Physics - P.K.Palanisamy (SciTech Publications (India) Pvt. Ltd., Fifth Print 2008).
2. Applied Physics - S.O. Pillai & Sivakami (New Age International (P) Ltd., Second Edition 2008).
3. Applied Physics - T. Bhima Shankaram & G. Prasad (B.S. Publications, Third Edition 2008).
4. Engineering Physics – Hitendra K Malik A K Singh (Tata Mc Graw Hill Edu Pvt Ltd
5. Nanotechnology – M.Ranter & D.Ranter (Pearson Edu)
6. Solid State Physics – A J Dekker (Macmillan)
7. Engineering Physics – Adeel Ahmad & B S Bellubbi (Florence Publication , Hyd)

#### **REFERENCES:**

1. Solid state physics -- M.Arumugam
- 2 Applied physics – Mani naidu

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**ENGINEERING CHEMISTRY**

**UNIT I:**

**Electrochemistry and Batteries:** Concept of ElectroChemistry, Conductance-Electrolyte in solution, Conductance-Specific, Equivalent and molar conductance, Ionic mobilities, Kohlrausch's Law. Application of conductance. EMF: Galvanic Cells, types of Electrodes, Reference Electrode (SCE, Quinhydrone electrode), Ion Selective Electrodes (Glass Electrode) Nernst equation, Concentration Cells, Galvanic series, Potentiometric titrations, Volumetry, Numerical problems.

**Batteries:** Primary and secondary cells, (lead-Acid cell, Ni-Cd cell, Lithium cells). Applications of batteries, fuel cells – Hydrogen – Oxygen fuel cells, Advantages of fuel cells.

**UNIT II:**

**Corrosion and its corrosion control:** Introduction, causes and different types of corrosion and effects of corrosion, theories of corrosion – Chemical, Electrochemical corrosion, corrosion reactions, factors affecting corrosion – Nature of metal – galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment-effect of temperature, effect of pH, Humidity, effect of oxidant.

**Corrosion control methods –** Cathodic protection, sacrificial anode, impressed current cathode. Surface coatings – methods of application on metals- hot dipping, galvanizing, tinning, cladding, electroplating - Organic surface coatings – paints constituents and functions.

**UNIT III:**

**Polymers:** Types of Polymerization, Mechanism (Chain growth & Step growth).Plastics:

Thermoplastic resins & Thermoset resins. Compounding & fabrication of plastics, preparation, properties, engineering applications of: polyethylene, PVC, PS, Teflon, Bakelite, Nylon. Conducting polymers: Poly acetylene, polyaniline, conduction, doping, applications. Liquid Crystal polymers: Characteristics and uses Rubber – Natural rubber, vulcanization. Elastomers – Buna-s, Butyl rubber, Thiokol rubbers, Fibers – polyester, fiber reinforced plastics (FRP), applications

**UNIT IV:**

**Water:** Introduction, Hardness: Causes, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water, numerical problems. Boiler troubles – Scale & sludge formation, caustic embrittlement, corrosion, priming & foaming Softening of water (Internal & external treatment-Lime soda, Zeolites, Ion exchange process and Numerical problems) Reverse osmosis, electro dialysis, electrodionization.

**UNIT V:**

**Surface Chemistry:** Solid surfaces- types of adsorption- Langmuir adsorption isotherm, BET adsorption equation- Calculation of surface area of solid, application adsorption. Nanomaterials: Introduction, preparation and applications of Nanomaterials.

**UNIT VI:**

**Energy sources:** fuels, classification – conventional fuels (solid, liquid, gaseous) Solid fuels – coal – analysis – proximate and ultimate analysis and their significance Liquid fuels – primary – petroleum – refining of petroleum-cracking knocking synthetic petrol – Bergius and Fischer Tropsch's process; Gaseous fuels – natural gas, analysis of flue gas by Orsat's method Combustion – problems, Calorific value of fuel – HCV, LCV, determination of calorific value by Junker's gas calorimeter.

**UNIT VII:**

**Phase rule:** Definitions: phase, component, degree of freedom, phase rule equation. Phase diagrams - one component system: water system. Two component system lead- silver system, heat treatment based on iron-carbon phase diagram, hardening, annealing.

**UNIT VIII:**

**Materials Chemistry:** Cement: composition of Portland cement, manufacture of port land Cement, setting & hardening of cement (reactions). Lubricants: Criteria of a good lubricant, mechanism, properties of lubricants: Cloud point, pour point, flash & fire point, Viscosity. Refractories: Classification, Characteristics of a good refractory and Ceramics.

Introduction to analytical chemistry-IR, UV-Visible spectroscopy-theory and instrumentation -with simple examples.

**TEXT BOOKS:**

1. Text Book of Engineering Chemistry – Shashi Chawla, Dhanpat Rai publishing Company, New Delhi (2008).
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).
3. Text of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co, New Delhi (2006)

**REFERENCE BOOKS**

1. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited , New Delhi (2006)
2. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills co., New Delhi (2004).
3. Chemistry of Engineering Materials by CV Agarwal, C.P Murthy, A. Naidu, BS Publications.
4. Chemistry of Engineering Materials by R.P Mani and K.N. Mishra, CENGAGE learning.
5. Applied Chemistry – A text for Engineering & Technology – Springer (2005).
6. Text Books of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).
7. Engineering Chemistry – R. Gopalan, D. Venkatappayya, D.V. Sulochana Nagarajan – Vikas Publishers (2008).

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**COMPUTER PROGRAMMING AND DATA STRUCTURES**

**UNIT - I**

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programmes, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

**UNIT - II**

Introduction to C Language – Background, Simple C Programme, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

Selection Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Programming examples.

**UNIT - III**

Designing Structured Programmes, Functions, basics, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programmes

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C programme examples.

**UNIT - IV**

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C programme examples.

**UNIT - V**

Derived types – Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

**UNIT - VI**

Input and Output – Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C programme examples.

**UNIT – VII**

Searching and Sorting – Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort, Searching-linear and binary search methods.

**UNIT - VIII**

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack application-infix to postfix conversion, postfix expression evaluation, recursion implementation, Queues-operations, array and linked representations.

**TEXT BOOKS :**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson education.

**REFERENCES:**

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education
3. C Programming with problem solving, J.A. Jones & K. Harrow, dreamtech Press
4. Programming in C – Stephen G. Kochan, III Edition, Pearson Eductaion.
5. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
6. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
7. C Programming & Data Structures, E. Balagurusamy, TMH.
8. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
9. C& Data structures – E V Prasad and N B Venkateswarlu, S. Chand&Co.

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**ENGINEERING DRAWING**

**UNIT – I**

**INTRODUCTION TO ENGINEERING DRAWING :** Principles of Engineering Graphics and their Significance – Drawing Instruments and their Use – Conventions in Drawing – Lettering – BIS Conventions. Curves used in Engineering Practice & their Constructions :

- a) Conic Sections including the Rectangular Hyperbola – General method only.
- b) Cycloid, Epicycloid and Hypocycloid
- c) Involute.
- d) Scales: Different types of Scales, Plain scales comparative scales, scales of chords.

**UNIT – II**

**DRAWING OF PROJECTIONS OR VIEWS ORTHOGRAPHIC PROJECTION IN FIRST ANGLE**

**PROJECTION:** Principles of Orthographic Projections – Conventions – First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces.

**UNIT – III**

**PROJECTIONS OF PLANES & SOLIDS:** Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes – Auxiliary Views.

**UNIT – IV**

**SECTIONS AND SECTIONAL VIEWS:-** Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views.

**DEVELOPMENT AND INTERPENETRATION OF SOLIDS:** Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramid Cone and their parts. Interpenetration of Right Regular Solids

**UNIT – V**

**INTERSECTION OF SOLIDS:-** Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

**UNIT - VI**

**ISOMETRIC PROJECTIONS :** Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.

**UNIT –VII**

**TRANSFORMATION OF PROJECTIONS :** Conversion of Isometric Views to Orthographic Views – Conventions.

**UNIT – VIII**

**PERSPECTIVE PROJECTIONS :** Perspective View : Points, Lines, Plane Figures and Simple Solids, Vanishing Point Methods (General Method only).

**TEXT BOOK :**

1. Engineering Drawing, N.D. Bhat / Charotar
2. Engineering Drawing and Graphics, Venugopal / New age.
3. Engineering Drawing – Basant Agrawal, TMH

**REFERENCES :**

1. Engineering drawing – P.J. Shah.S.Chand.
2. Engineering Drawing, Narayana and Kannaiah / Scitech publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill.
4. Computer Aided Engineering Drawing- Trymbaka Murthy- I.K. International.
5. Engineering Drawing – Grower.
6. Engineering Graphics for Degree – K.C. John.



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**COMPUTER PROGRAMMING LAB**

**Objectives:**

- To make the student learn a programming language.
- To teach the student to write programs in C to solve the problems.
- To Introduce the student to simple linear data structures such as lists, stacks, queues.

**Recommended Systems/Software Requirements:**

- Intel based desktop PC
- ANSI C Compiler with Supporting Editors

**Week 1.**

- Write a C program to find the sum of individual digits of a positive integer.
- A Fibonacci Sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

**Week 2.**

- Write a C program to calculate the following Sum:  
$$\text{Sum} = 1 - x^2/2! + x^4/4! - x^6/6! + x^8/8! - x^{10}/10!$$
- Write a C program to find the roots of a quadratic equation.

**Week 3**

- Write C programs that use both recursive and non-recursive functions
  - To find the factorial of a given integer.
  - To find the GCD (greatest common divisor) of two given integers.
  - To solve Towers of Hanoi problem.

**Week 4**

- The total distance travelled by vehicle in 't' seconds is given by distance =  $ut + 1/2at^2$  where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec<sup>2</sup>). Write C program to find the distance travelled at regular intervals of time given the values of 'u' and 'a'. The program should provide the flexibility to the user to select his own time intervals and repeat the calculations for different values of 'u' and 'a'.
- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

**Week 5**

- Write a C program to find both the largest and smallest number in a list of integers.
- Write a C program that uses functions to perform the following:
  - Addition of Two Matrices
  - Multiplication of Two Matrices

**Week 6**

- Write a C program that uses functions to perform the following operations:
  - To insert a sub-string in to a given main string from a given position.
  - To delete n Characters from a given position in a given string.
- Write a C program to determine if the given string is a palindrome or not

**Week 7**

- Write a C program that displays the position or index in the string S where the string T begins, or - 1 if S doesn't contain T.
- Write a C program to count the lines, words and characters in a given text.

**Week 8**

- a) Write a C program to generate Pascal's triangle.
- b) Write a C program to construct a pyramid of numbers.

**Week 9**

Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

$$1+x+x^2+x^3+\dots\dots\dots+x^n$$

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.

Print x, n, the sum

Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

**Week 10**

- a) 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
- b) Write a C program to convert a Roman numeral to its decimal equivalent.

**Week 11**

Write a C program that uses functions to perform the following operations:

- i) Reading a complex number
- ii) Writing a complex number
- iii) Addition of two complex numbers
- iv) Multiplication of two complex numbers

(Note: represent complex number using a structure.)

**Week 12**

- a) Write a C program which copies one file to another.
  - b) Write a C program to reverse the first n characters in a file.
- (Note: The file name and n are specified on the command line.)

**Week 13**

- a) Write a C programme to display the contents of a file.
- b) Write a C programme to merge two files into a third file ( i.e., the contents of the first file followed by those of the second are put in the third file)

**Week 14**

Write a C program that uses functions to perform the following operations on singly linked list.:

- i) Creation ii) Insertion iii) Deletion iv) Traversal

**Week 15**

Write C programs that implement stack (its operations) using

- i) Arrays ii) Pointers

**Week 16**

Write C programs that implement Queue (its operations) using

- i) Arrays ii) Pointers

**Week 17**

Write a C program that uses Stack operations to perform the following:

- i) Converting infix expression into postfix expression
- ii) Evaluating the postfix expression

**Week 18**

Write a C program that implements the following sorting methods to sort a given list of integers in ascending order

- i) Bubble sort
- ii) Selection sort

**Week 19**

Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers :

- i) Linear search
- ii) Binary search

**Week 20**

Write C program that implements the following sorting method to sort a given list of integers in ascending order:

- i) Quick sort

**Week 21**

Write C program that implement the following sorting method to sort a given list of integers in ascending order:

- i) Merge sort

**Week 22**

Write C programs to implement the Lagrange interpolation and Newton- Gregory forward interpolation.

**Week 23**

Write C programs to implement the linear regression and polynomial regression algorithms.

**Week 24**

Write C programs to implement Trapezoidal and Simpson methods.

**Text Books**

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications
2. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publications.
3. The Spirit of C, an introduction to modern programming, M.Cooper, Jaico Publishing House.
4. Practical C Programming, Steve Oualline, O'Reilly, SPD. TMH publications.
5. Computer Basics and C Programming, V. Rajaraman, PHI Publications.
6. Data structures and Program Design in C, R.Kruse, C.L.Tondo, B.P.Leung, M.Shashi, Pearson Education.

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**ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB**

**ENGINEERING PHYSICS LAB  
(Any twelve experiments compulsory)**

1. Dispersive power of the material of a prism – Spectrometer
2. Determination of wavelength of a source – Diffraction Grating.
3. Newton's Rings - Radius of curvature of plano convex lens.
4. Melde's experiment – Transverse and longitudinal modes.
5. Time constant of an R-C circuit.
6. L-C-R circuit.
7. Magnetic field along the axis of current carrying coil – Stewart and Gees method.
8. Study the characteristics of LED and LASER sources.
9. Study the characteristics of p-i-n and avalanche photodiode detectors.
10. Bending losses of fibres.
11. Evaluation of numerical aperture of given fibre.
12. Energy gap of a material of p-n junction.
13. Thermo electric effect – Seebeck effect and Peltier effect.
14. Torsional pendulum.
15. Single slit diffraction using laser.

**ENGINEERING CHEMISTRY LAB  
List of Experiments (Any 12 of the following):**

**Titrimetry:**

- a. Estimation of hardness of water by EDTA method. (or)  
Estimation of calcium in limestone by Permanganometry.

**Mineral Analysis:**

- 2 Determination of percentage of copper in brass
- 3 Estimation of manganese dioxide in pyrolusite.

**Instrumental Methods:**

4. **Colorimetry:**  
Determination of ferrous iron in cement by colorimetric method.  
(Or) Estimation of Copper by Colorimetric method.
5. **Conductometry:**  
Conductometric titration of strong acid Vs strong base.  
(or) Conductometric titration of mixture of acids Vs strong base.
6. **Potentiometry:**  
Titration of strong acid Vs strong base by potentiometry.  
(or) Titration of weak acid Vs strong base by potentiometry.

**Physical Properties:**

7. Determination of viscosity of sample oil by redwood/oswald's viscometer
8. Determination Surface Tension of lubricants.

**Identification and Preparations:**

9. Identification of functional groups present in organic compounds.
10. Preparation of organic compounds  
Asprin (or) Benzimidazole

**Kinetics:**

11. To determine the rate constant of hydrolysis of methyl acetate catalysed by an acid and also the energy of activation. (or) To study the kinetics of reaction between  $K_2S_2O_8$  and KI.
12. Demonstration Experiments ( Any One of the following ) :
  - a. Determination of dissociation constant of weak acid-by PH metry
  - b. Preparation of Thiokol rubber
  - c. Adsorption on Charcoal
  - d. Heat of reaction

**TEXT BOOKS:**

1. Practical Engineering Chemistry by K. Mukkanti, etal, B.S. Publications, Hyderabad.
2. Inorganic quantitative analysis, Vogel.

**REFERENCE BOOKS:**

1. Text Book of engineering chemistry by R. N. Goyal and Harmendra Goel.
2. A text book on experiments and calculation Engg. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

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**ENGLISH LANGUAGE COMMUNICATION SKILLS LAB**

The **Language Lab** focuses on the production and practice of sounds of language and familiarises the students with the use of English in everyday situations and contexts.

**Objectives:**

1. To expose the students to a variety of self-instructional, learner-friendly modes of language learning.
2. To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required facility to face computer-based competitive exams such GRE, TOEFL, GMAT etc.
3. To enable them to learn better pronunciation through stress on word accent, intonation, and rhythm.
4. To train them to use language effectively to face interviews, group discussions, public speaking.
5. To initiate them into greater use of the computer in resume preparation, report writing, format-making etc.

**SYLLABUS :**

The following course content is prescribed for the **English Language Laboratory** sessions:

1. Introduction to the Sounds of English- Vowels, Diphthongs & Consonants.
2. Introduction to Stress and Intonation.
3. Situational Dialogues / Role Play.
4. Oral Presentations- Prepared and Extempore.
5. 'Just A Minute' Sessions (JAM).
6. Describing Objects / Situations / People.
7. Information Transfer
8. Debate
9. Telephoning Skills.
10. Giving Directions.

**Minimum Requirement:**

**The English Language Lab shall have two parts:**

- i) **The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
- ii) **The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement ( Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*

- i) P – IV Processor
  - a) Speed – 2.8 GHZ
  - b) RAM – 512 MB Minimum
  - c) Hard Disk – 80 GB
- ii) Headphones of High quality

**Suggested Software:**

- Cambridge Advanced Learners' English Dictionary with CD.
- The Rosetta Stone English Library.
- Clarity Pronunciation Power – Part I.
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd with CD.
- Oxford Advanced Learner's Compass, 7<sup>th</sup> Edition.
- Learning to Speak English - 4 CDs.
- Vocabulary in Use, Michael McCarthy, Felicity O'Den, Cambridge.
- Murphy's English Grammar, Cambridge with CD.
- English in Mind, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

**Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):**

1. **A Handbook for English Language Laboratories** – Prof. E. Suresh Kumar, P. Sreehari, Foundation Books.
2. **Effective Communication & Public Speaking** by S. K. Mandal, Jaico Publishing House.
3. **English Conversation Practice** by Grant Taylor, Tata McGraw Hill.
4. **Speaking English effectively** by Krishna Mohan, N. P. Singh, Mac Millan Publishers.
5. **Communicate or Collapse: A Handbook of Effective Public Speaking, Group Discussions and Interviews**, by Pushpa Lata & Kumar, Prentice-Hall of India.
6. **Learn Correct English, Grammar, Usage and Composition** by Shiv. K. Kumar & Hemalatha Nagarajan, Pearson Longman
7. **Spoken English** by R. K. Bansal & J. B. Harrison, Orient Longman.
8. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr. G. Natanam & Prof. S. A. Sankaranarayanan, Anuradha Publications, Chennai.
9. **Effective Technical Communication**, M. Ashraf Rizvi, Tata McGraw-Hill.
10. **A Practical Course in English Pronunciation**, (with two Audio cassettes) by J. Sethi, Kamlesh Sadanand & D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
11. **A text book of English Phonetics for Indian Students** by T. Balasubramanian, Mac Millan
12. **Spoken English: A foundation Course, Parts 1 & 2, Kamalesh Sadanand and Susheela punitha**, Orient Longman

**DISTRIBUTION AND WEIGHTAGE OF MARKS*****English Language Laboratory Practical Paper:***

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 year-end Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year-end Examination shall be conducted by an external examiner/ or the teacher concerned with the help of another member of the staff of the same department of the same institution.

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**IT WORKSHOP/ ENGINEERING WORKSHOP**

**Objectives :**

The IT Workshop for engineers is a training lab course spread over 54 hours. The modules include training on PC Hardware, Internet & World Wide Web and Productivity tools including Word, Excel and Power Point

**PC Hardware** introduces the students to a personal computer and its basic peripherals, the process of assembling a personal computer, installation of system software like MS Windows , Linux and the required device drivers. In addition hardware and software level troubleshooting process, tips and tricks would be covered. **The students should work on working PC to disassemble and assemble to working condition and install Windows and Linux on the same PC. Students are suggested to work similar tasks in the Laptop scenario wherever possible.**

**Internet & World Wide Web** module introduces the different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet. Usage of web browsers, email, newsgroups and discussion forums would be covered. In addition, awareness of cyber hygiene, i.e., protecting the personal computer from getting infected with the viruses, worms and other cyber attacks would be introduced.

**Productivity tools** module would enable the students in crafting professional word documents, excel spread sheets and power point presentations using the Microsoft suite of office tools and LaTeX. **(Recommended to use Microsoft office 2007 in place of MS Office 2003)**

**PC Hardware**

**Week 1 – Task 1 :** Identify the peripherals of a computer, components in a CPU and its functions. Draw the block diagram of the CPU along with the configuration of each peripheral and submit to your instructor.

**Week 2 – Task 2 :** Every student should disassemble and assemble the PC back to working condition. Lab instructors should verify the work and follow it up with a Viva. Also students need to go through the video which shows the process of assembling a PC. A video would be given as part of the course content.

**Week 3 – Task 3 :** Every student should individually install MS windows on the personal computer. Lab instructor should verify the installation and follow it up with a Viva.

**Week 4 – Task 4 :** Every student should install Linux on the computer. This computer should have windows installed. The system should be configured as dual boot with both windows and Linux. Lab instructors should verify the installation and follow it up with a Viva

**Week 5 – Task 5 : Hardware Troubleshooting :** Students have to be given a PC which does not boot due to improper assembly or defective peripherals. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva

**Week 6 – Task 6 : Software Troubleshooting :** Students have to be given a malfunctioning CPU due to system software problems. They should identify the problem and fix it to get the computer back to working condition. The work done should be verified by the instructor and followed up with a Viva.

**Internet & World Wide Web**

**Week 7 - Task 1 : Orientation & Connectivity Boot Camp :** Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. Finally students should demonstrate, to the instructor, how to access the websites and email. If there is no internet connectivity preparations need to be made by the instructors to simulate the WWW on the LAN.

**Week 8 - Task 2 : Web Browsers, Surfing the Web :** Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers. Also, plug-ins like Macromedia Flash and JRE for applets should be configured.



**Week 9 - Task 3 : Search Engines & Netiquette :** Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google. This should be demonstrated to the instructors by the student.

**Week 10 - Task 4 : Cyber Hygiene :** Students would be exposed to the various threats on the internet and would be asked to configure their computer to be safe on the internet. They need to first install an anti virus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block pop ups, block active x downloads to avoid viruses and/or worms.

### **Productivity tools**

#### **LaTeX and Word**

**Week 11 – Word Orientation:** The mentor needs to give an overview of LaTeX and Microsoft (MS) office 2007/ equivalent (FOSS) tool word: Importance of LaTeX and MS office 2007/ equivalent (FOSS) tool Word as word Processors, Details of the three tasks and features that would be covered in each, using LaTeX and word – Accessing, overview of toolbars, saving files, Using help and resources, rulers, format painter.

**Task 1 : Using LaTeX and Word** to create project certificate. Features to be covered:-Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

**Week 12 - Task 2 : Creating project abstract** Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check, Track Changes.

**Week 13 - Task 3 : Creating a Newsletter :** Features to be covered:- Table of Content, Newspaper columns, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes, Paragraphs and Mail Merge in word.

#### **Excel**

**Week 14 - Excel Orientation:** The mentor needs to tell the importance of MS office 2007/ equivalent (FOSS) tool Excel as a Spreadsheet tool, give the details of the two tasks and features that would be covered in each. Using Excel – Accessing, overview of toolbars, saving excel files, Using help and resources.

**Task 1: Creating a Scheduler** - Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text

**Week 15 - Task 2 : Calculating GPA** - .Features to be covered:- Cell Referencing, Formulae in excel – average, std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, LOOKUP/VLOOKUP, Sorting, Conditional formatting

#### **LaTeX and MS/equivalent (FOSS) tool Power Point**

**Week 16 - Task1 :** Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows in both LaTeX and Power point. Students will be given model power point presentation which needs to be replicated (exactly how it's asked).

**Week 17- Task 2 :** Second week helps students in making their presentations interactive. Topic covered during this week includes : Hyperlinks, Inserting –Images, Clip Art, Audio, Video, Objects, Tables and Charts

**Week 18 - Task 3 :** Concentrating on the in and out of Microsoft power point and presentations in LaTeX. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes :- Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides.

#### **REFERENCES :**

1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education.
2. LaTeX Companion – Leslie Lamport, PHI/Pearson.
3. Introduction to Computers, Peter Norton, 6/e Mc Graw Hill
4. Upgrading and Repairing, PC's 18<sup>th</sup> e, Scott Muller QUE, Pearson Education
5. Comdex Information Technology course tool kit Vikas Gupta, WILEY Dreamtech

6. IT Essentials PC Hardware and Software Companion Guide Third Edition by David Anfinson and Ken Quamme. – CISCO Press, Pearson Education.
7. PC Hardware and A+Handbook – Kate J. Chase PHI (Microsoft)

## **ENGINEERING WORKSHOP**

### **1. TRADES FOR EXERCISES :**

**At least two exercises from each trade:**

1. House Wiring
2. Carpentry
3. Tin-Smithy and Development of jobs carried out and soldering.
4. Fitting

### **2. TRADES FOR DEMONSTRATION & EXPOSURE:**

1. Metal Cutting (Water Plasma)
- 2 Power Tools in Construction, wood working, Electrical Engineering and Mechanical Engineering

### **TEXT BOOK:**

1. Work shop Manual - P.Kannaiah/ K.L.Narayana, Scitech Publishers.
2. Workshop Manual by Venkat Reddy

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**APPLIED BIOCHEMISTRY**

**UNIT-I**

Properties of water: pH & Buffers, Physiological buffer. The Handerson Hasselbalch equation, determination of pKa values. Structural aspects of carbohydrates , amino acids and lipids.

**UNIT-II**

Biochemistry of Living Cell: types of cells, pro and eu karyotes. Sub-cellular - Fractionation using the Differential Centrifugation Method. Functions of each Organelle, Chemical Composition of cell walls Membrane lipids. Transport of Substances across Biological Membrane.

**UNIT-III**

Redox potential, components in electron transport systems in mitochondria, respiratory chain. Oxidative phosphorylation - Energetics ,

**UNIT-IV**

Chemical nature of Enzymes - study of the Properties of Enzymes and kinetics by Spectrophotometer. Diagnostic and therapeutic uses of Enzymes.

**UNIT-V**

Carbohydrate metabolism: respiration-types. glycolysis and kreb's cycle and energetics involved, Protein & Lipid metabolism (Briefly).

**UNIT-VI**

Nucleic Acid chemistry: Protein synthesis. Transcription and Translation, Replication, Polymerase Chain Reaction(PCR) Immunological Techniques or Immunoassay – Radio Immuno Assay (RIA), Enzyme- Linked Immunosorbent Assay (ELISA), Chemiluminiscence.

**UNIT-VII**

Blood Chemistry: Chemical Composition of Blood, Separation of Serum Proteins and lipoproteins by Electrophoresis and Ultracentrifugation Acid Base Balance and Biochemical Measurements of Acid-Base and Electrolyte status of the patients, Urine Analysis.

**UNIT-VIII**

General methods of biochemical analysis carried out in the estimation of blood constituents, such as glucose etc. Principles and different methods of chromatography – fluorometry, flame photometry, Automation and Biochemical Analysis. Applications of isotopes in biochemistry.

**TEXT BOOKS**

1. Lehninger A.L, Nelson O.'L. M.M. Cox, Principles of Biochemistry 3<sup>rd</sup> edition, 2000 CBS
2. Robert Murray, Peter A. Mayes, Victor W. Rodwell, Daryl K. Granner, Harper's Biochemistry, 26th Edition, McGraw-Hill Companies, February 2003.

**REFERENCE**

1. Rao, N. Mallikarjuna, Medical Biochemistry, New Age International Pvt Ltd,2002.
2. Lalit M. Srivastava, Nibhriti Das & Subrata sinha, Essentials of practical Biochemistry, CBS Publishers, Ist edition, 2002.

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**ELECTRONIC DEVICES AND CIRCUITS**

**Unit- I: p-n Junction Diode**

Qualitative Theory of p-n Junction, p-n Junction as a Diode, Diode Equation, Volt-Ampere Characteristics, Temperature dependence of VI characteristic, Ideal versus Practical – Resistance levels (Static and Dynamic), Transition and Diffusion Capacitances, Diode Equivalent Circuits, Load Line Analysis, Breakdown Mechanisms in Semi Conductor Diodes, Zener Diode Characteristics.

**Unit- II: Rectifiers and Filters**

The p-n junction as a Rectifier, Half wave Rectifier, Full wave Rectifier, Bridge Rectifier, Harmonic components in a Rectifier Circuit, Inductor Filters, Capacitor Filters, L- Section Filters,  $\pi$ - Section Filters, Comparison of Filters, Voltage Regulation using Zener Diode.

**Unit- III: Bipolar Junction Transistor**

The Junction Transistor, Transistor Current Components, Transistor as an Amplifier, Transistor Construction, BJT Operation, BJT Symbol, Common Base, Common Emitter and Common Collector Configurations, Limits of Operation, BJT Specifications.

**Unit- IV: Transistor Biasing and Stabilization**

Operating Point, The DC and AC Load lines, Need for Biasing, Fixed Bias, Collector Feedback Bias, Emitter Feedback Bias, Collector - Emitter Feedback Bias, Voltage Divider Bias, Bias Stability, Stabilization Factors, Stabilization against variations in  $V_{BE}$  and  $\beta$ , Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability.

**Unit- V: Small Signal Low Frequency BJT Models**

BJT Hybrid Model, Determination of h-parameters from Transistor Characteristics, Analysis of a Transistor Amplifier Circuit using h-Parameters, Comparison of CB, CE, and CC Amplifier Configurations.

**Unit-VI: Field Effect Transistor**

The Junction Field Effect Transistor (Construction, principle of operation, symbol) – Pinch-off Voltage - Volt-Ampere characteristics, The JFET Small Signal Model, MOSFET (Construction, principle of operation, symbol), MOSFET Characteristics in Enhancement and Depletion modes.

**Unit VII: FET Amplifiers**

FET Common Source Amplifier, Common Drain Amplifier, Generalized FET Amplifier, Biasing FET, FET as Voltage Variable Resistor, Comparison of BJT and FET.

**Unit VIII: INDUSTRIAL ELECTRONIC DEVICES & APPLICATIONS:**

Negative resistance Devices, Uni junction Transistor(UJT), UJT Relaxation Oscillator, Programmable UJT(PUT), Silicon Controlled Rectifier(SCR), Transient Effect in SCR, Light Activated SCR(LASCR), SILICON Controlled Switch(SCS), Schottky Barrier Diode, DIAC, TRIAC Diodes & Their characteristics.

**TEXT BOOKS**

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2ed., 1998, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 ed., 2006, PEI/PHI.
3. Introduction to Electronic Devices and Circuits - Rober T. Paynter, PE.

**REFERENCES**

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 ed., 2008, TMH.
2. Electronic Devices and Circuits - K. Lal Kishore, 2 ed., 2005, BSP.
3. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 ed., 2009, Wiley India Pvt. Ltd.
4. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 ed., 2008, TMH.

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**FUNDAMENTALS OF ELECTRICAL ENGINEERING**

**Objective:**

This course introduces the basic concepts of circuit analysis which is the foundation for all subjects of the Electrical Engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes Single phase circuits, magnetic circuits, theorems, transient analysis and network topology.

**UNIT – I Introduction to Electrical Circuits**

Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements – Kirchoff's laws – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation.

**UNIT – II Magnetic Circuits**

Magnetic Circuits – Faraday's laws of electromagnetic induction – concept of self and mutual inductance – dot convention – coefficient of coupling – composite magnetic circuit - Analysis of series and parallel magnetic circuits

**UNIT – III Single Phase A.C Circuits**

R.M.S and Average values and form factor for different periodic wave forms, Steady state analysis of R, L and C (in series, parallel and series parallel combinations) with sinusoidal excitation – Concept of Reactance, Impedance, Susceptance and Admittance – Phase and Phase difference – concept of power factor, Real and Reactive powers – J-notation, Complex and Polar forms of representation, Complex power – Locus diagrams – series R-L, R-C, R-L-C and parallel combination with variation of various parameters – Resonance – series, parallel circuits, concept of band width and Q factor.

**UNIT – V Three Phase Circuits**

Three phase circuits: Phase sequence – Star and delta connection – Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits – Measurement of active and reactive power.

**UNIT – VI Network theorems (without proofs)**

Tellegen's, Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation theorems for d.c. and a.c. excitations.

**UNIT – VII**

Dc Machine- Principle & operation of DC Generators and DC Motors , Different types of generator and motors, characteristics of generator and motor, simple problems.

**UNIT – VIII AC machines**

Principle, construction and operation of 1- $\Phi$  transformer, equivalent circuit, DC & AC test on 1- $\Phi$  transformer, transformer regulation, 1- $\Phi$  synchronous generator, principle, construction & operation, characteristics. Principle operation construction of 1- $\Phi$  induction motor, characteristics.

**TEXT BOOKS:**

1. Basic Electrical & Electronics Engineering by D.P.Kothari & I.J.Nagarath, TMH, 2013.
2. Electrical Engineering Fundamental by Vincent Dertoro. PHI.
3. Electrical Circuits by Chakravathi, Dhanapat Rai & son.
4. Basic Electrical Engg. Nagasarkar Sukhija, Oxford Publishers 2/e

**REFERENCE BOOKS:**

1. Network Analysis by Vanvalkenburg, PHI.
2. Network Analysis GK Mithal, Khanna Publishers
3. Higher Electrical Technology, Smith, Pearson.

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**SIGNALS AND SYSTEMS**

**Unit I : Signal Analysis**

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

**Unit II : Fourier Series Representation of Periodic Signals**

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

**Unit III : Fourier Transforms**

Deriving Fourier Transform from Fourier Series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

**Unit IV : Signal Transmission Through Linear Systems**

Linear System, Impulse response, Response of a Linear System, Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI system, Filter characteristics of Linear Systems, Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and Rise time.

**Unit V : Convolution and Correlation of Signals**

Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution, Convolution property of Fourier Transforms, Cross Correlation and Auto Correlation of functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Power density spectrum, Relation between Auto Correlation function and Energy/Power spectral density function, Relation between Convolution and Correlation, Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

**Unit VI : Sampling**

Sampling theorem – Graphical and analytical proof for Band Limited Signals, Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing, Introduction to Band Pass sampling.

**Unit VII : Laplace Transforms**

Review of Laplace Transforms (L.T), Partial fraction expansion, Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Constraints on ROC for various classes of signals, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

**Unit VIII : Z-Transforms**

Fundamental difference between Continuous and Discrete time signals, Discrete time signal representation using Complex exponential and Sinusoidal components, Periodicity of Discrete time signal using complex exponential signal, Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

**TEXT BOOKS:**

1. Signals, Systems & Communications - B.P. Lathi, 2009, BSP.
2. Signals and Systems – A.Rama Krishna Rao – 2008, TMH.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 ed., PHI.

**REFERENCES:**

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2 ed.
2. Introduction to Signal and System Analysis – K.Gopalan 2009, CENGAGE Learning.
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 ed., 2004, PE.

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**ANATOMY AND PHYSIOLOGY**

**UNIT-I**

Skeletal system: classification of Bones, Joints and Muscles- Structure and function. Major Muscles of Limbs and their Actions. Functional Concept of the Human body, Bone and Muscle Physiology,

**UNIT-II**

Nervous system and special senses: Brain and spinal cord, Peripheral and Autonomic Nervous System, nerve physiology, Electroencephalogram and Electrocardiogram.

Anatomy and physiology of Eye and Ear.

**UNIT-III**

Cardiovascular system: heart, arterial and venous system, Performance Characteristics of Heart and Major Blood Vessels, Electrocardiography

**UNIT-IV**

Respiratory system: Trachea and Lungs. Respiratory Physiology.

**UNIT-V**

Endocrine System: Endocrine Glands, Physiology of Endocrine Regulatory System.

**UNIT-VI**

Digestive System: Oesophagus, Stomach, Intestines, Liver, Gall Bladder and Pancreas

**UNIT-VII**

Lymphatic system: Spleen, glands and Lymph nodes

**UNIT-VIII**

Reproductive and Urinary Systems: Male and Female. Counter Current Concept and its Application of Concentration Of Urine

**TEXT BOOKS**

1. Charles E. Tobin, Basic Human Anatomy, McGraw Hill, 1980.
2. J Gibson, Modern Physiology & Anatomy for Nurses; Black-well Scientific Publishers, 1981.

**REFERENCE:**

1. Best and Taylor, The Living Body; B.I Publication, 1980. .
2. C. Tandan & Dr. Chandramoli; Textbook of physiology for Dental studies. Dorpan Publications.
3. Gorden Sears, W. S & Winwood W. S; Anatomy & Physiology for Nurses, Revised edition

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**BIOELECTRICITY AND ELECTRODES**

**UNIT-I**

Bioelectricity generation at the cellular & sub cellular level. Different biopotentials and their characteristics.

**UNIT-II**

Nernst Equation: Derivations and its significance. Refractory Period, Characteristics of Stimulus. Strength-Duration relationship. Electrical equivalent circuit of Axon. Membrane time and space constants.

**UNIT-III**

Hodgkin- huxley formulation, Membrane conductance, Nerve conduction, membrane properties from current voltage relations, Models of squid axon. Propagation of impulses in unmyelinated and myelinated nerve fiber. Electrical properties of receptors. Intensity-frequency relationship. Electrical properties of synaptic junctions - EPSP and IPSP.

**UNIT-IV**

Characteristics of Action potentials at SA Node, Atria, A V Node, Purkinje fibers and Ventricles. ECG Complexes. 12 lead ECG. Standard leads of Einthoven. Pericardial leads and Augmented limb leads. Relationship between unipolar extremity leads and standard Bipolar leads.

**UNIT-V**

Biopotential electrodes: classification & characteristics. Electrode-Electrolyte- Tissue Interface, Equivalent Circuit Properties of Needle & Micro Electrodes

**UNIT-VI**

Electrodes for surgery, physiotherapy and Analytical Instruments, Ion-sensitive electrodes used in Biochemistry analysers.

**UNIT-VII**

Electrical activity of skeletal muscles, Motor unit potentials, neuromuscular transmission, EMG wave form. Surface and needle electrodes for EMG. Velocity and their changes in normal and abnormal states. Fatigue and conduction, chemical significance. Gradation of muscular activity.

**UNIT-VIII**

Application of Bioelectric phenomena- Forward, Inverse problems. Electro Encephalogram. Impedance Plethysmography, Measurement of Tissue Resistance.

**TEXT BOOKS**

1. Robert Plonsey and Roger Barr, Bioelectricity, McGraw Hill, 1986.
2. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.

**REFERENCE**

1. L. A Geddes, Principles of Applied Biomedical Instrumentation, John Willy & Sons, 1989.
2. Plonsey Robert and Flemming David G. Bioelectrical phenomena, McGraw Hill, 1969.



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**ELECTRONIC DEVICES AND CIRCUITS LAB**

**PART A: (Only for Viva-voce Examination)**

ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions) :

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.
3. Study and operation of
  - Multimeters (Analog and Digital)
  - Function Generator
  - Regulated Power Supplies
  - CRO.

**PART B: (For Laboratory Examination – Minimum of 10 experiments)**

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Input & Output Characteristics of Transistor in CB Configuration.
4. Input & Output Characteristics of Transistor in CE Configuration.
5. Half Wave Rectifier with & without filters
6. Full Wave Rectifier with & without filters
7. FET characteristics
8. Measurement of h parameters of transistor in CB, CE, CC configurations
9. Frequency Response of CE Amplifier.
10. Frequency Response of Common Source FET amplifier
11. SCR characteristics.
12. UJT Characteristics
13. Triac Characteristics
14. Application in Power control Triac.

**PART C:**

**Equipment required for Laboratories:**

- |                                      |   |  |
|--------------------------------------|---|--|
| 1. Regulated Power supplies (RPS)    | - | 0-30 V   |
| 2. CRO's                             | - | 0-20 MHz.  |
| 3. Function Generators               | - | 0-1 MHz.   |
| 4. Multimeters                       |   |  |
| 5. Decade Resistance Boxes/Rheostats |   |  |
| 6. Decade Capacitance Boxes          |   |  |
| 7. Ammeters (Analog or Digital)      | - | 0-20 $\mu$ A, 0-50 $\mu$ A, 0-100 $\mu$ A, 0-200 $\mu$ A, 0-10 mA.   |
| 8. Voltmeters (Analog or Digital)    | - | 0-50V, 0-100V, 0-250V  |
| 9. Electronic Components             | - | Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, FETs, LEDs, MOSFETs, diodes Ge& Si type, Transistors – npn, pnp type) |

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**MEDICAL SCIENCES LAB**

1. Histology Practicals. Showing the slides of Primary tissues.
2. Recording of B. P. and Effects of Physical Exertion and Posture on this Parameter.
3. Demonstration of Dissecting Upper limbs, Lower limbs, Pelvis and Pelvic Organs Abdomen and Abdominal Organs.
4. Demonstration of Dissecting thorax – showing heart & major blood vessels, lungs and respiratory system.
5. Recording Mechanical Response of the Muscle on Application of Induced Electric Signal,
6. Study of Rate of Conduction of Nerve Impulse.
7. Quantitative estimation of glucose, Urea and creatinine.
8. Quantitative estimation of Serum proteins, A/G Ratio
9. Test for presence of (a) Reducing Sugars (b) Proteins. (c) Ketone Bodies.
10. Test for presence of (a) Blood. (b) Bile Salts. (c) Bile Pigments.
11. Analysis of Na and K in an unknown sample (Demonstration).
12. Plasma protein electrophoresis.

**Equipment required**

1. microscope
2. sphygmomanometer
3. stethoscope
4. kymograph
5. flame photometer
6. Tuning Forks of different resonant frequencies
7. poly graph
8. Electrophoresis apparatus
9. Chromatograph
10. Colorimeter.
11. Spectrophotometer.
12. pH meter
13. Flame photometer

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## ENVIRONMENTAL STUDIES

**UNIT-I : ECOSYSTEMS:** Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structure and Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Homeostasis / Cybernetics, Food chain concentration, Biomagnification, ecosystems value, services and carrying capacity.

**UNIT-II: NATURAL RESOURCES:** Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources – case studies. Land resources: land as a resource, land degradation, man induced landslides and land use / land cover mapping.

**UNIT-III: BIODIVERSITY AND BIOTIC RESOURCES:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values. Hot spots of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, conservation of biodiversity: In-Situ and Ex-situ conservation. Food and fodder resources, Timber and non-timber forest products.

**UNIT-IV: ENVIRONMENTAL POLLUTION AND CONTROL:** Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutant of water and their sources, drinking water quality standards, Waste water treatment methods: effluent treatment plants (ETP), Sewage treatment plants (STP), common and combined effluent treatment plants (CETP). Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents. Noise Pollution: Sources, Industrial Noise- Occupational Health hazards, standards, Methods of control of Noise. Thermal Pollution: Thermal Comforts, Heat Island effect, Radiation effects. Nuclear Pollution: Nuclear power plants, nuclear radiation, disasters and impacts, genetical disorders. Solid waste: types, Collection processing and disposal of industrial and municipal solid wastes composition and characteristics of e-Waste and its management.

**UNIT-V: GLOBAL ENVIRONMENTAL PROBLEMS AND GLOBAL EFFORTS :** Green house effect, Green House Gases (GHG), Global Warming, Sea level rise, climate change and their impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol and Montréal Protocol,

**UNIT-VI: ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND ENVIRONMENTAL MANAGEMENT PLAN:** Definition of Impact: classification of impacts, Positive and Negative, Reversible and irreversible, light, moderate and severe, methods of baseline data acquisition. Impacts on different components: such as human health resources, air, water, flora, fauna and society. Prediction of impacts and impact assessment methodologies. Environmental Impact Statement (EIS). Environmental Management Plan (EMP): Technological Solutions, preventive methods, Control technologies, treatment technologies: green-belt-development, rain water harvesting, Remote sensing and GIS methods.

### UNIT-VII: ENVIRONMENTAL POLICY, LEGISLATION, RULES AND REGULATIONS

National Environmental Policy, Environmental Protection act, Legal aspects Air (Prevention and Control of pollution ) Act- 1981, Water (Prevention and Control of pollution ) Act-1974, Water pollution Cess Act-1977, Forest Conservation Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules .

### UNIT: VIII -- TOWARDS SUSTAINABLE FUTURE

Concept of Sustainable Development, Threats to Sustainability, Population and its explosion, Crazy Consumerism, Over-exploitation of resources, Strategies for Achieving Sustainable development, Environmental Education, Conservation of Resources, Urban Sprawl, Sustainable Cities and Sustainable Communities, Human health, Role of IT in Environment, Environmental Ethics, Environmental Economics, Concept of Green Building, Clean Development Mechanism (CDM).

### SUGGESTED TEXT BOOKS:

1. Environmental studies , From crisis to cure by R.Rajagopalan, 2005
2. Text book of Environmental Science and Technology by M.Anji Reddy 2007
3. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

### REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T.Wright. 2008 PHL Learning Private Ltd. New Delhi
2. Environmental Engineering and science by Gilbert M.Masters and Wendell P. Ela .2008 PHI Learning Pvt. Ltd.

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**SWITCHING THEORY AND LOGIC DESIGN**

**UNIT I**

**Number Systems & Codes :** Philosophy of Number Systems, Complement Representation of Negative Numbers, Binary Arithmetic, Binary Codes, Error Detecting & Error Correcting Codes, Hamming codes.

**UNIT II**

**Boolean Algebra and Switching Functions :** Fundamental Postulates of Boolean Algebra, Basic theorems and Properties, Switching Functions, Canonical and Standard forms, Algebraic simplification Digital Logic Gates, Properties of XOR gates, Universal Gates, Multilevel NAND/NOR Realizations.

**UNIT III**

**Minimization of Switching Functions :** Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, Simplification rules.

**UNIT IV**

**Combinational Logic Design**

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and Hazard free Realizations.

**UNIT V**

**Programmable Logic Devices & Threshold Logic :** Basic PLD's-ROM, PROM, PLA, PAL, Realization of Switching functions using PLD's, Capabilities and Limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

**UNIT VI**

**Sequential Circuits - I :** Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples), Basic Flip-Flops, Triggering and Excitation tables, Steps in Synchronous Sequential Circuit Design, Design of modulo-N Ring & Shift counters, Serial binary adder, Sequence detector.

**UNIT VII**

**Sequential Circuits - II :** Finite State Machine–Capabilities and Limitations, Mealy and Moore models, Minimization of Completely Sspecified and Incompletely Sspecified Sequential Machines, Partition Techniques and Merger chart methods, Concept of Minimal cover table.

**UNIT VIII**

**Algorithmic State Machines :** Salient features of the ASM chart, Simple examples, System design using data path and control subsystems, Control implementations, Examples of Weighing Machine and Binary multiplier.

**TEXTBOOKS :**

1. Switching & Finite Automata theory – Zvi Kohavi, 2 ed., TMH.
2. Digital Design – Morris Mano, 3 ed., 2006, PHI.
3. Switching Theory and Logic Design – A. Anand Kumar, 2008, PHI.

**REFERENCES :**

1. An Engineering Approach to Digital Design – Fletcher, PHI.
2. Fundamentals of Logic Design – Charles H. Roth, 5 ed., 2004, Thomson Publications.
3. Digital Logic Applications and Design – John M. Yarbrough, 2006, Thomson Publications.

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**PULSE AND DIGITAL CIRCUITS**

**Unit-I**

**Linear Wave Shaping** : High pass and low pass RC circuits and their response for Sinusoidal, Step, Pulse, Square, & Ramp inputs, High pass RC network as Differentiator, Low pass RC circuit as an Integrator, Attenuators and its application as a CRO Probe, RL and RLC Circuits and their response for Step Input, Ringing Circuit.

**Unit- II**

**Non-Linear Wave Shaping**: Diode clippers, Transistor clippers, Clipping at two independent levels, Comparators, Applications of Voltage comparators. Clamping Operation, Clamping circuit taking Source and Diode resistances into account, Clamping Circuit Theorem, Practical Clamping Circuits, Effect of Diode Characteristics on Clamping Voltage, Synchronized Clamping.

**Unit-III**

**Switching Characteristics of Devices** : Diode as a Switch, Piecewise Linear Diode Characteristics, Diode Switching times, Transistor as a Switch, Break down voltages, Transistor in Saturation, Temperature variation of Saturation Parameters, Transistor-switching times, Silicon-controlled-switch circuits.

**Unit-IV**

**Multivibrators**: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

**Unit-V**

**Time Base Generators** : General features of a Time base Signal, Methods of Generating Time Base Waveform, Miller and Bootstrap Time base Generators-Basic Principles, Transistor Miller Time Base generator, Transistor Bootstrap Time Base Generator, Transistor Current Time Base Generators, Methods of Linearity improvement.

**Unit-VI**

**Sampling Gates** : Basic operating principles of Sampling Gates, Unidirectional and Bi-directional Sampling Gates, Four Diode Sampling Gate, Reduction of pedestal in Gate Circuits, Six Diode Gate, Application of Sampling Gates.

**Unit-VII**

**Synchronization and Frequency Division**: Pulse Synchronization of Relaxation Devices, Frequency division in Sweep Circuit, Stability of Relaxation Devices, Astable Relaxation Circuits, Monostable Relaxation Circuits, Synchronization of a Sweep Circuit with Symmetrical Signals, Sine wave frequency division with a Sweep Circuit, A Sinusoidal Divider using Regeneration and Modulation.

**Unit-VIII**

**Realization of Logic Gates Using Diodes & Transistors**: AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison.

**TEXT BOOKS:**

1. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 ed., 2008, TMH.
2. Solid State Pulse circuits –David A. Bell, 4 ed., 2002 PHI.

**REFERENCES:**

1. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.
2. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 ed., 2008.
3. Pulse and Digital Circuits – Motheki S. Prakash Rao, 2006, TMH.
4. Wave Generation and Shaping - L. Strauss.

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**BASIC CLINICAL SCIENCES-I**

**UNIT-I**

NEPHROLOGY: Principles of dialysis; Haemodialysis, Acetate dialysis, Bicarbonate dialysis. Peritoneal dialysis, Chronic ambulatory peritoneal dialysis, Haemoperfusion, Sequential ultra filtration. Haemofiltration, Adequacy of dialysis, Clearance, dialysance,

**UNIT-II**

Components of dialysing system, Dialysate, composition of dialysate, Types of dialysers, controls and monitoring devices for dialysers. Clinical significance. Renal transplantation: Basic principles.

**UNIT-III**

NEUROLOGY: Diseases of nervous system, spinal cord lesions, motor nervous disease, Prolapsed intravertebral disc, Neuropathies, Myasthenia gravis, Diseases of muscle.

**UNIT-IV**

DIAGNOSTIC INVESTIGATIONS IN NEUROLOGY. Electro encephalography. Computerized axial tomography, Angiography, Pneumoencephalography, neuromuscular stimulation, Electromyography. Clinical applications. Clinical significance, Diseases of muscle, Motor neuron disorders, The electrical study of reflexes. The silent period. The F response, The H reflex, The axon reflexes. Disorders of neuromuscular transmission

**UNIT-V**

CARDIOLOGY: Heart structure and function, Cardiac cycle, various valves and their function, Cardio vascular measurements. Prosthetic devices. Monitors. Heart lung machine applications and clinical significance. CVP and SWAN catheters. Electro cardiography: Source of ECG potentials: Dipole theory, conduction system, Normal and abnormal ECG's. Diagnostic applications, interpretation of ECG. Cardiac pacing. Diagnostic indications. Criteria for selection. Therapeutic indications. Complications. Temporary pacing. Permanent pacing.

**UNIT-VI**

CARDIAC ASSIST DEVICES: Arterial and Ventricular fibrillation, application of cardiac assist devices. Cardiac catheterisation. Echocardiography, Cine angiography, Treadmill and Ergometer Applications and Clinical significance. Diagnostic usage of ultrasound scanners. Doppler ultrasound measurement. Clinical significance. Open heart surgery grafts, bypass surgery. Instrumentation used for open-heart surgery, Organization of I.C.C.U Clinical aspects.

**UNIT-VII**

GENERAL SURGERY: Surgical patient. Clinically significant investigations, Pre operative preparation. Study and operation of surgical equipment. laproscopy and its use in various surgeries

**UNIT-VIII**

GASTROENTROLOGY: Anatomy and physiology of G.I.T. clinically significant symptoms, signs and diseases. Nutritional support and parenteral therapy. Height and weight estimations according to age. Intravenous cannulae, I. V Sets, Infusion pumps, stomach wash tubes. Various endoscopic procedures, liver biopsy etc.

**TEXT BOOKS:**

1. Strauss, Maurice B. & Louis G. Welt. Diseases of kidney, vol. 1&2 Little Brown.1997
2. James G. Mcleod, Physiological Approach to Clinical Neurology, Butterworth-Heinemann Ltd, 3<sup>rd</sup> edition.

**REFERENCES:**

1. D.Goldstein, mehmet Oz, Cardiac Assist Devices, Blackwell Future,2002.
2. Robert F Rushmer , Cardio vascular Dynamics.WB Saunders, 1976.
3. T.L Dent. W.E. Stodel, J.G.turcotte, Surgical Endoscopy, year book Medical pub,1985.
4. Jones DB, Wu JS, Soper NJ, Laproscopic surgery: Principles and Procedures 2<sup>nd</sup> ed, Marcel Dekker, 2004.

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**BIOTRANSDUCERS AND APPLICATIONS**

**UNIT-I**

INTRODUCTION: Classification, Basic requirements of bio transducers, Quasi state effects (linearity, Hysterisis), Amplitude distortion, Phase distortion, Sampling errors, Input and Output impedance effects, Factors influencing the choice and design of the transducer in Measuring the Physiological Parameters.

**UNIT-II**

TEMPERATURE TRANSDUCERS (Measurement Principle, Design and Applications): Thermo resistive, Thermo electric, PN junction diode- Thermometers, frequency change temperature Transducers, Chemical Thermometry, Radiation Thermometry.

**UNIT-III**

DISPLACEMENT, TRANSDUCERS: Potentiometric Transducers: Resistive, Resistive strain gauges. L V. D. T, Inductive displacement transducer, Capacitive displacement transducers, Ultrasonic methods.

**UNIT-IV**

FORCE & VELOCITY TRANSDUCERS: Differentiation and Integration methods, Doppler system, Methods based on the mass bauer effect, Electro magnetic methods. Acceleration transducers: Piezo electric transducers

**UNIT-V**

PRESSURE TRANSDUCERS: Occlusive cuff methods. Force balance methods. Direct hydraulically coupled Catheter transducer system, Diaphragm displacement pressure transducers. Electrical transduction methods for Catheter tip transducer. Optical transducers. Implantable pressure transducer, Micro pressure transducer.

**UNIT-VI**

FLOW TRANSDUCERS: Flow probe design and application: Catheter tip electromagnetic Intra vascular probe & electronic system. Doppler shift flow meters, Pressure gradient technique, Intra vascular Thermistor probe, Water filled plethysmography, Air filled plethysmography, Fick & Rapid injection indicator dilution methods.

**UNIT-VII**

Bioelectric Amplifiers - Different types of Bioelectric amplifiers, Principle of Operational Amplifier, Instrumentation Amplifier characteristics, Integrator, Differentiator, Log Amplifier and Antilog Amplifier. Signal Conditioning

**UNIT- VIII**

BIOTELEMETRY: Radio Telemetry principles, FM, AM, PCM. Transmission of biological data through radio telemetry. Single channel, multi channel systems. Block diagrams and functions of bio signal transmitters and receivers.

**TEXT BOOKS:**

1. L. A Geddes, L.E.Baker, Principles of Applied Biomedical Instrumentation, John Wiley India.
2. Tatsuo Togawa, Toshiyo Tamura & P, Ake Oberg, Biomedical Transducers and Instruments, CRC Press, Boca Raton, 1997.
3. Introduction to Measurements and Instrumentation, second edition, Arun K Ghosh, PHI, New Delhi 2007

**REFERENCE:**

1. Richard. S. C.Cobbold; Transducers for Biomedical Measurements- principles and application; Krieger pub Co,
2. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.

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**PULSE AND DIGITAL CIRCUITS LAB**

**Minimum Twelve experiments to be conducted:**

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers.
3. Non Linear wave shaping – Clampers.
4. Transistor as a switch.
5. Study of Logic Gates & some applications.
6. Study of Flip-Flops & some applications.
7. Sampling Gates.
8. Astable Multivibrator.
9. Monostable Multivibrator.
10. Bistable Multivibrator.
11. Schmitt Trigger.
12. UJT Relaxation Oscillator.
13. Bootstrap Sweep Circuit.

**Equipment required for Laboratories:**

1. Regulated Power Supply - 0 – 30 V
2. CRO - 0 – 20 M Hz.
3. Function Generators - 0 – 1 M Hz
4. Components
5. Multi Meters



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**TRANSDUCERS LAB**

1. L.V.D.T & STRAIN GAUGE Designing of Oscillator & proportional amplifier
2. Resistance Thermometry (R. T. D)
3. Thermister & Thermocouple Designing of Bridge Circuit & Reference Junction Compensation Circuit
4. Photo Sensors: Photo Diode, Solar Cell, and Photo Transistor
5. pH Measurement
6. Pressure Measurement Designing of Instrumentation Amp With Different Gains
7. Level Measurement
8. P. I. D P.I, P.D, P. I. D Designing Of Integrator & Differentiator Using Components
9. Op-Amp As Adder Subtractor Designing of Adder & Subtractor Using Components
10. Speed Measurement
11. L. D. R & Piezo Electric Transducers
12. Inductive & Capacitive Pickup

**The transducers/ equipment required to do the above experiments**

1. L.V.D.T
2. STRAIN GAUGE (cantilever strain gauge)
3. Resistance Thermometry (R. T. D)
4. Thermister
5. Thermocouple
6. Photo Sensors: Photo Diode, Solar Cell, and Photo Transistor, L. D. R
7. pH Meter
8. Sealed pressure transducer for Pressure Measurement
9. Micro controller based Level Measurement system
10. P. I. D setup
11. Electric pickup and magnetic pickup for Speed Measurement
12. Piezo Electric Transducer
13. Inductive & Capacitive Pickup
14. Signal generators
15. C.R.O
16. Digital storage C.R.O
17. Multimeter

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**BASIC SIMULATION LAB**

**List of Experiments:**

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of unit sample, unit step and sinusoidal responses of the given LTI system and verifying its physical realizability and stability properties.
9. Gibbs Phenomenon
10. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
11. Waveform Synthesis using Laplace Transform.
12. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.
13. Generation of Gaussian noise ( Real and Complex), Computation of its mean, M.S. Value and its Skew, Kurtosis, and PSD, Probability Distribution Function.
14. Sampling Theorem Verification.
15. Removal of noise by Autocorrelation / Cross correlation.
16. Extraction of Periodic Signal masked by noise using Correlation.
17. Verification of Weiner-Khinchine Relations.
18. Checking a Random Process for Stationarity in Wide sense.

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**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**

**Unit I Introduction to Managerial Economics:**

Definition, Nature and Scope of Managerial Economics–Demand Analysis: Demand Determinants, Law of Demand and its exceptions.

**Unit II Elasticity of Demand:** Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Factors governing demand forecasting, methods of demand forecasting (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

**Unit III Theory of Production and Cost Analysis:** Production Function – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Cobb-Douglas Production function, Laws of Returns, Internal and External Economies of Scale.

**Cost Analysis:** Cost concepts, Opportunity cost, Fixed vs. Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems)- Managerial Significance and limitations of BEA.

**Unit IV Introduction to Markets & Pricing Policies:**

**Market structures:** Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly.

**Objectives and Policies of Pricing- Methods of Pricing:** Cost Plus Pricing, Marginal Cost Pricing, Sealed Bid Pricing, Going Rate Pricing, Limit Pricing, Market Skimming Pricing, Penetration Pricing, Two-Part Pricing, Block Pricing, Bundling Pricing, Peak Load Pricing, Cross Subsidization.

**Unit V Business & New Economic Environment:** Characteristic features of Business, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, Changing Business Environment in Post-liberalization scenario.

**Unit VI Capital and Capital Budgeting:** Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance.

Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

**Unit VII Introduction to Financial Accounting:** Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).

**Unit VIII Financial Analysis through ratios:** Computation, Analysis and Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio), Capital structure Ratios (Debt- Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Profit Ratio, P/E Ratio and EPS).

**TEXT BOOKS:**

1. Aryasri: Managerial Economics and Financial Analysis, TMH, 2009.
2. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.

**REFERENCES:**

1. Raghunatha Reddy & Narasimhachary: Managerial Economics & Financial Analysis, Scitech, 2009.
2. V.Rajasekarn & R.Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Suma Damodaran, Managerial Economics, Oxford University Press, 2009.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
5. Subhash Sharma & M P Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2008.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2008.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2009.
8. Dwivedi: Managerial Economics, Vikas, 2009.
9. M.Kasi Reddy, S.Saraswathi: Managerial Economics and Financial Accounting, PHI, 2007.
10. Erich A. Helfert: Techniques of Financial Analysis, Jaico, 2007.

**Prerequisites:** Nil

**Objective:** To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making.

**Codes/Tables:** Present Value Tables need to be permitted into the examinations Hall.

**Question Paper Pattern:** 5 Questions to be answered out of 8 questions .Out of eight questions 4 questions will be theory questions and 4 questions should be problems.  
Each question should not have more than 3 bits.

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**PRINCIPLES OF COMMUNICATIONS**

**UNIT I**

Introduction : Block diagram of Electrical communication system, Radio communication : Types of communications, Analog, pulse and digital  
Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, correlation, convolution.

**UNIT II**

Amplitude Modulation : Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation of AM, DSB SC, SSB SC, Demodulation of AM : Diode detector, Product demodulation for DSB SC & SSB SC.

**UNIT III**

Angle Modulation : Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

**UNIT IV**

Pulse Modulations : Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM, Time Division Multiplexing, Frequency Division Multiplexing, Asynchronous Multiplexing.

**UNIT V**

Digital Communication : Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

**UNIT VI**

Digital Modulation : ASK, FSK, PSK, DPSK, QPSK demodulation, coherent and incoherent reception, Modems.

**UNIT VII**

Information Theory : Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

**UNIT VIII**

Error control coding : Introduction, Error detection and correction codes, block codes, convolution codes.

**TEXT BOOKS:**

1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 20<sup>th</sup> reprint, 2004.
2. Principles of Communications – H. Taub and D. Schilling, TMH, 2003.

**REFERENCES:**

1. Electronic Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.
2. Communication Systems Engineering – John. G. Proakis and Masoud Salehi, PHI, 2nd Ed. 2004.

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**DIGITAL SIGNAL PROCESSING**

**Unit I**

**Introduction:** Introduction to Digital Signal Processing: Discrete time signals & sequences, linear shift invariant systems, stability, and causality, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems

**Unit II**

**Discrete Fourier Series:** DFS representation of Periodic Sequences, Properties of Discrete Fourier Series, , Discrete Fourier Transforms: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT : Over-lap Add method, Over-lap Save method, Relation between DTFT, DFS, DFT and Z-Transform.

**Unit III**

**Fast Fourier Transforms:** Fast Fourier transforms (FFT) - Radix-2 decimation-in-time and decimation-in-frequency FFT Algorithms, Inverse FFT, and FFT with general Radix-N

**Unit IV**

**Realization of Digital Filters:** Applications of Z – transforms, solution of difference equations of digital filters, System function, Stability criterion, Frequency response of stable systems, Realization of digital filters – Direct, Canonic, Cascade and Parallel forms

**Unit V**

**IIR Digital Filters:** Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital filters from analog filters, Step and Impulse invariant techniques, Bilinear transformation method, Spectral transformations.

**Unit VI**

**FIR Digital Filters:** Characteristics of FIR Digital Filters, Frequency response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling technique, Comparison of IIR & FIR filters

**Unit VII**

**Multirate Digital Signal Processing:** Introduction, Down sampling, Decimation, Upsampling, interpolation, Sampling Rate Conversion, conversion of band pass signals, Concept of resampling, Applications of multi rate signal processing

**Unit VIII**

**Finite Word Length Effects :**Limit cycles, Overflow oscillations, Round-off noise in IIR digital filters, Computational output round off noise, Methods to prevent overflow, Trade off between round off and overflow noise, Measurement of coefficient quantization effects through pole-zero movement, Dead band effects.

**TEXT BOOKS:**

1. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
2. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
3. Fundamentals of Digital Signal Processing – Loney Ludeman, John Wiley, 2009

**REFERENCE BOOKS:**

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using Matlab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – S.Salivahanan, A.Vallavaraj and C.Gnanapriya, TMH, 2009
4. Discrete Systems and Digital Signal Processing with MATLAB – Taan S. ElAli, CRC press, 2009.
5. Digital Signal Processing - A Practical approach, Emmanuel C. *Ifeachor* and Barrie W. Jervis, 2<sup>nd</sup> Edition, Pearson Education, 2009

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**ANALOG AND DIGITAL IC APPLICATIONS**

**UNIT I**

**INTEGRATED CIRCUITS** : Classification, chip size and circuit complexity, basic information of Opamp, ideal and practical Op-amp, internal circuits, Op-amp characteristics, DC and AC characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential.

**UNIT II**

**OP-AMP APPLICATIONS** : Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators, introduction to voltage regulators, features of 723.

**UNIT III**

**ACTIVE FILTERS & OSCILLATORS** : Introduction, 1st order LPF, HPF filters. Band pass, Band reject and all pass filters. Oscillator types and principle of operation – RC, Wien and quadrature type, waveform generators – triangular, sawtooth, square wave and VCO.

**UNIT IV**

**TIMERS & PHASE LOCKED LOOPS** : Introduction to 555 timer, functional diagram, monostable and astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565.

**UNIT V**

**D-A AND A- D CONVERTERS** : Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, and IC 1408 DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC. DAC and ADC specifications.

**UNIT VI**

Classification of Integrated circuits, comparison of various logic families, standard TTL NAND Gate-Analysis& characteristics, TTL open collector O/Ps, Tristate TTL, MOS & CMOS open drain and tristate outputs, CMOS transmission gate, IC interfacing- TTL driving CMOS & CMOS driving TTL .

**UNIT VII**

Design using TTL-74XX & CMOS 40XX series, code converters, decoders, Demultiplexers, decoders & drives for LED & LCD display. Encoder, priority Encoder, multiplexers & their applications, priority generators/checker circuits. Digital arithmetic circuits-parallel binary adder/subtractor circuits using 2's, Complement system. Digital comparator circuits.

**UNIT VIII**

**SEQUENTIAL CIRCUITS** : Flip-flops & their conversions. Design of synchronous counters. Decade counter, shift registers & applications, familiarities with commonly available 74XX & CMOS 40XX series of IC counters.

**Memories** : ROM architecture, types & applications, RAM architecture, Static & Dynamic RAMs, synchronous DRAMs.

**TEXT BOOKS :**

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 1987.

**REFERENCES :**

1. Operational Amplifiers & Linear Integrated Circuits – R.F. Coughlin & Fredrick F. Driscoll, PHI, 1977.
2. Operational Amplifiers & Linear Integrated Circuits: Theory & Applications –Denton J. Daibey, TMH.
3. Design with Operational Amplifiers&Analog Integrated Circuits-Sergio Franco,McGraw Hill,3rd Ed.,2002.
4. Digital Fundamentals – Floyd and Jain, Pearson Education,8th Edition, 2005.

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**BASIC CLINICAL SCIENCES -II**

**UNIT-I**

Orthopaedics: classification of joints, reduction replacements

**UNIT-II**

Pathology: general pathology, investigations. Blood bank: blood groups, blood transfusion, exchange transfusion.

**UNIT-III**

Measurement of Intra vascular pressure of Blood flow, Clinical Significance of Plethysmography. Humidity and Temperature measurements, Clinical significance. Mechanism of Respiration, Gas exchange. Artificial respiration, Diagnostic and Therapeutic indications.

**UNIT-IV**

Anaesthesia: general Anaesthesia, uptake of Anaesthetic gases and vapours, Preanaesthetic care and preparation. Postoperative care, Laws of gases. Recommendations and preventions. Patient monitoring during surgery. Monitoring of respiration and temperature. Invasive and non-invasive monitoring, recent trends. Organization of theatres, CSSD

**UNIT-V**

Radio therapy: Principles of radiation, cancer radio therapy. Perspective, Radio sensitivity, Radio resistance of tumours and Tissues. Classification of Tumours according to cell radio sensitivity. Cell survival theory: Oxygen effect. Cell repair, radio curability of tumours. Therapeutic ratio. normal Tissue tolerance dose.

**UNIT-VI**

Management on radiation: Radioactive protection. Somatic effects, LD 50. Effect of radiation on skin blood, blood forming organs and Reproductive organs. Embryo late effects of radiation, Radiation carcinogenesis, leukaemogenesis. Cataract, Genetic effects. Hazards and permissible exposures. Protective lines of defence. Physical measurements and medical tests.

**UNIT-VII**

Nuclear medicine: determination of distribution of radioactive material with in the body.  
Organ imaging procedures: central nervous system, cardio vascular system, respiratory system, thyroid, liver, spleen, pancreas, kidney.

**UNIT-VIII**

Therapeutic uses of Radio isotopes: Thyroid function studies, Tests for renal function, Body spaces, Haematological procedures, Blood flow. Gastro intestinal function. Radio immunoassay, Polycythemia, meta static bone diseases. Malignancy, plural effusion and ascites.

**TEXT BOOKS :**

1. John Crawford Adams, Outline of Orthopaedics. Churchill Livingstone, 2001.
2. Ronald. D. Miller., Miller's Anaesthesia: 2 volume set, 2004.
3. W.J. Meredith & J.B.Massey, Fundamental Physics of Radiology. Johns and Cunningham

**REFERENCE :**

1. Ramesh chandra The Physics of Radiology-An Introduction to Nuclear Medicine.
2. Lawrence A.Kaplan etal., Clinical Chemistry: Theory, Analysis, Correlation, 4<sup>th</sup> ed, 2002.

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**BIOFLUIDS AND MECHANICS**

**UNIT-I**

BIO-FLUID MECHANICS: Newton's laws, Stress, Strain, Elasticity, Hooke's-law, viscosity, Newtonian fluid, Non-Newtonian fluid, Viscoelastic fluids, vascular tree, Relationship between diameter, velocity and Pressure of blood flow, Resistance against flow.

**UNIT-II**

FLOW PROPERTIES OF BLOOD: Physical, chemical and Rheological properties of blood. Apparent and Relative viscosity. Blood viscosity variation: Effect of shear rate, Hematocrit, Temperature, Protein content of blood. Casson's Equation, Problems associated with extracorporeal blood flow.

**UNIT-III**

RHEOLOGY OF BLOOD IN MICROVESSELS: Fahraeus-Lindqvist effect and inverse effect, distribution of suspended particles in a narrow rigid tube. Nature of red cells in tightly fitting tubes, hematocrit in very narrow tube

**UNIT-IV**

BIOVISCOELASTIC FLUID: Viscoelasticity, Viscoelastic models Maxwell, Voigt and Kelvin Models and simulation in Matlab, Response to Harmonic variation, and Use of viscoelastic models.  
Bioviscoelastic fluids: Protoplasm, Mucus, Saliva, Synovial fluids.

**UNIT-V**

CARDIAC MECHANICS: Cardiovascular system. Mechanical properties of blood vessels: arteries, arterioles, capillaries and veins.  
Blood flow: Laminar and Turbulent, Physics of cardiovascular diseases, Prosthetic heart valves and replacements.

**UNIT-VI**

RESPIRATORY MECHANICS: Alveoli mechanics, Interaction of Blood and Lung, Mathematical model Lung Ventilation. P.V curve of Lung. Breathing mechanism, Airway resistance, Physics of Lung diseases.

**UNIT-VII**

SOFT TISSUE MECHANICS: Pseudo elasticity, Non-Linear stress-strain relationship, Structure, Function and mechanical properties of skin, ligaments and tendons.

**UNIT-VIII**

ORTHOPEDIC MECHANICS: Mechanical properties of Cartilage, Diffusion properties of Articular cartilage, Mechanical properties of Bone, Kinetics and Kinematics of joints, Lubrication of Joints.

**TEXT BOOKS:**

1. Y.C Fung, Biomechanics- Mechanical properties of living tissues, 2nd ed, Springer-Verlag, 1993.
2. D.O Cooney, Biomedical engineering Principles. Marcel Dekker, INC New York. 1976.

**REFERENCES:**

1. Silver Frederick H. Biomaterials, Medical Devices & Tissue Engineering: Chapman & Hall, London, 1994
2. Biomechanics by Nihat ozkaya and Margareta Nordin
3. D.A Mc Donald, Blood flow in arteries, Edward Arnold Ltd, 1998.



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## ADVANCED ENGLISH COMMUNICATION SKILLS LAB

### 1. Introduction

The introduction of the English Language Lab is considered essential at 3<sup>rd</sup> year level. At this stage the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be an integrated theory and lab course to enable students to use 'good' English and perform the following:

- Gather ideas and information, to organise ideas relevantly and coherently.
- Engage in debates.
- Participate in group discussions.
- Face interviews.
- Write project/research reports/technical reports.
- Make oral presentations.
- Write formal letters.
- Transfer information from non-verbal to verbal texts and vice versa.
- To take part in social and professional communication.

### 2. Objectives:

This Lab focuses on using computer-aided multimedia instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.

### 3. Syllabus:

The following course content is prescribed for the Advanced Communication Skills Lab:

- **Functional English** - starting a conversation – responding appropriately and relevantly – using the right body language – role play in different situations.
- **Vocabulary Building** – synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, analogy, idioms and phrases.
- **Reading Comprehension** – reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, Critical reading.
- **Writing Skills** – structure and presentation of different types of writing – *Resume writing / e-correspondence/Technical report writing/Portfolio writing* – planning for writing – *research abilities/data collection/organizing data/tools/analysis* – improving one's writing.
- **Group Discussion** – dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and coherence.
- **Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars and written presentations through posters/projects/reports/PPTs/e-mails/assignments etc.
- **Interview Skills** – concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele and video-conferencing.

### 4. Minimum Requirement:

**The English Language Lab shall have two parts:**

- The Computer aided Language Lab** for 60 students with 60 systems, one master console, LAN facility and English language software for self- study by learners.
- The Communication Skills Lab** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo –audio & video system and camcorder etc.

**System Requirement ( Hardware component):**

*Computer network with Lan with minimum 60 multimedia systems with the following specifications:*

- iii)** P – IV Processor
  - a. Speed – 2.8 GHZ
  - b. RAM – 512 MB Minimum
  - c. Hard Disk – 80 GB

- iv)** Headphones of High quality

### 5. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

#### Suggested Software:

- **Clarity Pronunciation Power** – part II
- **Oxford Advanced Learner’s Compass**, 7<sup>th</sup> Edition
- **DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE**( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from ‘train2success.com’**
  - **Preparing for being Interviewed,**
  - **Positive Thinking,**
  - **Interviewing Skills,**
  - **Telephone Skills,**
  - **Time Management**
  - **Team Building,**
  - **Decision making**
- **English in Mind**, Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge

#### 6. Books Recommended:

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D, Pearson Education 2011.
3. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
4. **English Vocabulary in Use** series, Cambridge University Press 2008.
5. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
6. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
7. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
8. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
9. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.
10. **English for Technical Communication for Engineering Students**, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
11. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron’s/DELTA/Cambridge University Press.
12. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

#### DISTRIBUTION AND WEIGHTAGE OF MARKS:

##### *Advanced Communication Skills Lab Practicals:*

1. The practical examinations for the English Language Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be a continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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**ANALOG AND DIGITAL IC APPLICATIONS LAB**

**Note: Minimum of 12 experiments have to be conducted (Six from each part):**

**List of Experiments:**

**Part-I**

**Linear IC Experiments**

1. OP AMP Applications – Adder, Subtractor, Comparator Circuits.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Oscillator Circuits – Phase Shift and Wien Bridge Oscillators.
5. IC 555 Timer – Monostable Operation Circuit.
6. Schmitt Trigger Circuits – using IC 741
7. IC 565 – PLL Applications.
8. Voltage Regulator using IC 723, Three Terminal Voltage Regulators – 7805, 7809, 7912.

**Part-II**

**Digital IC Applications**

1. D, J K Flip Flops 7474, 7483.
2. Decade counter 7490.
3. UP/DOWN counter 74163
4. Universal shift registers 74194/195.
5. 3-8 decoder -74138
6. 4-bit comparator 7485.
7. 8\*1 Multiplexer-74151 and 2\*4 Demultiplexer-74155.
8. RAM (16\*4)- 74189 (Read and Write operations).

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## HOSPITAL SYSTEM MANAGEMENT (OPEN ELECTIVE)

### UNIT-I

Classification of Hospital Systems: General, Specialist, Teaching and Research Hospitals, Primary Health Centre Their role, Functions. Role of Biomedical Engineers

### UNIT-II

Aspects of Hospital Services: Outpatient, Inpatient, supportive, emergency, drug and medical supply. Nursing Services, Dietary services, Transport services.

### UNIT-III

Hospital Planning: Location, Orientation, budgeting, communication both with in and outside the hospital. Electric power supply for various Theatres and Rooms, Diesel Generator, stand by power supply.

### UNIT-IV

Air conditioning of important theatres and equipment housings, water supply requirements and management, lifts, fire fighting and equipments. Sanitation with in the hospitals, laundry services.

### UNIT-V

Computer and Information Management in Hospitals: Registration, Administration, Discharge records of patient's. Patients billing, Maintenance of patients records, Maintenance of inventory of medicines and drugs.

### UNIT-VI

Electrical Factors in Hospital Design, voltage stabilizer, uninterrupted power supply for intensive care units and computerised monitoring units, safety precautions.

### UNIT-VII

Electrical factors associated with equipment: interference of systems, protection, grounding of ECG, EEG, EMG and other therapeutic equipments.

### UNIT-VIII

Biomedical equipment services, purchase, servicing and maintenance, Management of condemned equipment, Training of men on medical equipments, preventive and periodical maintenance procedures.

### TEXT BOOKS

1. S. I. Goel & Ram Kumar, Hospital Administration and Management, Deep and Deep Publications, New Delhi.2002.
2. Principles of Hospital Administration and Management by Ravi Bindra, Adroit publishers, 2004

### REFERENCE:

1. Source book of Modern Technology for Hospitals and Health care by Ashok Sahni, ISHA, BANGALORE, 1992.
2. I.Donald Snook, Opportunities in Hospital Administration Careers, McGraw-Hill, 1997.

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**INTELLECTUAL PROPERTY RIGHTS  
(OPEN ELECTIVE)**

**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks : Purpose and function of trade marks, acquisition of trade mark rights, protectable matter, selecting and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights : Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

**UNIT – IV**

Law of patents : Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – V**

Trade Secrets : Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

**UNIT – VI**

Unfair competition : Misappropriation right of publicity, False advertising.

**UNIT – VII**

New development of intellectual property: new developments in trade mark law ; copy right law, patent law, intellectual property audits.

**UNIT – VIII**

International overview on intellectual property, international – trade mark law, copy right law, international patent law, international development in trade secrets law.

**References & Text Books :**

1. Intellectual property right, Deborah. E. Bouchoux, cengage learning.
2. Intellectual property right – nleashmy the knowledge economy, prabuddha ganguli, Tate Mc Graw Hill Publishing company ltd.,

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**NANO TECHNOLOGY  
(OPEN ELECTIVE)**

**Unit-I:**

**Introduction to nanotechnology:**

Importance of nanoscale, Nanostructure types, electronic, magnetic, optical Properties of Nanomaterials, top-down and bottom- up approach to nanostructures.

**Unit-II:**

**Quantum Mechanical phenomenon in nanostructures:**

Quantum confinement of electrons in semiconductor Nano structures, one dimensional confinement (Quantum wires), two dimensional confinements (Quantum Wells), three dimensional confinements (Quantum dots).

**Unit-III**

**Carbon Nano Structures:**

Carbon nanotubes (CNTs), Fullerenes, C60, C80 and C240 Nanostructures, Properties (mechanical, optical and electrical) and applications.

**Unit-IV**

**Fabrication of Nanomaterials:**

Physical Methods: Inert gas condensation, Arc discharge, RFplasma, Plasma arc technique, Ion sputtering, Laser ablation, Laser pyrolysis, Molecular beam epitaxy, Chemical vapour deposition method.

**Unit-V**

**Nano scale characterization techniques:**

Scanning probe techniques (AFM, MFM, STM, SEM, TEM), XRD

**Unit-VI**

**Nanodevices and Nanomedicine:**

Lab on chip for bioanalysis, Core/shell Nanoparticles in drug delivery systems (site specific and targeted drug delivery), cancer treatment, and bone tissue treatment.

**Unit-VII**

**Nano and molecular electronics:**

Resonant-Tunneling structures, single electron tunneling, Single Electron transistors, coulomb blockade, giant magneto resistance, tunneling magneto resistance.

**Unit-VIII**

**nanolithography and nanomanipulation:**

e-beam lithography and SEM based nanolithography and nanomanipulation, Ion beam lithography, oxidation and metallization. Mask and its application. Deep UV lithography, X-ray based lithography.

**TEXT BOOKS:**

1. Charles.p.pode, Introduction to nanotechnology, springer publications
2. Springer Handbook of Nanotechnology - Bharat Bhusan
3. Phani kumar, principles of nanotechnology, scitech publications

**REFERENCES BOOKS:**

1. David Ferry "Transport in Nano structures" Cambridge University press 2000
2. Nanobiotechnology; ed. C.M.Niemeyer, C.A. Mirkin.
3. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
4. Encyclopedia of Nanotechnology- Hari Singh Nalwa
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. S. Dutta "Electron Transport in Mesoscopic systems" Cambridge University press
7. H. Grabert and M. Devoret "Single charge Tunneling" Plenum press 1992

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**BIOLOGICAL CONTROL SYSTEMS**

**UNIT-I**

Dynamic Systems and their Control. Modelling and Block Diagrams. Open and Closed loop Systems.

**UNIT-II**

Principles and General Engineering Techniques of Feedback Control. Basic Closed Loop Relation. Closed Loop Dynamics of First Order and Second Order.

**UNIT-III**

System Stability and Compensation. Frequency Response and Techniques. Root Locus Method. Introduction to Non-linear Control.

**UNIT-IV**

Examples of Biological Control Systems. Pupil Control System. Visual Fixation System. Oculo-motor System.

**UNIT-V**

Skeletal Muscle Servomechanism. The Semicircular Canal. Free Swinging Limbs. Thermo Regulation.

**UNIT-VI**

Respiration Models and Controls. Cardiovascular Control Systems.

**UNIT-VII**

Sugar Level Control Mechanism. Endocrine Control System. Excretion Control.

**UNIT-VIII**

Human Operator Tracking Characteristics. Biological Receptors-Receptor Characteristics. Transfer Function Models of Receptors.

**TEXT BOOKS**

1. Ogata Katsuhika, Modern Control Engineering, Second Edition, Prentice Hall of India, 1992.
2. Michel C Khoo, Physiological Control Systems -Analysis, simulation and estimation, Prentice Hall of India, 2001.

**REFERENCE:**

1. Milsum John H. , Biological Control Systems Analysis, McGraw-Hill, 1996

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**BIOMEDICAL SIGNAL PROCESSING**

**UNIT-I**

Discrete and continuous Random variables, Probability distribution and density functions. Gaussian and Rayleigh density functions, Correlation between random variables.

**UNIT-II**

Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth, Noise figure of systems.

**UNIT-III**

Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantization, DCT and the K L transform.

**UNIT-IV**

Cardiological Signal Processing: Pre-processing. QRS Detection Methods. Rhythm analysis. Arrhythmia detection Algorithms. Automated ECG Analysis. ECG Pattern Recognition. Heart rate variability analysis.

**UNIT-V**

Adaptive Noise Canceling: Principles of Adaptive Noise Canceling. Adaptive Noise Canceling with the LMS adaptation Algorithm. Noise Canceling Method to Enhance ECG Monitoring. Fetal ECG Monitoring.

**UNIT-VI**

Signal Averaging, polishing—mean and trend removal, linear prediction. Yule–walker(Y–W) equations. Their applications in ECG and EEG.

**UNIT-VII**

Neurological Signal Processing: Modeling of EEG Signals. Detection of spikes and spindles Detection of Alpha, Beta and Gamma Waves. Auto Regressive(A.R.) modeling of seizure EEG. Sleep Stage analysis. Inverse Filtering. Least squares and polynomial modeling.

**UNIT-VIII**

Original Prony's Method. Prony's Method based on the Least Squares Estimate. Analysis of Evoked Potentials and PCG.

**TEXT BOOKS**

1. Rangaraj M. Rangayyan – Biomedical Signal Analysis. IEEE Press, 2001.
2. D.C.Reddy, Biomedical Signal Processing- principles and techniques, Tata McGraw-Hill, 2005.
3. Biomedical Digital Signal Processing, Willis J.Tompkins, PHI,

**REFERENCE:**

1. Weitkumat R, Digital Bio signal Processing, Elsevier, 1991.
2. Akay M , Biomedical Signal Processing, Academic: Press 1994
3. Cohen.A, Biomedical Signal Processing -Vol. I Time & Frequency Analysis, CRC Press, 1986.



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**MEDICAL IMAGING TECHNIQUES**

**UNIT-I**

Fundamentals of X-ray: Electromagnetic Radiation, Interactions between X-rays and Matter, Intensity of an X-ray Beam, Attenuation. Generation and Detection of X-rays: X-ray Generation, Fillers, Beam Restrictors and Grids, Intensifying Screens, Fluorescent Screens, X-ray detectors.

**UNIT-II**

X-Ray Image Characteristics: Spatial Resolution, Image Noise, Image Contrast, Receiver Operating Curve (ROC), Image Subtraction, Digital Radiography. X-ray diagnostic methods, Biological effects of Ionising radiation.

**UNIT-III**

Conventional Tomography, Longitudinal Section Tomography, Computed Tomography, Reconstruction Techniques: Algebraic, Iterative reconstruction Techniques, Radon Transform and its applications. Back Projection, Filter Back Projection Algorithms.

**UNIT-IV**

Radio Nuclide Imaging: Fundamentals of Radioactivity, Radioactive materials, Generation and Detection of Nuclear Emission, Diagnostic Methods using Radiation Detectors.

Radio Nuclide Imaging Systems: SPECT, PET, Attenuation compensation. Characteristics of Radio nuclide Images, Internal Radiation, Dosimetry and Biological effects,

**UNIT-V**

Fundamentals of Acoustic Propagation: Reflection, Refraction, Attenuation, Absorption, Scattering, Non linearity Parameter and Doppler Effect. Image Characteristics: Ultrasonic Texture, Speckle reduction, Compensation of Phase Aberration, Tissue Characterization. Transducer Beam Characteristics, Axial and Lateral Resolution, Focusing arrays.

**UNIT-VI**

Ultrasonic Diagnostic Methods: Pulse-Echo Systems, Transmission Methods, Doppler Methods, Duplex Methods, Duplex Imaging. Biological effects due to Ultrasound.

**UNIT-VII**

Magnetic Resonance Imaging: Fundamentals of Nuclear Magnetic Resonance, Fourier Spectrum of the NMR Signal, Spin Density, Relaxation Times, Pulse Sequences.

Generation and Detection of NMR signal: Magnetic field Gradients, The NMR Coil/ Probe, The Transmitter, and The Receiver.

**UNIT-VIII**

Characteristics of Magnetic Resonance Imaging: Spatial Resolution, Image contrast.

Imaging Methods: Data Acquisition, Spin - Echo Imaging, Gradient Echo Imaging, Blood Flow Imaging, NMR Spectroscopy, Sensitivity and Resolution, Imaging Safety. Biological Effects of Magnetic Fields.

**TEXT BOOK**

1. K.Kirk Shung, Michael B. Smith, Benjamin Tsui. Principles of Medical Imaging.,Pub : Academic Press, 1992
2. Rangaraj M. Rangayyan, Biomedical Image Analysis", CRC Press, Boca Raton,FL, 2005.

**REFERENCE:**

1. Avinash C. Kak, Principles of Computerised Tomographic Imaging. IEEE PRESS

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**BIOMEDICAL EQUIPMENT**

**UNIT-I**

Bio Amplifiers and signal conditioning circuits.

RECORDERS & DISPLAY DEVICES: General features of Thermal, Ink Jet, Photo graphic, Dot Recorders. General features of Display Devices for Bio -Signals.

**UNIT-II**

Diagnostic Equipment:- E.C.G, T.M.T, E.E.G, E.M.G, P.F.T, Phono cardiography. (Working principle, Types of Electrodes used, Calibration, Basic Trouble Shooting). Ophthalmoscope, Retinoscope.

**UNIT-III**

Analytical equipment: pH Meter, Conductivity Meter, Electrophoresis, Chromatography, Flame Photo Meter, Spectro Photometer, Biochemistry Analysers, Electrolyte Analysers, Cell Counter, Blood Gas Analyser. (Working principle, Types of Electrodes. Calibration. Basic Trouble Shooting.)

**UNIT-IV**

MONITORING EQUIPMENT: Arrhythmia monitors, Holter monitor. Blood Pressure Monitors, Central monitoring stations in critical care units, Ambulatory monitors, fetal monitors. Incubator, Apnea monitors.

**UNIT-V**

THERAPEUTIC EQUIPMENT:-

Infusion pumps, Suction Apparatus.

Pacemaker: Synchronous and Asynchronous, External and Internal, Demand and Fixed type Pacemaker, Programmable Pacemakers. Defibrillators: AC and DC Defibrillators, Synchronous and Asynchronous. Nerve stimulators, Bladder stimulators, Implantable Stimulators, Short wave Diathermy, Micro wave Diathermy, Ultra Sound Diathermy

**UNIT-VI**

Heamo dialyser, Qualitative requirements, General scheme of operation, Types of exchangers, Block diagram, Electronic control and monitoring systems. Heart Lung machine: Governing principle, Qualitative Requirements, Functional details of thin film membrane type blood oxygenators. Intra Aortic Balloon Pump principle and application.

**UNIT-VII**

SURGICAL EQUIPMENT: electro surgical generators - Unipolar, Bipolar. Hazards of electro surgical units and Safety measures. Anesthesia delivery systems, Different types of Ventilators, Humidifiers, Nebulisers, Surgical microscope & O.T table.

**UNIT-VIII**

Patient Electrical Safety, Types of Hazards, Natural protective Mechanism, Leakage current, Patient Isolation, Hazards in operation rooms. Grounding conditions in Hospital Environment.

**TEXT BOOKS**

1. Handbook of Bio Medical Instrumentation -R. S. Khandpur. 2003
2. Joseph .J. Carr, John M. Brown; Introduction to Biomedical Equipment Technology, Pearson-2001.
3. John Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2003.

**REFERENCE:**

1. Bronzino, Joseph; Handbook of Biomedical Engineering. 2nd edition, CRC Press, 2000.
2. Bio-Medical Instruments Theory & Design. Welkowitz, Walter & Others, 2<sup>nd</sup> Edition, Academic Press, 1991

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**BIOMEDICAL EQUIPMENT LAB**

**STUDY, OPERATION AND TROUBLE SHOOTING OF:**

1. ECG Recorder and Monitor
2. EEG, EMG Recorder
3. Pace Maker
4. DC Defibrillator
5. Short Wave Diathermy Unit
6. Ultrasound Diathermy Unit
7. Safety Evaluation Circuits
8. Audiometer
9. Hearing Aids
10. Pneumo tachograph and signal conditioners (PFT)
11. Ultra Sound Scanner
12. Electro surgical generators.

**Equipment required to do the above experiments**

1. ECG simulator, amplifier, Monitor
2. EEG simulator , amplifier
3. EMG simulator , amplifier.
4. Arrhythmia simulator,Pace Maker
5. Arrhythmia simulator,DC Defibrillator
6. Short Wave Diathermy
7. Ultrasound Diathermy
8. Safety analyzer
9. Audiometer
10. Hearing Aids
11. Pneumo tachograph and signal conditioners (PFT)
12. Ultra Sound Scanner
13. Electro surgical generators.
14. C.R.O
15. Digital storage C.R.O
16. Multimeter

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## BIOMEDICAL SIGNAL PROCESSING LAB

1. Computation of Convolution and Correlation Sequences.
2. Analog and Digital Signal Conditioning.
3. Signal Averaging Improvement in the SNR Using Coherent Averaging.
4. Signal Averaging Improvement in the SNR Using Incoherent Averaging.
5. Exponential Averaging.
6. Data Polishing: Mean and Trend Removal.
7. Design of IIR Filter.
8. Design of FIR Filter.
9. PSD Estimation.
10. Data Compression Techniques: AZTEC, TP.
11. Data Compression Technique: CORTES.
12. Data Compression Technique: K. L. Transform.
13. Data Compression Techniques: DCT, Wavelets.
14. Noise Cancellation Techniques.
15. QRS Detections and HRV Analysis.

Using Matlab and signal processing toolbox. (20 keys / 60 intake)

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**MEDICAL IMAGING TECHNIQUES LAB**

**Implementation of the below Algorithms.**

1. Algorithms for Low Pas filter, High Pass Filter, Median Filter
2. Prewitt Edge, Quick Edge Detector
3. Miller's Algorithm
4. Cooley -Turkey Algorithm
5. Numerical Implementation of the Two Dimensional F. F. T.
6. Reconstruction Algorithm for Parallel Projections.
7. Reconstruction Algorithm for Fan Beam Projections
8. Re-Sorting Algorithm
9. Back Projection Algorithm.
10. A.R.T. (Algebraic Reconstruction Techniques).
11. S. A. R. T.
12. S. I. R T (Simultaneous Iterative Reconstruction Technique)

**Additional requirements along with the computer facilities**

C compiler

Matlab with signal processing and image processing toolboxes. (20 keys / 60 intake)

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## IMAGE PROCESSING AND PATTERN RECOGNITION

### UNIT-I

Basic Concepts, Pattern Recognition Systems, Fundamental Problems in pattern recognition system design, Design concepts and Methodologies: Character recognition ,Speech recognition, Finger print Recognition, Pattern Recognition Model.

### UNIT – II:

Decision Functions: Linear Decision functions, Distance functions. Minimum distance and Maximum distance classification, clustering concepts, Cluster seeking algorithms, K- means Algorithms.

### UNIT – III:

Baye's classifier: Bayes classified decision function for Baye's classifier, Baye's Classifier for normal patterns. Trainable pattern classifiers – deterministic approach, perception, approach - reward – punishment concept.

### UNIT – IV:

Gradient approach, Gradient Descent algorithms, LMSE Algorithms, Multi category classification.

### UNIT – V:

Trainable pattern classifiers, statistical approach, stochastic approximation methods, Robbin Minro algorithms, increment correction algorithms, LMSE algorithms. Syntactic patter recognition, formulation – syntax directed recognition – picture descript.

### UNIT – VI:

Digital Image fundamentals: Representation, elements. Image transforms: Fast Fourier transform, DCT and DWT.

### UNIT – VII:

Image enhancement: Spatial domain, frequency domain methods, Histogram equalization, Modification techniques: Image Smoothing, image sharpening.

### UNIT – VIII:

Image encoding - Fidelity criteria, Encoding process, Mapping – Quantizer coder – Image Segmentation – Masks – Point detection – Line Detection – Edge Detection.

### TEXT BOOKS:

1. Digital Image Processing – by R.C. Gonzalez & R.E. Woods, Addison Wesley.
2. Pattern Recognition Principles – J.T.TOU.R.C. Gonzalez, Addison Wesley.

### REFERENCE:

1. Fundamentals of Digital Image Processing – by A.K. Jain, PHI Pearson Education

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**REHABILITATION ENGINEERING**

**UNIT-I**

Anthropometry: Methods for Static and dynamic Measurements, Measurement of characteristics and movement, Measurement of Muscular Strength and Capabilities. Measurement tools and processes in Rehabilitation engineering: fundamental principles, structure, function; performance and behaviour. Subjective and objective measurement methods.

**UNIT-II**

Ergonomic aspects in designating devices: Introduction to Models in Process Control, Design of Information Devices, Traditional Devices, V.D.U' s, Using colour, Design of Controls

**UNIT-III**

Engineering concepts in sensory rehabilitation Engineering. Sensory augmentation and substitution: Visual system, Visual augmentation, Tactual vision substitution, and Auditory vision substitution. Auditory system: Auditory augmentation, Audiometer, Hearing aids, cochlear implantation, visual auditory substitution, tactual auditory substitution, Tactual system: Tactual augmentation, Tactual substitution,

**UNIT-IV**

ARTIFICIAL LARYNX (pneumatic & electronic): Analyzing artificial electronic larynx, Augmentative Communication, Control and Computer Access. AAC: user interface; outputs, acceleration techniques, Intervention and other issues.

**UNIT-V**

Orthopedic Prosthetics and Orthotics in rehabilitation:

Engineering concepts in motor rehabilitation, applications. Computer Aided Engineering in Customized Component Design. Intelligent prosthetic knee. A Hierarchically controlled prosthetic Hand. A self-aligning orthotic knee joint. Externally powered and controlled Orthotics and Prosthetics. FES systems-Restoration of hand function, restoration of standing and walking.

**UNIT-VI**

Active Prostheses: Active above knee prostheses. Myoelectric Hand and Arm Prostheses: different types block diagram, signal flow diagram and functions. The MARCUS intelligent Hand prostheses

**UNIT-VII**

Robotic Manipulation Aids: Modes of operation and control.

Environmental control systems: Environmental control and Access to computers.

**UNIT-VIII**

Computer applications in Rehabilitation engineering: Interfaces in compensation for visual perception. Improvement of orientation and mobility, Computer assisted lip reading, Brain computer interface.

**TEXTBOOKS:**

1. Bronzino, Joseph; Handbook of biomedical engineering. 2nd edition, CRC Press, 2000.
2. Robinson C.J Rehabilitation engineering. CRC press 1995

**REFERENCE:**

1. Horia- Nocholai Teodorecu, L.C.Jain , intelligent systems and technologies in rehabilitation engineering; CRC; December 2000.
2. Etienne Grandjean, Harold Oldroyd, Fitting the task to the man, Taylor & Francis, 1988.

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**COMPUTER NETWORKS**

**UNIT I**

Introduction to networks, internet, protocols and standards, the OSI model, layers in OSI model, TCP/IP suite, Addressing, Analog and digital signals.

**UNIT II**

Physical Layer: digital transmission, multiplexing, transmission media, circuit switched networks, Datagram networks, virtual circuit networks, switch and Telephone network.

**UNIT III**

Data link layer: Introduction, Block coding, cyclic codes, checksum, framing, flow and error control, Noiseless channels, noisy channels, HDLC, point to point protocols

**UNIT IV**

Medium Access sub layer: Random access, controlled access, channelization, IEEE standards, Ethernet, Fast Ethernet, Giga-Bit Ethernet, wireless LANs.

**UNIT V**

Connecting LANs, backbone networks and virtual LANs, Wireless WANs, SONET, frame relay and ATM.

**UNIT VI**

Network Layer: Logical addressing, internetworking, tunneling, address mapping, ICMP, IGMP, forwarding, uni-cast routing protocols, multicast routing protocols.

**UNIT VII**

Transport Layer: Process to process delivery, UDP and TCP protocols, SCTP, data traffic, congestion, congestion control, QoS, integrated services, differentiated services, QoS in switched networks.

**UNIT VIII**

Application Layer – Domain name space, DNS in internet, electronic mail, FTP, WWW, HTTP, SNMP, multi-media, network security

**TEXT BOOKS:**

- 1.Data Communications and Networking – Behrouz A. Forouzan, Fourth Edition TMH,2006.
- 2.Computer Networks -- Andrew S Tanenbaum, 4th Edition, Pearson Education.

**REFERENCE BOOKS:**

- 1.An Engineering Approach to Computer Networks-S.Keshav,2nd Edition,Pearson Education
- 2.Understanding communications and Networks,3rd Edition, W.A.Shay, Cengage Learning.
- 3.Computer and Communication Networks ,Nader F. Mir, Pearson Education
- 4.Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose,K.W.Ross,3<sup>rd</sup> Edition, Pearson Education.
- 5.Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group.
- 6.Data communications and computer Networks, P.C.Gupta,PHI.



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**MICROPROCESSORS AND MICROCONTROLLERS**

**UNIT-I**

**8086 Architecture:** Introduction to 8085 Microprocessor, 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical memory organization, Architecture of 8086, signal descriptions of 8086- common function signals, Minimum and Maximum mode signals, Timing diagrams, Interrupts of 8086.

**UNIT-II**

**Instruction Set and Assembly Language Programming of 8086:** Instruction formats, addressing modes, instruction set, assembler directives, macros, simple programs involving logical, branch and call instructions, sorting, evaluating arithmetic expressions, string manipulations.

**UNIT -III**

**I/O Interface:** 8255 PPI, various modes of operation and interfacing to 8086, interfacing keyboard, display, stepper motor interfacing, D/A and A/D converter.

**UNIT -IV**

**Interfacing with advanced devices:** Memory interfacing to 8086, Interrupt structure of 8086, Vector interrupt table, Interrupt service routine, Introduction to DOS and BIOS interrupts, Interfacing Interrupt Controller 8259 DMA Controller 8257 to 8086.

**UNIT -V**

**Communication Interface:** Serial communication standards, Serial data transfer schemes, 8251 USART architecture and interfacing, RS- 232, IEEE- 488, Prototyping and trouble shooting.

**UNIT -VI**

**Introduction to Microcontrollers:** Overview of 8051 microcontroller, Architecture, I/O Ports, Memory organization, addressing modes and instruction set of 8051, simple programs

**UNIT- VII**

**8051 Real Time Control:** Interrupts, timer/ Counter and serial communication, programming Timer Interrupts, programming external hardware interrupts, programming the serial communication interrupts, programming 8051 timers and counters

**UNIT -VIII**

**RISC architecture:** Introduction, Family architecture, Register File, The ALU, Memory access and Instruction execution, I/O memory. EEPROM, I/O ports, Timers, UART, Interrupt Structure

**TEXT BOOKS:**

1. D. V. Hall, Micro processors and Interfacing, TMGH, 2<sup>nd</sup> edition 2006.
2. Kenneth. J. Ayala, The 8051 microcontroller , 3<sup>rd</sup> edition, Cengage learning, 2010

**REFERENCES:**

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2<sup>nd</sup> edition 2006.
2. The 8051 Microcontrollers, Architecture and programming and Applications -K.Uma Rao, Andhe Pallavi, , Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - By Liu and GA Gibson, PHI, 2<sup>nd</sup> Ed.,
4. Microcontrollers and application, Ajay. V. Deshmukh, TMGH, 2005
5. The 8085 Microprocessor: Architecture, programming and Interfacing – K.Uday Kumar, B.S.Umashankar, 2008, Pearson

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**ARTIFICIAL INTELLIGENCE  
(ELECTIVE-I)**

**UNIT I**

Introduction: AI problems, foundations of AI, History of AI. Intelligent agents – Agents and Environments. The concept of rationality, the nature of environments, structure of agents.

**UNIT II**

Problem-solving: Solving problems by Searching – Problem solving agents, searching for solutions, uninformed search strategies – Breadth first search, depth first search, Depth limited search, Iterative deepening depth first search, Bidirectional search. Informed (Heuristic) search strategies – Greedy best-first search, A\* search, Heuristic functions, Local search Algorithms – Hill climbing, simulated, annealing search, local beam search, genetic algorithms.

**UNIT III**

CSP and Adversarial search: Constraint satisfaction problems, Backtracking search for CSPs – Variable and value ordering, Propagating information through constraints, intelligent backtracking: looking backward, local search for constraint satisfaction problems. Games, Optimal decisions in games – Optimal strategies, minimax algorithm, optimal decisions in multiplayer games, Alpha-Beta pruning, Imperfect Real-time decisions – Evaluation functions, cutting off search.

**UNIT IV**

Knowledge representation and reasoning: Logical Agents, Knowledge-Based Agents, Logic, Propositional logic – Syntax, Semantics, a simple knowledge base, Inference, Equivalence, validity and satisfiability, Resolution patterns in Propositional logic – Resolution, Forward and Backward chaining. First order logic – Representation, Syntax and semantics, models for first-order logic, symbols and interpretations, terms, atomic sentences, complex sentences, quantifiers, equality. Inference in first-order logic: Propositional vs. first-order inference – Inference rules for quantifiers, reduction to propositional inference, unification and lifting – A first-order inference rule, Unification, forward chaining – first-order definite clauses, a simple forward-chaining algorithm, Backward chaining – a backward chaining algorithm, Resolution – conjunctive normal form for first-order logic, the resolution inference rule, example proofs.

**UNIT V**

Planning: Classical planning problem – Language of planning problems, Expressiveness and extension, planning with state-space search – Forward state-space search, Backward state-space search, Heuristics for state-space search. Partial-order planning – an example, Planning Graphs – The graphplan algorithm.

**UNIT VI**

Learning: Forms of learning – Induction learning, Learning Decision Trees – decision trees as performance elements, expressive of decision trees, inducing decision trees from examples, choosing attribute tests, assessing the performance of the learning algorithm. Neural Networks – Units in neural networks, network structures, single layer feed-forward neural networks (perceptrons), Multilayer feed-forward neural networks, learning neural network structures.

**UNIT VII**

Communication: Communication as Action, Fundamentals of language, The component steps of Communication, A Formal Grammar for a Fragment of English – the Lexicon of  $\epsilon_0$ , the Grammar of  $\epsilon_0$ . Syntactic Analysis(Parsing) – Efficient Parsing. Augmented Grammars – Verb subcategorization, Generative capacity of augmented grammars. Semantic Interpretation – The semantics of an English fragment, Time and tense, Quantification, Pragmatic Interpretation.

**UNIT VIII**

Perception: Introduction, Image Formation – Images without lenses: the pinhole camera, Lens systems, Light: the photometry of image formation, Color: the spectrophotometry of image formation, Early Image Processing Operations – Edge detection, Image segmentation. Extracting Three-Dimensional Information – Motion, Binocular stereopsis, Texture gradients, Shading, Contour. Object Recognition – Brightness-based recognition, Feature-based recognition, Pose Estimation.

**TEXT BOOK:**

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach – 2ed”, Pearson Education.

**REFERENCE BOOKS:**

1. Elaine Rich and Kevin Knight, “Artificial Intelligence – 2ed”, TMH, 1991, rp2008.
2. Dan W. Patterson “Introduction to Artificial Intelligence and Expert Systems –PHI/Pearson Education, 1990, rp2007.
3. Michael Negnevitsky, “Artificial Intelligence – A guide to Intelligent Systems – 2ed”, Pearson Edition, 2002, rp2008.
4. Patrick Henry Winston, “Artificial Intelligence –3ed, Pearson Edition, 1992.
5. Patrick Henry Winston and Berthold Klaus Paul Horn, “LISP –3ed, Pearson Edition, 1989, rp2004.
6. Ivan Bratka, “PROLOG Programming for Artificial Intelligence –3ed”, Pearson Education.
7. Nils J. Nilsson, “Artificial Intelligence – A New Synthesis”, Elsevier, 1998, rp2003.
8. N.P. Padhy, “Artificial Intelligence and Intelligent Systems”, Oxford University Press, 2005.

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**ARTIFICIAL NEURAL NETWORKS  
(ELECTIVE-I)**

**UNIT I**

**Introduction** - what is a neural network? Human Brain, Models of a Neuron, Neural networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks

**UNIT II**

**Learning Process** – Error Correction learning, Memory based learning, Hebbian learning, Competitive, Boltzmann learning, Credit Assignment Problem, Memory, Adaption, Statistical nature of the learning process

**UNIT III**

**Single layer perceptrons** – Adaptive filtering problem, Unconstrained Organization Techniques, Linear least square filters, least mean square algorithm, learning curves, Learning rate annealing techniques, perceptron –convergence theorem, Relation between perceptron and Bayes classifier for a Gaussian Environment

**UNIT IV**

**Multilayer Perceptron** – Back propagation algorithm XOR problem, Heuristics, Output representation and decision rule, Computer experiment, feature detection

**UNIT V**

**Back Propagation** - back propagation and differentiation, Hessian matrix, Generalization, Cross validation, Network pruning Techniques, Virtues and limitations of back propagation learning, Accelerated convergence, supervised learning.

**UNIT VI**

**Self Organization Maps** – Two basic feature mapping models, Self organization map, SOM algorithm, properties of feature map, computer simulations, learning vector quantization, Adaptive pattern classification

**UNIT VII**

**Neuro Dynamics** – Dynamical systems, stability of equilibrium states, attractors, neurodynamical models, manipulation of attractors as a recurrent network paradigm

**UNIT VIII**

**Hopfield Models** – Hopfield models, computer experiment

**TEXT BOOK:**

1. Neural networks A comprehensive foundations, Simon Haykin, PHI edition.

**REFERENCES:**

1. Artificial neural networks - B.Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural networks in Computer intelligence, Li Min Fu TMH 2003
3. Neural networks James A Freeman David M S kapura pearson education 2004
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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**TELEMEDICINE  
(Elective-I)**

**Unit I:**

History of telemedicine, Block diagram of telemedicine system, Definition of telemedicine, Tele health, Tele care, organs of telemedicine, scope, Benefits, and limitations of telemedicine.

**Unit II:**

Type of information; Audio, Video, Still images, Text and data, fax, type of communications and network, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications: GSM satellite, and Micro wave. Different Modulation techniques. Types of antennas depending on requirements, Integration and operational issues: - system integration, store –and - forward operation, Real-time Telemedicine.

**Unit –III:**

Data Exchange: Network Configuration, circuit and packet switching, H. 320 series ( Video phone based ISDN) T. 120, H.324 (Video phone based PSTN). Video Conferencing.

**Unit –VI:**

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7.

**Unit – V:**

Ethical and legal aspects of Telemedicine: Confidentiality, and the law, patient rights and consent, access to medical Records, Consent treatment, jurisdictional Issues, Intellectual property rights.

**Unit – VI:**

Tele radiology: Definition, Basic parts of Tele-radiology system: Image Acquisition system Display system, Communication network, Interpretation section. Tele pathology: multimedia databases, color images of sufficient resolution: Dynamic range, spatial resolution, compression methods, Interactive control of color, Controlled sampling security and confidentiality tools.

**Unit – VII**

And Tele-Cardiology Tele-Oncology, Tele-Surgery.

**Unit – VIII**

Applications of Tele-Surgery

**TEXTBOOKS:**

1. Olga (EDT) Ferrer – Roca, M.Sosa (EDT) Iudicissa Hand book of Telemedicine IOS press 2002
2. A.C. Norris, Essentials of Telemedicine and Telecare John Sons & Ltd, 2002

**REFERENCES**

- 1 .Biomedical Telemetry by Mackay,Stuart R, John Wiley.

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**EMBEDDED AND REAL TIME SYSTEMS  
(ELECTIVE – II)**

**UNIT I : INTRODUCTION**

Embedded systems overview, design challenge, processor technology, IC technology, Design Technology, Trade-offs. Single purpose processors RT-level combinational logic, sequential logic (RT-level), custom single purpose processor design (RT-level), optimizing custom single purpose processors.

**UNIT II: GENERAL PURPOSE PROCESSORS**

Basic architecture, operation, Pipelining, Programmer's view, development environment, Application Specific Instruction-Set Processors (ASIPs) – Micro Controllers and Digital Signal Processors.

**UNIT III : STATE MACHINE AND CONCURRENT PROCESS MODELS**

Introduction, models Vs. languages, finite state machines with data path model (FSMD), using state machines, program state machine model (PSM), concurrent process model, concurrent processes, communication among processes, synchronization among processes, implementation, data flow model, real-time systems.

**UNIT IV: COMMUNICATION INTERFACE**

Need for communication interfaces, RS232 / UART, RS422 / RS485, USB, Infrared, IEEE 1394 Firewire, Ethernet, IEEE 802.11, Blue tooth.

**UNIT - V**

**Introduction to Real – Time Operating Systems :** Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.  
**(Chapter 6 and 7 from Text Book 3, Simon).**

**UNIT - VI**

**Basic Design Using a Real-Time Operating System :** Principles, Semaphores and Queues, HardReal-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools, An Example System. (Chapter 8,9,10 & 11 from Text Book 3, Simon).

**UNIT - VII**

**Introduction to advanced architectures :** ARM and SHARC, Processor and memory organization and Instruction level parallelism; Networked embedded systems: Bus protocols, I2C bus and CAN bus; Internet-Enabled Systems, Design Example-Elevator Controller.  
**(Chapter 8 from Text Book 1, Wolf).**

**UNIT VIII: DESIGN TECHNOLOGY**

Introduction, Automation, Synthesis, Parallel evolution of compilation and synthesis, Logic Synthesis, RT synthesis, Behavioral Synthesis, Systems Synthesis and Hardware/ Software Co-Design, Verification, Hardware/Software co-simulation, Reuse of intellectual property codes.

**TEXT BOOKS:**

1. Embedded System Design – A Unified Hardware/Software Introduction – Frank Vahid, Tony D. Givargis, John Wiley, 2002.
2. An Embedded Software Primer – David E. Simon, Pearson Ed., 2005.
3. Computers and Components, Wayne Wolf, Elsevier.,

**REFERENCES :**

1. Embedded Microcomputer Systems – Jonathan W. Valvano, Brooks / Cole, Thompson Learning.
2. Embedded / Real Time Systems – KVKK Prasad, Dreamtech Press, 2005.
3. Introduction to Embedded Systems – Raj Kamal, TMS, 2002.

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**VLSI DESIGN  
(ELECTIVE-II)**

**Unit I**

**Introduction:** Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS Technologies; Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors, CMOS Nanotechnology

**Unit II**

**Basic Electrical Properties:** Basic Electrical Properties of MOS and BiCMOS Circuits:  $I_{ds}$ - $V_{ds}$  relationships, MOS transistor threshold Voltage,  $g_m$ ,  $g_{ds}$ , Figure of merit  $\omega_0$ ; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

**Unit III**

**VLSI Circuit Design Processes:** VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, 2  $\mu$ m CMOS Design rules for wires, Contacts and Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

**Unit IV**

**Gate Level Design:** Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out, Choice of layers.

**Unit V:**

**Data Path Subsystems:** Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

**Unit VI:**

**Array Subsystems:** SRAM, DRAM, ROM, Serial Access Memories, Content Addressable Memory.

**Unit VII:**

**Semiconductor Integrated Circuit Design:** PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

**Unit VIII**

**CMOS Testing:** CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques, System-level Test Techniques, Layout Design for improved Testability.

**TEXT BOOKS:**

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005 Edition
2. VLSI Desing- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
3. CMOS VLSI Design – A circuits and systems perspective, Neil H. E Weste, David Harris, Ayan Banerjee, pearson, 2009.

**REFERENCES:**

1. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
2. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
3. VLSI Design – A.Albert Raj, Latha, PHI, 2008
4. Introduction to VLSI – Mead & Convey, BS Publications, 2010
5. VLSI Design – M. Micheal Vai, CRC Press, 2009.

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**DSP PROCESSORS AND ARCHITECTURES  
(ELECTIVE – II)**

**UNIT I**

**INTRODUCTION TO DIGITAL SIGNAL PROCESSING** : Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Linear time-invariant systems, Digital filters, Decimation and interpolation.

**UNIT II**

**COMPUTATIONAL ACCURACY IN DSP IMPLEMENTATIONS** : Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of error in DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

**UNIT III**

**ARCHITECTURES FOR PROGRAMMABLE DSP DEVICES** : Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

**UNIT IV**

**EXECUTION CONTROL AND PIPELINING** : Hardware looping, Interrupts, Stacks, Relative Branch support, Pipelining and Performance, Pipeline Depth, Interlocking, Branching effects, Interrupt effects.

**UNIT V**

**PROGRAMMABLE DIGITAL SIGNAL PROCESSORS** : Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

**UNIT VI**

**IMPLEMENTATIONS OF BASIC DSP ALGORITHMS** : The Q-notation, FIR Filters, IIR Filters, Interpolation Filters, Decimation Filters, 2D Signal processing.

**UNIT VII**

**IMPLEMENTATION OF FFT ALGORITHMS** : An FFT Algorithm for DFT Computation, A Butterfly Computation, Overflow and scaling, Bit-Reversed index generation, An 8-Point FFT implementation on the TMS320C54XX, Computation of the signal spectrum.

**UNIT VIII**

**INTERFACING MEMORY AND I/O PERIPHERALS TO PROGRAMMABLE DSP DEVICES :**

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA). A Multichannel buffered serial port (McBSP), McBSP Programming, a CODEC interface circuit, CODEC programming, A CODEC-DSP interface example.

**TEXT BOOKS :**

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. S. Chand & Co, 2000.

**REFERENCES :**

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkata Ramani and M. Bhaskar, TMH, 2004.
2. Digital Signal Processing – Jonatham Stein, John Wiley, 2005

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**MICROPROCESSORS AND MICROCONTROLLERS LAB**

**List of Experiments:**

**The Following programs/experiments are to be written for assembler and execute the same with 8086 and 8051 kits.**

1. Programs for 16 bit arithmetic operations for 8086 (using Various Addressing Modes).
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Program for digital clock design using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessors using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Program and verify Timer/ Counter in 8051.
11. Program and verify Interrupt handling in 8051
12. UART Operation in 8051.
13. Communication between 8051 kit and PC.
14. Interfacing LCD to 8051.
15. Interfacing Matrix/ Keyboard to 8051.
16. Data Transfer from Peripheral to Memory through DMA controller 8237 / 8257.
17. Touch screen interface to ARM Processor.
18. Temperature control soldering session- ARM Processor based

**Note:**

- Minimum of 12 experiments to be conducted.
- Atleast 2 experiments from microcontrollers are compulsory.



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**IMAGE PROCESSING LAB**

1. Image data Compression
2. Maximum distance algorithm.
3. K- mean algorithm.
4. Gradient descent algorithm.
5. LMSE algorithm.
6. Image Enhancement –Histogram.
7. Image Smoothing.
8. Image Sharpening.
9. Masks.
10. Point Detection.
11. Line Detection.
12. Edge Detection.

**Additional requirements along with the computer facilities**

Using Matlab with signal processing and image processing toolboxes. (20 keys / 60 intake)

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## BIOMATERIALS (ELECTIVE – III)

### UNIT I

Properties of Materials. Classes of materials used in medicine: Metals, Polymers, Hydrogels Bioresorbable and Biodegradable Materials, Ceramics, Natural materials composites thin films, grafts, Coatings medical fibers and Biological functional materials, Smart materials, Pyrolytic Carbon for long-term medical Implants textured and Porous materials non-fouling surfaces

### UNIT-II

Host reactions to : Inflammation, Wound healing and the Foreign body response.

Systemic toxicity and Hypersensitivity. Blood coagulation and Blood-materials Interactions. Tumorigenesis.

### UNIT-III

Testing biomaterials: In Vitro assessment of tissue compatibility In vivo assessment of tissue compatibility. Testing of blood-materials interactions.

Degradation of materials in the biological environment: Effects of the Biological environment on metals, polymers and ceramics.

### UNIT-IV

Applications of materials in medicine, Dentistry and Biology: Cardiovascular medical devices. Nonthrombogenic treatments and Strategies. Dental implantation adhesive and Sealants. Ophthalmologic applications-intraocular lens implants.

### UNIT-V

Orthopedic biomaterials, Materials for fixation screws, plates, intramedullar nails. Performance of drug delivery systems, Sutures. Burn dressings and Skin substitutes.

### UNIT-VI

Artificial organs and tissues: Implantable cardiac assist devices. Materials for extracorporeal devices. Cochlear implants. Artificial red blood cell substitutes.

### UNIT-VII

Sterilization of implants and Devices implants and Device failure. Surface properties with Biological responses. Implant retrieval and Evaluation.

### UNIT-VIII

Standards development and regulation of medical products using biomaterials. Nano bio materials.

### TEXT BOOKS:

1. Biomaterials Science: An Introduction to Materials in Medicine Buddy D. Ratner, Frederick J. Schoen, Allan S. Hoffman, Jack E. Lemons
2. Hench L L Ethridg E.C. Biomaterials, an interfacial approach, Academic press 1982

### REFERENCE:

1. Bronzino J D, The Handbook Biomedical Engineering, CRC Press.

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**TRANSPORTATION PHENOMENA IN LIVING SYSTEMS  
(ELECTIVE – III)**

**UNIT-I**

Heat Transport: Body temperature regulation modes of heat transfer, processes of Heat loss and heat gain from the human body.

**UNIT-II**

Heat transportation in Tissues, Muscles, Skin and other Organs in different environmental temperatures.

**UNIT-III**

Models of heat transfer in the body.

**UNIT-IV**

Fundamentals and applications of mass transport. Introduction to Mass Transport. Diffusion with Convection or Electrical Potentials. Transport in Porous Media. Transvascular Transport. Solvent and Solute Transport across the Kidney Glomerulus.

**UNIT-V**

Processes of mass transfer Diffusion, Osmosis, Electro Osmosis. Ultra filtration. Reverse Osmosis through natural Membrane systems, Reverse Osmosis through artificial synthetic Membranes.

**UNIT-VI**

Mass Transport and Biochemical Interactions, Oxygen Transport from the Lungs to the Tissues.

**UNIT-VII**

Mass transfer: Mass transfer in Kidney, Skeletal, Nervous, G. I. system, Cardio Pulmonary system.

**UNIT-VIII**

Mass transfer in Dialysers and Oxygenators.

**TEXT BOOK**

1. Fournier, Ronald L., Basic transport phenomena in biomedical engineering. Taylor & Francis. 1998

**REFERENCE:**

1. David.O. Cooney, Biomedical engg. Principles: An introduction to fluid, Heat & Mass transport process Vol & 2 ; Marcel Dekker inc.,
2. Medical physiology by Ganong
3. Physiology by Best and Taylor

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**PHYSIOLOGICAL SYSTEMS MODELING  
(ELECTIVE-III)**

**UNIT-I**

The problem of system modeling in Physiology. Types of Nonlinear models of physiological systems. Deductive and Inductive modeling.

**UNIT-II**

Nonparametric modeling: Volterra models. Wiener models. Efficient volterra kernel estimation Analysis of estimation errors.

**UNIT-III**

Parametric modeling: Basic parametric model forms and Estimation procedures. Volterra kernels of nonlinear differential equations. Discrete-time volterra kernels of NARMAX models. From Volterra kernel measurements to Parametric models. Equivalence between continuous and Discrete -parametric models.

**UNIT-IV**

Preliminary tests and Data preparation. Model specification and Estimation. Model validation and Interpretation. Outline of step-by-step procedure.

**UNIT-V**

Applications: Neurosensory systems: Cardiovascular system, Renal system, Metabolic-Endocrine system.

**UNIT-VI**

Modeling of multiinput/multioutput systems: The Two-input case. Application s of Two-input modeling to physiological systems. The Multiinput case spatiotemporal and spectrotemporal modeling.

**UNIT-VII**

Modeling of neuronal systems: A General model of membrane and Synaptic dynamics, Functional integration in the Single neuron, Neuronal systems with Pointprocess inputs Modeling of neuronal ensembles.

**UNIT-VIII**

Modeling of Closed-loop systems: Autoregressive form of Closed-loop model, Network model form of Closed-loop systems.

**TEXT BOOK**

1. Vasilis Z. Marmarelis, Nonlinear dynamic modeling of physiological systems, Wiley-IEEE Press, 2004.

**REFERENCE:**

1. David T. Westwick, Robert E. Kearney, Identification of Nonlinear Physiological Systems, Wiley-IEEE Press, 2003.
2. Michel C Khoo, Physiological Control Systems -Analysis, simulation and estimation, Prentice Hall of India, 2001.

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**ROBOTICS AND AUTOMATION  
(ELECTIVE-IV)**

**UNIT – I**

**BASIC CONCEPTS: Introduction:** Automation and Robotics – An over view of Robotics – classification by coordinate system and control systems - Dynamic stabilization of Robotics.

**UNIT – II**

**POWER SOURCES AND SENSORS:** Hydraulic, Pneumatic and electric drivers – Determination HP of motor and gearing ratio, variable speed arrangements, Path Determination - Machinery Vision – Ranging – Laser – Acoustic, Magnetic Fiber Optic and Tactile Sensor

**UNIT – III**

**MANIPULATORS:** Construction of Manipulators, Manipulator Dynamic and Force Control, Electronic and Pneumatic manipulators.

**UNIT – IV**

**ACTUATORS AND GRIPPERS:** Pneumatic, Hydraulic Actuators, Stepper Motor Control Circuits, End Effector, Various types of Grippers, Design consideration.

**UNIT – V**

Homogeneous transformation – DH notations and transformation – Forward and inverse kinematics of serial manipulators - Differential transformation and manipulators, Jacobians – problems. Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

**UNIT VI**

**Image Processing and Analysis with Vision Systems:** Introduction – Image processing versus Image Analysis – Two and Three Dimensional image types- Acquisition of images – Digital images – Frequency content of an image – Fourier Transform of a signal and its frequency content – Image Processing techniques – Gray morphology Operations – Depth measurement with vision systems – Image data comparison – Applications of vision systems.

**UNIT VII**

**PATH PLANNING:** Trajectory planning and avoidance of obstacles, path planning, Slew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages

**UNIT VIII**

**Fuzzy Logic Control:** Introduction – Fuzzy Control - Crisp values versus Fuzzy values – Fuzzy sets – Fuzzification – Fuzzy interface rule base – Defuzzification – Simulation of fuzzy Logic Controller – Applications of Fuzzy Logic in Robotics

**TEXT BOOKS:**

1. Robotics / Fu K S/ McGraw Hill.
2. Introduction to Robotics, Analysis, Systems, Applications by Saeed B.Niku – PHI

**REFERENCES:**

1. Robotics, CSP Rao and V.V. Reddy, Pearson Publications (In press)
2. Industrial Robotics / Groover M P / Pearson Edu.
3. Robotics and Control / Mittal R K & Nagrath I J / TMH.
4. An Introduction to Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
5. Robotic Engineering / Richard D. Klafter, Prentice Hall
5. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science
6. Introduction to Robotics / John J Craig / Pearson Edu.
7. Robot Dynamics and Control by Mark W. Spong and M. Vidyasagar, John Wiley & So

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**MEDICAL INFORMATICS  
(ELECTIVE-IV)**

**UNIT-I**

Introduction and Overview of hospital information system. Patient history taking mechanisms.

**UNIT-II**

Patient Data Processing, Database Management, Communication of Medical data across different hospital units. Networking and Integration of patient data.

**UNIT-III**

Data from Patients, Coding and Classification , The Patient Record, Biosignal Analysis, Medical Imaging, Image Processing and Analysis.

**UNIT-IV**

Patient-Centered Information Systems ,Primary Care, Clinical Departmental Systems, Clinical Support Systems, Nursing Information Systems.

**UNIT-V**

Medical Knowledge and Decision Support, Methods for Decision Support, Clinical Decision-Support Systems, Strategies for Medical Knowledge Acquisition, Predictive Tools for Clinical Decision Support.

**UNIT-VI**

Institutional Information Systems, Modeling of Health Care for Information Systems Development, Hospital Information Systems: Clinical Use, Technical Choices, Health Information Resources.

**UNIT-VII**

Methodology for Information Processing , Logical Operations, Biostatistical Methods, Biosignal Processing Methods, Pattern Recognition, Modeling for Decision Support, Structuring the Computer-based Patient Record, Evaluation of Clinical Information Systems.

**UNIT-VIII**

Methodology for Information Systems: Human-Computer Interaction in Health Care ,Costs and Benefits of Information Systems, Security in Medical Information Systems, Standards in Health-care Informatics and Telematics, Project Management,

**TEXT BOOK**

1. Bommel, J.Van; Musen, M.A. Handbook of Medical Informatics 1st ed. 1997.

**REFERENCES:**

1. R.D.Lele ,Computers in Medicine Tata McGraw Hill, 2005.
2. Davidson, P., Best Practice Series: Healthcare Information Systems, Auerbach Publications, 2000.
3. Edward B.H. Shortliffe & James J Cimino- Biomedical Informatics –Computer Application in Health Care and Biomedicine. (New Age Int. P.Ltd.), 3<sup>rd</sup> Edition Springer-2008.

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**QUANTITATIVE ENGINEERING PHYSIOLOGY  
(ELECTIVE-IV)**

**UNIT-I - Cellular Physiology**

Introduction to Physiology, Introduction to Modeling and Review of Electric Circuits.

**UNIT-II**

Review of Cellular Physiology, Cellular Metabolism and Kinetics, Membrane Dynamics.

**UNIT-III**

Ion Transport types of transport and Cellular Homeostasis, The Resting Potential.

**UNIT-IV**

Regulation of Cell Function and Cell Cycle Detailed aspects of Neoplasia, Uses of DNA Micro-Arrays,

**UNIT-V -Neuromuscular Physiology**

Review of Nervous System, The Action Potential, Propagation of Action Potentials measurement by Patch Clamp.

**UNIT-VI**

Skeletal Muscle, Neuromuscular Junction and Synaptic Transmission, Smooth Muscle, study of Demyelinating Diseases.

**UNIT-VII - Cardiovascular Physiology**

Review of Cardiovascular Physiology, The ECG, causes and classification of Arrhythmias, characteristics of Defibrillation phenomena.

**UNIT-VIII**

Pressure Volume Relationships, Models of Circulation, Cardiac Output, Cardiac Regulation, Physiological aspects of Myocardial infarction.

**TEXT BOOKS:**

1. Text Book of Physiology by Guyton.
2. Text Book of Physiology by West & Todd

**REFERENCE:**

1. Text Book of Physiology by Choudary.

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**RELIABILITY ENGINEERING**

**UNIT – I: Basics of Probability theory & Distribution**

Basic probability theory – rules for combining probabilities of events – Bernoulli's trials – probabilities density and distribution functions – binomial distribution – expected value and standard deviation of binomial distribution.

**UNIT – II: Network Modeling and evaluation**

Analysis of Series, Parallel, Series-Parallel networks, Redundant System Conditional Probability Approach, Cut Set method.

**UNIT – III: Reliability functions**

Reliability functions  $f(t)$ ,  $F(t)$ ,  $R(t)$ ,  $h(t)$  and their relationships – exponential distribution – Expected value and standard deviation of exponential distribution – Bath tub curve – reliability analysis of series parallel networks using exponential distribution.

**UNIT – IV: Reliability Evaluation**

Reliability Characteristics, Component Reliability and Hazard Models, Component Reliability from Test Data, Evaluation Using Markov Model and Improvement Techniques.

**UNIT – V: Reliability Testing**

Life Test Objectives, Types of Reliability, Test Specifications, Tolerance Test Conditions, Tolerance of Instruments, Specifications.

**UNIT – VI: Accelerated Life Testing**

Methods for ALT Data Quantifications, Temperature Stress And Failures Rates, Stress Combinations in ALT, ALT on Sub-Assemblies, Limitations, Accelerated Test for Evaluation Life, Compressed Time Testing, Cumulative Damage Model.

**UNIT – VII: Data Analysis and Estimations**

Graphical Representation of Statistical Data. Point and Interval Estimation, Goodness of Fit Test, Moment, Maximum, Likelihood and Least Square Estimators

**UNIT – VIII: Monte Carlo Simulation**

Random variates, Simulation output, Application of MCS Techniques: Tossing a coin, Throwing a die, Simulating a two component system, Time Depended Reliability Assessment. Two component non-repairable system. Reliability, Availability of Repairable and standby systems, Number of Simulations.

**TEXT BOOKS:**

1. Reliability Evaluation of Engg. Systems – Concepts and Techniques, by Roy. Billinton, R.N.Allan, 2nd edition Springer Publications,- (Reprint 2008).
2. Reliability Engineering and Life Testing by V.N.A. Naikan , PHI Publications -2009..



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**INDUSTRY ORIENTED MINI PROJECT**

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**SEMINAR**

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**PROJECT WORK**

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**COMPREHENSIVE VIVA**