ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

11

BIOMEDICAL ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE

(Applicable for the batches admitted from 2013-14)

(I - IV Years Syllabus)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
KUKATPALLY, HYDERABAD - 500 085.

ACADEMIC REGULATIONS R13 FOR B. TECH. (REGULAR)

Applicable for the students of B. Tech. (Regular) from the Academic Year 2013-14 and onwards

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

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

1.1 The candidate shall pursue a course of study for not less than four academic years and not more than eight academic years.

1.2 After eight academic years of course of study, the candidate is permitted to write the examinations for two more years.

1.3 The candidate shall register for 224 credits and secure 216 credits with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

2 The students, who fail to fulfill all the academic requirements for the award of the degree within ten academic years from the year of their admission, shall forfeit their seats in B. Tech. course.

3 Courses of study

The following courses of study are offered at present as specializations 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
08	Chemical Engineering
10	Electronics and Instrumentation Engineering

11	Bio-Medical Engineering
12	Information Technology
14	Mechanical Engineering (Mechatronics)
17	Electronics and Telematics Engineering
18	Metallurgy and Material Technology
19	Electronics and Computer Engineering
20	Mechanical Engineering (Production)
21	Aeronautical Engineering
22	Instrumentation and Control Engineering
23	Biotechnology
24	Automobile Engineering
25	Mining Engineering
26	Mining Machinery
27	Petroleum Engineering
28	Civil and Environmental Engineering
29	Mechanical Engineering (Nano Technology)
30	Agricultural Engineering
31	Computer Science & Technology

4 Credits

	I Year		Semester	
	Periods / Week	**Credits**	**Periods / Week**	**Credits**
Theory	03+1/03 02	06 04	04 —	04 —
Practical	03	04	03	02
Drawing	02+03	06	03 06	02 04
Mini Project	—	—	—	02
Comprehensive Viva Voce	—	—	—	02
Seminar	—	—	6	02
Project	—	--	15	10

5 Distribution and Weightage of Marks

5.1 The performance of a student in each semester or I year shall be evaluated subject-wise for a maximum of 100 marks for a theory and 75 marks for a practical subject. In addition, industry-oriented mini-project, seminar and project work shall be evaluated for 50, 50 and 200 marks, respectively.

5.2 For theory subjects the distribution shall be 25 marks for Internal Evaluation and 75 marks for the End-Examination.

5.3 For theory subjects, during a semester there shall be 2 mid-term examinations. Each mid- term examination consists of one objective paper, one essay paper and one assignment. The objective paper and the essay paper shall be for 10 marks each with a total duration of 1 hour 20 minutes (20 minutes for objective and 60 minutes for essay paper). The Objective paper is set with 20 bits of multiple choice, fill-in the blanks and matching type of questions for a total of 10 marks. The essay paper shall contain 4 full questions (one from each unit) out of which, the student has to answer 2 questions, each carrying 5 marks. While the first mid-term examination shall be conducted on 1 to 2.5 units of the syllabus, the second mid-term examination shall be conducted on 2.5 to 5 units. Five (5) marks are allocated for Assignments (as specified by the subject teacher concerned). The first Assignment should be submitted before the conduct of the first mid-examination, and the second Assignment should be submitted before the conduct of the second mid-examination. The total marks secured by the student in each mid-term examination are evaluated for 25 marks, and the average of the two mid-term examinations shall be taken as the final marks secured by each candidate. However, in the I year, there shall be 3 mid term examinations, each for 25 marks, along with 3 assignments in a similar pattern as above (1st mid shall be from Unit-I, 2nd mid shall be 2 &3 Units and 3rd mid shall be 4 & 5 Units) and the average marks of the examinations secured (each evaluated for a total of 25 marks) in each subject shall be considered to be final marks for the internals/sessionals. If any candidate is absent from any subject of a mid-term examination, an on-line test will be conducted for him by the University.

The details of the Question Paper pattern without deviating from the R13 regulations as notified in the website is as follows:

- ***The End semesters Examination will be conducted for 75 marks which consists of two parts viz. i). Part-A for 25 marks, ii). Part –B for 50 marks.***
- ***Part-A is compulsory question which consists of ten sub-questions. The first five sub-questions are from each unit and carries 2 marks each. The next five sub-questions***

are one from each unit and carries 3 marks each.

- ***Part-B consists of five Questions (numbered from 2 to 6) carrying 10 marks each. Each of these questions is from one unit and may contain sub-questions. For each question there will be an "either" "or" choice (that means there will be two questions from each unit and the student should answer any one question)***

5.4 For practical subjects there shall be a continuous evaluation during a semester for 25 sessional marks and 50 end semester examination marks. Out of the 25 marks for internal evaluation, day-to-day work in the laboratory shall be evaluated for 15 marks and internal practical examination shall be evaluated for 10 marks conducted by the laboratory teacher concerned. The end semester examination shall be conducted with an external examiner and the laboratory teacher. The external examiner shall be appointed from the clusters of colleges which are decided by the examination branch of the University.

5.5 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 internal tests) and 75 marks for end semester examination. There shall be two internal tests in a Semester and the 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 will be taken into consideration.

5.6 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 along with the project work in IV year II Semester. The industry oriented mini-project shall be submitted in a report form and presented before the committee. It shall be evaluated for 50 marks. The committee consists of an external examiner, head of the department, the supervisor of the mini-project and a senior faculty member of the department. There shall be no internal marks for industry-oriented mini-project.

5.7 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 of the topic, and submit it to the department. It 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 the seminar.

5.8 There shall be a Comprehensive Viva-Voce in IV year II semester.

The Comprehensive Viva-Voce will be conducted by a Committee consisting of Head of the Department and two Senior Faculty members of the Department. The Comprehensive Viva-Voce is intended to assess the student's understanding of the subjects he 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.

5.9 Out of a total of 200 marks for the project work, 50 marks shall be allotted for Internal Evaluation and 150 marks for the End Semester Examination (Viva Voce). The End Semester Examination of the project work shall be conducted by the same committee as appointed for the 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 one another. The evaluation of project work shall be made 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.

5.10 The Laboratory marks and the sessional marks awarded by the College are subject to scrutiny and scaling by the University wherever necessary. In such cases, the sessional and laboratory marks awarded by the College will be referred to a Committee. The Committee will arrive at a scaling factor and the marks will be scaled accordingly. The recommendations of the Committee are final and binding. The laboratory records and internal test papers shall be preserved in the respective institutions as per the University rules and produced before the Committees of the University as and when asked for.

6 Attendance Requirements

6.1 A student is eligible to write the University examinations only if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

6.2 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

6.3 Shortage of Attendance below 65% in aggregate shall not be condoned.

6.4 A student who is short of attendance in semester / I year may seek re-admission into that semester/I year when offered within 4 weeks from the date of the commencement of class work.

6.5 Students whose shortage of attendance is not condoned in any semester/I year are not eligible to write their end semester examination of that class and their registration stands cancelled.

6.6 A stipulated fee shall be payable towards condonation of shortage of attendance.

6.7 A student will be promoted to the next semester if he satisfies the attendance requirement of the present semester/I year, as applicable, including the days of attendance in sports, games, NCC and NSS activities.

6.8 If any candidate fulfills the attendance requirement in the present semester or I year, he shall not be eligible for readmission into the same class.

7 Minimum Academic Requirements

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

7.1 A student is deemed to have satisfied the minimum academic requirements if he has earned the credits allotted to each theory/ practical design/drawing subject/project and secures not less than 35% of marks in the end semester exam, and minimum 40% of marks in the sum total of the mid-term and end semester exams.

7.2 A student shall be promoted from first year to second year if he fulfills the minimum attendance requirement.

7.3 A student will not be promoted from II year to III year unless he fulfils the academic requirement of 34 credits up to II year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in II year II semester.

7.4 A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 56 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations and secures prescribed minimum attendance in III year II semester.

7.5 A student shall register and put up minimum attendance in all 224 credits and earn 216 credits. Marks obtained in the best 216 credits shall be considered for the calculation of percentage of marks.

7.6 Students who fail to earn 216 credits as indicated in the course structure within ten academic years (8 years of study + 2 years additionally for appearing for exams only) from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled.

8 Course pattern

8.1 The entire course of study is for four academic years. I year shall be on yearly pattern and II, III and IV years on semester pattern.

8.2 A student, eligible to appear for the end examination in a subject, but absent from it or has failed in the end semester examination, may

write the exam in that subject during the period of supplementary exams.

8.3 When a student is detained for lack of credits/shortage of attendance, he may be re-admitted into the next semester/year. However, the academic regulations under which he was first admitted, shall continues to be applicable to him.

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	
First Class with Distinction	70% and above	**From the aggregate marks secured from 216 Credits.**
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 obtained in internal evaluation and end semester / I year examination shall be shown separately in the memorandum of marks.

10 Minimum Instruction Days

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

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

12 There shall be no transfer from one college/stream to another within the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

13 WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the university or if any case of indiscipline is pending against him, the result of the student will be withheld and he will not be allowed into the next semester. His degree will be withheld in such cases.

14. **TRANSITORY REGULATIONS**

14.1 Discontinued, detained, or failed candidates are eligible for readmission as and when next offered.

14.2 After the revision of the regulations, the students of the previous batches will be given two chances for passing in their failed subjects, one supplementary and the other regular. If the students cannot

clear the subjects in the given two chances, they shall be given equivalent subjects as per the revised regulations which they have to pass in order to obtain the required number of credits.

14.3 In case of transferred students from other Universities, the credits shall be transferred to JNTUH as per the academic regulations and course structure of the JNTUH.

15. General

15.1 Wherever the words “he”, “him”, “his”, occur in the regulations, they include “she”, “her”, “hers”.

15.2 The academic regulation should be read as a whole for the purpose of any interpretation.

15.3 In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Vice-Chancellor is final.

15.4 The University 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 University.

15.5 The students seeking transfer to colleges affiliated to JNTUH from various other Universities/Institutions, have to pass the failed subjects which are equivalent to the subjects of JNTUH, and also pass the subjects of JNTUH which the candidates have not studied at the earlier Institution on their own without the right to sessional marks. Further, though the students have passed some of the subjects at the earlier institutions, if the same subjects are prescribed in different semesters of JNTUH, the candidates have to study those subjects in JNTUH in spite of the fact that those subjects are repeated.

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Academic Regulations R13 For B.Tech. (Lateral Entry Scheme)

Applicable for the students admitted into II year B. Tech. (LES) from the Academic Year 2013-14 and onwards

1 **Eligibility for award of B. Tech. Degree (LES)**

I. The LES candidates shall pursue a course of study for not less than three academic years and not more than six academic years.

II. They shall be permitted to write the examinations for two more years after six academic years of course work.

2. The candidate shall register for 168 credits and secure 160 credits from II to IV year B.Tech. Program (LES) for the award of B.Tech. degree with compulsory subjects as listed in Table-1.

Table 1: Compulsory Subjects

Serial Number	Subject Particulars
1	All practical subjects
2	Industry oriented mini project
3	Comprehensive Viva-Voce
4	Seminar
5	Project work

3. The students, who fail to fulfil the requirement for the award of the degree in 8 consecutive academic years (6 years of study + 2 years additionally for appearing exams only) from the year of admission, shall forfeit their seats.

4. The attendance regulations of B. Tech. (Regular) shall be applicable to B.Tech. (LES).

5. **Promotion Rule**

A student shall be promoted from second year to third year if he fulfills the minimum attendance requirement.

A student shall be promoted from III year to IV year only if he fulfils the academic requirements of 34 credits up to III year I semester from all the examinations, whether or not the candidate takes the examinations.

6. **Award of Class**

After a student has satisfied the requirement 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	
First Class with Distinction	70% and above	**From the aggregate marks secured from 216 Credits.**
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 obtained in the internal evaluation and the end semester examination shall be shown separately in the marks memorandum.

7. All the other regulations as applicable to **B. Tech. 4-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
	If the candidate:	
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 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.	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.
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	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

	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.	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

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.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. TECH. BIOMEDICAL ENGINEERING

I YEAR

Code	Subject	L	T/P/D	C
A10001	English	2	-	4
A10002	Mathematics – I	3	1	6
A10003	Mathematical Methods	3	-	6
A10004	Engineering Physics	3	-	6
A10005	Engineering Chemistry	3	-	6
A10501	Computer Programming	3	-	6
A10301	Engineering Drawing	2	3	6
A10581	Computer Programming Lab.	-	3	4
A10081	Engineering Physics / Engineering Chemistry Lab.	-	3	4
A10083	English Language Communication Skills Lab.	-	3	4
A10082	IT Workshop / Engineering Workshop	-	3	4
	Total	**19**	**16**	**56**

II YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A30011	Applied Biochemistry	4	-	4
A30404	Electronic Devices & Circuits	4	-	4
A30210	Fundamentals of Electrical Engineering	4	-	4
A30406	Signals and Systems	4	-	4
A31101	Anatomy and Physiology	4	-	4
A31112	Medical Instrumentation	4	-	4
A30482	Electronic Devices and Circuits Lab	0	3	2
A31181	Medical Sciences Lab	0	3	2
	Total	**24**	**6**	**28**

II YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A40009	Environmental Studies	4	-	4
A40407	Switching Theory and Logic Design	4	-	4
A40415	Pulse and Digital Circuits	4	-	4
A41104	Clinical Sciences - I	4	-	3
A41103	Bio Transducers and Applications	4	-	4
A41105	Hospital System Management	4	-	4
A41181	Transducers Lab	0	3	2
A40481	Basic Simulation Lab	0	3	2
	Total	**24**	**6**	**28**

III YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A50010	Managerial Economics and Financial Analysis	4	-	4
A50414	Principles of Communications	4	-	4
A50421	Digital Signal Processing	4	-	4
A50425	Linear and Digital IC Applications	4	-	4
A51107	Clinical Sciences – II	4	-	4
A51106	Bio Medical Equipment - I	4	-	4
A50086	Advanced Communication Skills Lab	0	3	2
A50492	Pulse Circuits and IC Applications Lab	0	3	2
	Total	**24**	**6**	**28**

III YEAR II SEMESTER

Code	Subject	L	T/P/D	C
	Open Elective	4	-	4
A60017	Disaster Management			
A60018	Human Values and Professional Ethics			
A60017	Intellectual Property Rights			
A61109	Biological Control Systems	4	-	4
A60430	Microprocessors and Microcontrollers	4	-	4
A61111	Medical Image Acquisition Techniques	4	-	4
A61110	Biomedical Equipment – II	4	-	4
A61108	Bio Fluids and Mechanics	4	-	4
A61182	Biomedical Equipment Lab	0	3	2
A60494	Microprocessors and Microcontrollers Lab	0	3	2
	Total	**24**	**6**	**28**

IV YEAR I SEMESTER

Code	Subject	L	T/P/D	C
A71114	Medical Image Processing	4	-	4
A71115	Rehabilitation Engineering	4	-	4
A70515	Computer Networks	4	-	4
A71113	Biomedical Signal Processing	4	-	4
A70441 A70527 A72909	**Elective – I** Lasers & Fiber Optic Instrumentation Artificial Neural Networks Nanotechnology	4	-	4
A70438 A70432 A70437	**Elective – II** Embedded & Real Time Systems VLSI Design DSP Processors & Architectures	4	-	4
A71183	Biomedical Signal Processing Lab	0	3	2
A71184	Medical Imaging Lab	0	3	2
	Total	**24**	**6**	**28**

IV YEAR II SEMESTER

Code	Subject	L	T/P/D	C
A80241 A81121 A81120	**Elective -III:** Reliability Engineering Transportation Phenomena in living systems Telemedicine	4	-	4
A80357 A81119 A81118	**Elective – IV** Robotics and Automation Medical Informatics Biometric Systems	4	-	4
A81117	Biomaterials	4	-	4
A80087	Industry Oriented Mini Project	0	-	2
A80089	Seminar	0	6	2
A80088	Major Project	0	15	10
A80090	Comprehensive Viva	0	0	2
	Total	**12**	**21**	**28**

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	2	**-/-/-**	**4**

(A10001) ENGLISH

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 competencies 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. Hence, it is suggested that they read it on their own the 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, fostering ideas and practice of language skills.

Objectives:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.

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 they

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 the five units of the prescribed text: **Skills Annexe -Functional English for Success)**
- 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
- Scanning
- 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 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
- Describing graphs using expressions of comparison

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 Five Units, are prescribed:

For Detailed study: First Textbook: "Skills Annexe -Functional English for Success", Published by Orient Black Swan, Hyderabad

For Non-detailed study

1. **Second text book "Epitome of Wisdom",** Published by Maruthi Publications, Guntur
   - The course content and study material is divided into Five Units.

Unit –I:

1. Chapter entitled **'Wit and Humour**' from **'Skills Annexe'** -Functional English for Success, Published by Orient Black Swan, Hyderabad
2. Chapter entitled **'Mokshagundam Visvesvaraya'** from **"Epitome of Wisdom**", Published by Maruthi Publications, Hyderabad.

L- Listening For Sounds, Stress and Intonation

S- Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)

R- Reading for Subject/ Theme

W- Writing Paragraphs

G- Types of Nouns and Pronouns

V- Homonyms, homophones synonyms, antonyms

Unit –II

1. Chapter entitled **"Cyber Age"** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad.
2. Chapter entitled **'Three Days To See'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L – Listening for themes and facts

S – Apologizing, interrupting, requesting and making polite conversation

R- for theme and gist

W- Describing people, places, objects, events

G- Verb forms

V- noun, verb, adjective and adverb

Unit –III

1. Chapter entitled **'Risk Management'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad.
2. Chapter entitled **'Leela's Friend'** by R.K. Narayan from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L – for main points and sub-points for note taking

S – giving instructions and directions; Speaking of hypothetical situations

R – reading for details

W – note-making, information transfer, punctuation

G – present tense

V – synonyms and antonyms

Unit –IV

1. Chapter entitled **'Human Values and Professional Ethics'** from **"Skills Annexe -Functional English for Success"** Published by Orient Black Swan, Hyderabad.
2. Chapter entitled **'The Last Leaf'** from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L - Listening for specific details and information

S- narrating, expressing opinions and telephone interactions

R - Reading for specific details and information

W- Writing formal letters and CVs

G- Past and future tenses

V- Vocabulary - idioms and Phrasal verbs

Unit –V

1. Chapter entitled **'Sports and Health'** from **"Skills Annexe - Functional English for Success"** Published by Orient Black Swan, Hyderabad.
2. Chapter entitled **'The Convocation Speech'** by N.R. Narayanmurthy' from **"Epitome of Wisdom"**, Published by Maruthi Publications, Hyderabad.

L- Critical Listening and Listening for speaker's tone/ attitude

S- Group discussion and Making presentations

R- Critical reading, reading for reference

W- Project proposals; Technical reports, Project Reports and Research Papers

G- Adjectives, prepositions and concord

V- Collocations and Technical vocabulary

Using words appropriately

* Exercises from the texts not prescribed shall also be used for classroom tasks.

REFERENCES :

1. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
2. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
3. English Grammar Practice, Raj N Bakshi, Orient Longman.
4. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
5. Effective English, edited by E Suresh Kumar, A RamaKrishna Rao, P Sreehari, Published by Pearson.
6. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
7. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
8. Technical Communication, Meenakshi Raman, Oxford University Press.
9. Objective English Edgar Thorpe & Showick Thorpe, Pearson Education.
10. Grammar Games, Renuvolcuri Mario, Cambridge University Press.

11. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education.
15. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw – Hill.
16. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO.
17. A Communicative Grammar of English, Geoffrey Leech, Jan Svartvik, Pearson Education.
18. Enrich your English, Thakur K B P Sinha, Vijay Nicole Imprints Pvt Ltd.,
19. A Grammar Book for You And I, C. Edward Good, MacMillan Publishers.

Outcomes:

- Usage of English Language, written and spoken.
- Enrichment of comprehension and fluency
- Gaining confidence in using language in verbal situations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	3	**1/-/-**	**6**

(A10002) MATHEMATICS -I

Objectives: To learn

- The types of Matrices and their properties.
- Concept of rank of a matrix and applying the concept of rank to know the consistency of linear equations and to find all possible solutions, if exist.
- The concept of eigenvalues and eigenvectors of a matrix is to reduce a quadratic form into a canonical form through a linear transformation.
- The mean value theorems and to understand the concepts geometrically.
- The functions of several variables and optimization of these functions.
- The evaluation of improper integrals, Beta and Gamma functions.
- Multiple integration and its applications.
- Methods of solving the differential equations of 1st and higher order.
- The applications of the differential equations to Newton's law of cooling, Natural growth and decay, Bending of beams etc.
- The definition of integral transforms and Laplace Transform.
- Properties of Laplace transform.
- Inverse Laplace Transform.
- Convolution theorem.
- Solution of Differential equations using Laplace transform.

UNIT-I

Theory of Matrices: Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix,

Elementary row and column transformations- Elementary matrix, Finding rank of a matrix by reducing to Echelon and normal forms. Finding the inverse of a non-singular square matrix using row/ column transformations (Gauss-Jordan method). Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix. Solving m x n and n x n linear system of equations by Gauss elimination.

Cayley-Hamilton Theorem (without proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation –

Orthogonal Transformation. Eigen values and eigen vectors of a matrix. Properties of eigen values and eigen vectors of real and complex matrices. Finding linearly independent eigen vectors of a matrix when the eigen values of the matrix are repeated.

Diagonalization of matrix – Quadratic forms up to three variables. Rank – Positive definite, negative definite, semi definite, index, signature of quadratic forms. Reduction of a quadratic form to canonical form.

UNIT – II

Differential calculus methods: Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.

Functions of several variables: Functional dependence- Jacobian- Maxima and Minima of functions of two variables without constraints and with constraints-Method of Lagrange multipliers.

UNIT – III

Improper integration, Multiple integration & applications: Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions

Multiple integrals – double and triple integrals – change of order of integration-change of variables (polar, cylindrical and spherical) Finding the area of a region using double integration and volume of a region using triple integration.

UNIT – IV

Differential equations and applications : Overview of differential equations-exact, linear and Bernoulli (NOT TO BE EXAMINED). Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

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

UNIT – V

Laplace transform and its applications to Ordinary differential equations Definition of Integral transform, Domain of the function and Kernel for the Laplace transforms. Existence of Laplace transform. Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem –

Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem –- Solving ordinary differential equations by Laplace transforms.

TEXT BOOKS:

1. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers.
2. Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Publishing House, Delhi.
2. Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
3. Engineering Mathematics – I by D. S. Chandrasekhar, Prison Books Pvt. Ltd.
4. Engineering Mathematics – I by G. Shanker Rao & Others I.K. International Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC.
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition, Pearson Education.

Outcome:

- After learning the contents of this Unit the student is able to write the matrix representation of a set of linear equations and to analyze solutions of system of equations.
- The student will be able to understand the methods of differential calculus to optimize single and multivariable functions.
- The student is able to evaluate the multiple integrals and can apply the concepts to find the Areas, Volumes, Moment of Inertia etc., of regions on a plane or in space.
- The student is able to identify the type of differential equation and uses the right method to solve the differential equation. Also able to apply the theory of differential equations to the real world problems.
- The student is able to solve certain differential equations using Laplace Transform. Also able to transform functions on time domain to frequency domain using Laplace transforms.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	3	**-/-/-**	**6**

(A10003) MATHEMATICAL METHODS

Objectives:

- The objective is to find the relation between the variables x and y out of the given data (x,y).
- This unit also aims to find such relationships which exactly pass through data or approximately satisfy the data under the condition of least sum of squares of errors.
- The aim of numerical methods is to provide systematic methods for solving problems in a numerical form using the given initial data.
- This topic deals with methods to find roots of an equation and solving a differential equation.
- The numerical methods are important because finding an analytical procedure to solve an equation may not be always available.
- In the diverse fields like electrical circuits, electronic communication, mechanical vibration and structural engineering, periodic functions naturally occur and hence their properties are very much required.
- Indeed, any periodic and non-periodic function can be best analyzed in one way by Fourier series and transforms methods.
- The unit aims at forming a partial differential equation (PDE) for a function with many variables and their solution methods. Two important methods for first order PDE's are learnt. While separation of variables technique is learnt for typical second order PDE's such as Wave, Heat and Laplace equations.
- In many Engineering fields the physical quantities involved are vector-valued functions.
- Hence the unit aims at the basic properties of vector-valued functions and their applications to line integrals, surface integrals and volume integrals.

UNIT – I:

Interpolation and Curve fitting:

Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations – Differences of a polynomial-Newton's formulae for interpolation – Central difference interpolation Formulae – Gauss Central Difference Formulae –

Interpolation with unevenly spaced points-Lagrange's Interpolation formula. B. Spline interpolation – Cubic spline.

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

UNIT – II :

Numerical techniques:

Solution of Algebraic and Transcendental Equations and Linear system of equations: Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .

Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method

Numerical Differentiation, Integration, and Numerical solutions of First order differential equations: Numerical differentiation, Numerical integration - Trapezoidal rule, Simpson's $1/3^{rd}$ and 3/8 Rule , Generalized Quadrature.

Numerical solution of Ordinary Differential equations: Solution by Taylor's series method –Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods, Predictor –corrector methods(Milne's Method and Adams-Bashforth methods only).

UNIT – III:

Fourier series and Fourier Transforms: Definition of periodic function.

Fourier expansion of periodic functions in a given interval of length 2π

Determination of Fourier coefficients – Fourier series of 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.

UNIT-IV:

Partial differential equations : Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method), Method of separation of variables for second order equations –Applications of Partial differential equations-Two dimensional wave equation, Heat equation.

UNIT – V

Vector Calculus: Vector Calculus: Scalar point function and vector point

function, Gradient- Divergence- Curl and their related properties, - Laplacian operator, Line integral – work done – Surface integrals -Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification). Solenoidal and irrotational vectors, Finding Potential function.

TEXT BOOKS:

1. Advanced Engineering Mathematics by Kreyszig, John Wiley & Sons.
2. Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publishers.

REFERENCES:

1. Mathematical Methods by T.K.V. Iyengar, B.Krishna Gandhi & Others, S. Chand.
2. Introductory Methods by Numerical Analysis by S.S. Sastry, PHI Learning Pvt. Ltd.
3. Mathematical Methods by G.Shankar Rao, I.K. International Publications, N.Delhi.
4. Mathematical Methods by V. Ravindranath, Etl, Himalaya Publications.
5. Advanced Engineering Mathematics with MATLAB, Dean G. Duffy, 3rd Edi, 2013, CRC Press Taylor & Francis Group.
6. Mathematics for Engineers and Scientists, Alan Jeffrey, 6th Edi, 2013, Chapman & Hall/ CRC.
7. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

Outcomes:

From a given discrete data, one will be able to predict the value of the data at an intermediate point and by curve fitting, can find the most appropriate formula for a guessed relation of the data variables. This method of analysis data helps engineers to understand the system for better interpretation and decision making

- After studying this unit one will be able to find a root of a given equation and will be able to find a numerical solution for a given differential equation.
- Helps in describing the system by an ODE, if possible. Also, suggests to find the solution as a first approximation.
- One will be able to find the expansion of a given function by Fourier series and Fourier Transform of the function.
- Helps in phase transformation, Phase change and attenuation of coefficients in acoustics.

- After studying this unit, one will be able to find a corresponding Partial Differential Equation for an unknown function with many independent variables and to find their solution.
- Most of the problems in physical and engineering applications, problems are highly non-linear and hence expressing them as PDEs'. Hence understanding the nature of the equation and finding a suitable solution is very much essential.
- After studying this unit, one will be able to evaluate multiple integrals (line, surface, volume integrals) and convert line integrals to area integrals and surface integrals to volume integrals.
- It is an essential requirement for an engineer to understand the behavior of the physical system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	3	**-/-/-**	**6**

(A10004) ENGINEERING PHYSICS

Objectives:

It gives

- to the students basic understanding of bonding in solids, crystal structures and techniques to characterize crystals.
- to understand the behavior of electron in a solid and thereby one can determine the conductivity and specific heat values of the solids.
- to study applications in Engineering like memory devices, transformer core and Electromagnetic machinery.
- to help the student to design powerful light sources for various Engineering Applications and also enable them to develop communication systems using Fiber Technology.
- to understand the working of Electronic devices, how to design acoustic proof halls and understand the behavior of the materials at Nano scale.

UNIT-I

Crystallography: Ionic Bond, Covalent Bond, Metallic Bond, Hydrogen Bond, Vander-Waal's Bond, Calculation of Cohesive Energy of diatomic molecule-Space Lattice**,** Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices, Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Crystal Planes and Directions, Inter Planar Spacing of Orthogonal Crystal Systems, Structure of Diamond and NaCl.

X-ray Diffraction & Defects in Crystals: Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method**:** Point Defects: Vacancies, Substitutional, Interstitial, Frenkel and Schottky Defects, line defects (Qualitative) & Burger's Vector.

UNIT-II

Principles of Quantum Mechanics: Waves and Particles, de Broglie Hypothesis , Matter Waves, Davisson and Germer' Experiment, Heisenberg's Uncertainty Principle, Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function – Infinite square well potential, extension to three dimensions

Elements of Statistical Mechanics & Electron theory of Solids: Phase space, Ensembles, Micro Canonical, Canonical and Grand Canonical Ensembles **-** Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac Statistics (Qualitative Treatment), Concept of Electron Gas, , Density of States, Fermi

Energy- Electron in a periodic Potential, Bloch Theorem, Kronig-Penny Model (Qualitative Treatment), E-K curve, Origin of Energy Band Formation in Solids, Concept of Effective Mass of an Electron, Classification of Materials into Conductors, Semi Conductors & Insulators.

UNIT-III

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities: Ionic and Electronic - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo - electricity and Ferro- electricity.

Magnetic Properties & Superconducting 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 and their Applications, Superconductivity, Meissner Effect, Effect of Magnetic field, Type-I & Type-II Superconductors, Applications of Superconductors.

UNIT-IV

Optics: Interference-Interference in thin films (Reflected light), Newton rings experiment- Fraunhofer diffraction due to single slit, N-slits, Diffraction grating experiment , Double refraction-construction and working of Nicol's Prism.

Lasers & Fiber Optics: Characteristics of Lasers, Spontaneous and Stimulated Emission of Radiation, Einstein's Coefficients and Relation between them, Population Inversion, Lasing Action, Ruby Laser, Helium-Neon Laser, Semiconductor Diode Laser, Applications of Lasers- Principle of Optical Fiber, Construction of fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Types of Optical Fibers: Step Index and Graded Index Fibers, Attenuation in Optical Fibers, Application of Optical Fiber in communication systems.

UNIT-V:

Semiconductor Physics: Fermi Level in Intrinsic and Extrinsic Semiconductors, Calculation of carrier concentration in Intrinsic &, Extrinsic Semiconductors, Direct and Indirect Band gap semiconductors, Hall Effect-Formation of PN Junction, Open Circuit PN Junction, Energy Diagram of PN Diode, Diode Equation, I-V Characteristics of PN Junction diode, Solar cell, LED & Photo Diodes. Acoustics of Buildings & Acoustic Quieting, Reverberation and Time of Reverberation, Sabine's Formula for Reverberation Time, Measurement of Absorption Coefficient of a Material, factors affecting the Architectural Acoustics and their Remedies.

Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume

Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-gel, Top-down Fabrication: Chemical Vapour Deposition, Characterization by TEM.

TEXT BOOKS:

1. Engineering Physics,K. Malik, A. K. Singh, Tata Mc Graw Hill Book Publishers.
2. Engineering Physics, V. Rajendran, Tata Mc Graw Hill Book Publishers.

REFERENCES:

1. Fundamentals of Physics, David Halliday, Robert Resnick, Jearl Walker by John Wiley & Sons.
2. Sears and Zemansky's University Physics (10th Edition) by Hugh D. Young Roger A. Freedman, T. R. Sandin, A. Lewis FordAddison-Wesley Publishers.
3. Applied Physics for Engineers – P. Madhusudana Rao (Academic Publishing company, 2013).
4. Solid State Physics – M. Armugam (Anuradha Publications).
5. Modern Physics – R. Murugeshan & K. Siva Prasath – S. Chand & Co. (for Statistical Mechanics).
6. A Text Book of Engg Physics – M. N. Avadhanulu & P. G. Khsirsagar– S. Chand & Co. (for acoustics).
7. Modern Physics by K. Vijaya Kumar, S. Chandralingam: S. Chand & Co.Ltd.
8. Nanotechnology – M.Ratner & D. Ratner (Pearson Ed.).
9. Introduction to Solid State Physics – C. Kittel (Wiley Eastern).
10. Solid State Physics – A.J. Dekker (Macmillan).
11. Applied Physics – Mani Naidu Pearson Education.

Outcomes:

- The student would be able to learn the fundamental concepts on behavior of crystalline solids.
- The knowledge on Fundamentals of Quantum Mechanics, Statistical Mechanics enables the student to apply to various systems like Communications Solar Cells, Photo Cells and so on.
- Design, Characterization and study of properties of materials help the student to prepare new materials for various Engineering applications.
- This course also helps the student exposed to non-destructive testing methods.
- Finally, Engineering Physics Course helps the student to develop problem solving skills and analytical skills.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	3	**-/-/-**	**6**

(A10005) ENGINEERING CHEMISTRY

Objective:

An engineer is as someone who uses scientific, natural and physical principles to design something of use for people or other living creatures. Much of what any engineer does involves chemistry because everything in our environment has a molecular make up. Engineering requires the concepts of applied chemistry and the more chemistry an engineer understands, the more beneficial it is. In the future, global problems and issues will require an in-depth understanding of chemistry to have a global solution. This syllabus aims at bridging the concepts and theory of chemistry with examples from fields of practical application, thus reinforcing the connection between science and engineering. It deals with the basic principles of various branches of chemistry which are fundamental tools necessary for an accomplished engineer.

UNIT I:

Electrochemistry & Corrosion: Electro Chemistry – Conductance - Specific, Equivalent and Molar conductance and their Units; Applications of Conductance (Conductometric titrations). **EMF:** Galvanic Cells, types of Electrodes – (Calomel, Quinhydrone and glass electrodes); Nernst equation and its applications ; concept of concentration cells, electro chemical series, Potentiometric titrations, determination of P^H using glass electrode-Numerical problems.

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

Corrosion and its control: Causes and effects of corrosion; Theories of corrosion – Chemical & Electrochemical corrosion; Types of corrosion (Galvanic, Water line, Pitting and Intergranular); Factors affecting rate of corrosion – Nature of metal and Nature of Enviornment – Corrosion control methods – Cathodic protection (sacrificial anodic and impressed current). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (galvanization & tinning), Cementation, cladding, electroplating (copper plating) Electroless plating (Ni plating) - Organic coatings – Paints - constituents and their functions.

UNIT II:

Engineering Materials: Polymers: Types of Polymerization (Chain & Step growth).**Plastics:** Thermoplastic & Thermo setting resins; Compounding &

fabrication of plastics (Compression and injection moulding).Preparation, properties, engineering applications of PVC, Teflon and Bakelite.

Fibers- Charcterstics of fibers – preparation, properties and uses of Nylon – 6,6 and Dacron – Fiber Reinforced Plastics (FRP) – applications. **Rubbers** – Natural rubber and its vulcanization. Elastomers – Buna-s, Butyl rubber and Thiokol rubber.

Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers. **Bio-degradable Polymers**- preparation and Applications of Poly vinyl acetate and Poly lactic acid - **Cement:** composition of Portland cement, setting & hardening of cement (reactions), **Lubricants:** Classification with examples- Characterstics of a good lubricant & mechanism of lubrication (thick film, thin film and extreme pressure) – properties of lubricants: viscosity, Cloud point, flash and fire points. **Refractories:** Classification, characteristics of a good refractory and applications.

Nanomaterials: Introduction, preparation by sol-gel & chemical vapour deposition methods. Applications of nanomaterials.

UNIT III:

Water and its Treatment: Hardness of Water: Causes of hardness, expression of hardness – units – types of hardness, estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale & sludges, Priming and foaming, caustic enbrittlement and boiler corrosion; Treatment of boiler feed water – Internal treatment (Phosphate, Colloidal and calgon conditioning) – External treatment – Lime Soda process, Zeolite process and ion exchange process. Numerical Problems. **Potable Water**- Its Specifications – Steps involved in treatment of potable water – Disinfection of water by chlorination and ozonisation. Reverse osmosis & its significance.

Unit – IV :

Fuels & Combustion: Fuels – Classification – soild fuels : coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining – cracking – types – fixed bed catalytic cracking. Knocking – octane and cetane rating, synthetic petrol, Bergius and Fischer-Tropsch's process: Gaseous fuels - constituents, characterstics and applications of natural gas, LPG and CNG. Analysis of flue gas by Orsat's apparatus – Numerical Problems.

Combustion – Definition, Calorific value of fuel – HCV , LCV; Determination of calorific value by Junker's gas calorimeter – theoretical calculation of Calorific value by Dulong's formula – Numerical problems on combustion.

UNIT V:

Phase Rule & Surface Chemistry : **Phase Rule:** Definition of terms: Phase,

component, degree of freedom, phase rule equation. Phase diagrams – one component system- water system. Two component system Lead- Silver, cooling curves, heat treatment based on iron-carbon phase diagram - hardening, annealing and normalization.

Surface Chemistry: **Adsorption –** Types of Adsorption, Isotherms – Freundlich and Langmuir adsorption isotherm, applications of adsorption; **Colloids**: Classification of Colloids; Electrical & optical properties, micelles, applications of colloids in industry.

TEXT BOOKS:

1. Engineering Chemistry by R.P. Mani,K.N. Mishra, B. Rama Devi / CENGAGE learning.
2. Engineering Chemistry by P.C Jain & Monica Jain, Dhanpatrai Publishing Company (2008).

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 Publishing Company Limited, New Delhi (2004).
3. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi (2006).
4. Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

Outcome:

- Students will demonstrate a depth of knowledge and apply the methods of inquiry in a discipline of their choosing, and they will demonstrate a breadth of knowledge across their choice of varied disciplines.
- Students will demonstrate the ability to access and interpret information, respond and adapt to changing situations, make complex decisions, solve problems, and evaluate actions.
- Students will demonstrate awareness and understanding of the skills necessary to live and work in a diverse engineering world.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

I Year B.Tech. BME	**L**	**T/P/D**	**C**
	3	**-/-/-**	**6**

(A10501) COMPUTER PROGRAMMING

Objectives:

- To understand the various steps in Program development.
- To understand the basic concepts in C Programming Language.
- To learn how to write modular and readable C Programs.
- To learn to write programs (using structured programming approach) in C to solve problems.
- To introduce the students to basic data structures such as lists, stacks and queues.
- To make the student understand simple sorting and searching methods.

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Program Development.

Introduction to the C Language – Background, C Programs, Identifiers, Types, Variables, Constants, Input / Output, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements- Selection Statements (making decisions) – if and switch statements, Repetition statements (loops)-while, for, do-while statements, Loop examples, other statements related to looping – break, continue, goto, Simple C Program examples.

UNIT - II

Functions-Designing Structured Programs, Functions, user defined functions, inter function communication, Standard functions, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Limitations of recursion, example C programs, Preprocessor commands.

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

UNIT - III

Pointers – Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, Pointer Applications-Arrays and Pointers, Pointer Arithmetic and arrays, Passing an array to a function,

memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions.

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

UNIT - IV

Enumerated, Structure,and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self referential structures, unions, bit fields, C programming examples, command –line arguments.

Input and Output – Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), file status functions (error handling),Positioning functions, C program examples.

UNIT – V

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

Lists- Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Push and Pop Operations, Queues- Enqueue and Dequeue operations.

TEXT BOOKS:

1. Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Programming in C. P. Dey and M Ghosh , Oxford University Press.

REFERENCE BOOKS:

1. C& Data structures – P. Padmanabham, Third Edition, B.S. Publications.
2. C for All, S. Thamarai Selvi, R.Murugesan, Anuradha Publications.
3. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, 7th Edition, Pearson education.
4. Programming in C, Ajay Mittal, Pearson.
5. Programming with C, B.Gottfried, 3rd edition, Schaum's outlines, TMH.
6. Problem solving with C, M.T.Somasekhara, PHI
7. Programming with C, R.S.Bickar, Universities Press.
8. Computer Programming & Data Structures, E.Balagurusamy, 4th edition, TMH.
9. Programming in C – Stephen G. Kochan, III Edition, Pearson

Education.

10. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI.
11. C Programming with problem solving, J.A. Jones & K. Harrow,Dreamtech Press.

Outcomes:

Demonstrate the basic knowledge of computer hardware and software.

Ability to apply solving and logical skills to programming in C language and also in other languages.

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I Year B.Tech. BME	**L**	**T/P/D**	**C**
	2	**-/-/3**	**6**

(A10301) ENGINEERING DRAWING

UNIT – I

Introduction to Engineering Drawing: Principles of Engineering Drawing/ Graphics – Various Drawing Instruments – Conventions in Drawing – **Lettering practice** – BIS Conventions.

Curves: Constructions of Curves used in Engineering Practice:

a) Conic Sections including the Rectangular Hyperbola – General method only.

b) Cycloid, Epicycloid and Hypocycloid

c) Involute.

Scales: Construction of different types of Scales, Plain, Diagonal, Vernier scale.

UNIT – II

Orthographic Projections in First Angle

Projection: Principles of Orthographic Projections – Conventions – First and Third Angle projections.

Projections of Points : including Points in all four quadrants.

Projections of Lines : Parallel, perpendicular, inclined to one plan and inclined to both planes. True length and true angle of a line. Traces of a line.

Projections of Planes: Plane parallel, perpendicular and inclined to one reference plane. Plane inclined to both the reference planes.

UNIT – III

Projections of Solids: Projections of regular solids, cube, prisms, pyramids, tetrahedran, cylinder and cone, axis inclined to both planes.

Sections and Sectional Views: Right Regular Solids – Prism, Cylinder, Pyramid, Cone – use of Auxiliary views.

UNIT – IV

Development of Surfaces: Development of Surfaces of Right, Regular Solids – Prisms, Cylinder, Pyramids, Cone and their parts. frustum of solids.

Intersection of Solids:- Intersection of Cylinder Vs Cylinder, Cylinder Vs Prism, Cylinder Vs Cone.

UNIT – V

Isometric Projections : Principles of Isometric Projection – Isometric Scale

– Isometric Views– Conventions – Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of parts with Spherical surface.

Transformation of Projections : Conversion of Isometric Views to Orthographic Views. Conversion of orthographic views to isometric views – simple objects.

Perspective Projections : Perspective View : Points, Lines and Plane Figures, Vanishing Point Methods (General Method only).

TEXT BOOKS

1. Engineering Drawing – Basant, Agrawal, TMH
2. Engineering Drawing, N.D. Bhatt

REFERENCES :

1. Engineering Graphics. P I Varghese Tata McGraw Hill Education Pvt. Ltd.
2. Engineering drawing – P.J. Shah .S.Chand Publishers.
3. Engineering Drawing- Johle/Tata Macgraw Hill Book Publishers.
4. Engineering Drawing – M.B. Shah and B.C. Rana, Pearson.
5 . Engineering Drawing by K.Venu Gopal & V.Prabu Raja New Age Publications.
6. Engineering Drawing by John. PHI Learning Publisher.

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I Year B.Tech. BME	**L**	**T/P/D**	**C**
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(A10581) COMPUTER PROGRAMMING LAB

Objectives:

- To write programs in C to solve the problems.
- To implement linear data structures such as lists, stacks, queues.
- To implement simple searching and sorting methods.

Recommended Systems/Software Requirements:

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

Week I

a) Write a C program to find the sum of individual digits of a positive integer.

b) 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.

c) 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

a) Write a C program to calculate the following Sum:

Sum=$1-x^2/2! +x^4/4!-x^6/6!+x^8/8!-x^{10}/10!$

b) Write a C program to find the roots of a quadratic equation.

Week 3

a) The total distance travelled by vehicle in 't' seconds is given by distance s = $ut+1/2at^2$ where 'u' and 'a' are the initial velocity (m/sec.) and acceleration (m/sec^2). 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'.

b) 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 4

a) Write C programs that use both recursive and non-recursive functions

i) To find the factorial of a given integer.

ii) To find the GCD (greatest common divisor) of two given integers.

Week 5

a) Write a C program to find the largest integer in a list of integers.

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

i) Addition of Two Matrices

ii) Multiplication of Two Matrices

Week 6

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

i) To insert a sub-string in to a given main string from a given position.

ii) To delete n Characters from a given position in a given string.

b) Write a C program to determine if the given string is a palindrome or not

Week 7

a) 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.

b) 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:

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

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 program to display the contents of a file.

b) Write a C program 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

a) Write a C program that uses non recursive function to search for a Key value in a given list of integers using Linear search.

b) Write a C program that uses non recursive function to search for a Key value in a given sorted list of integers using Binary search.

Week 15

a) Write a C program that implements the Selection sort method to sort a given array of integers in ascending order.

b) Write a C program that implements the Bubble sort method to sort a given list of names in ascending order.

Week 16

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

i) Create a singly linked list of integer elements.

ii) Traverse the above list and display the elements.

Week 17

Write a C program that implements stack (its operations) using a singly linked list to display a given list of integers in reverse order. Ex. input: 10 23 4 6 output: 6 4 23 10

Week 18

Write a C program that implements Queue (its operations) using a singly

linked list to display a given list of integers in the same order. Ex. input: 10 23 4 6 output: 10 23 4 6

Week 19

Write a C program to implement the linear regression algorithm.

Week 20

Write a C program to implement the polynomial regression algorithm.

Week 21

Write a C program to implement the Lagrange interpolation.

Week 22

Write C program to implement the Newton- Gregory forward interpolation.

Week 23

Write a C program to implement Trapezoidal method.

Week 24

Write a C program to implement Simpson method.

TEXT BOOKS:

1. C programming and Data Structures, P. Padmanabham, Third Edition, BS Publications.
2. Computer Programming in C, V. Rajaraman, PHI Publishers.
3. C Programming, E.Balagurusamy, 3rd edition, TMH Publishers.
4. C Programming, M.V.S.S.N.Prasad, ACME Learning Pvt. Ltd.
5. C and Data Structures, N.B.Venkateswarlu and E.V.Prasad,S.Chand Publishers.
6. Mastering C, K.R. Venugopal and S.R. Prasad, TMH Publishers.

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I Year B.Tech. BME	**L**	**T/P/D**	**C**
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(A10081) ENGINEERING PHYSICS / ENGINEERING CHEMISTRY LAB

ENGINEERING PHYSICS LAB

(Any TEN experiments compulsory)

Objectives

This course on Physics lab is designed with 13 experiments in an academic year. It is common to all branches of Engineering in B.Tech Ist year.

The objective of the course is that the student will have exposure to various experimental skills which is very essential for an Engineering student.

The experiments are selected from various areas of Physics like Physical Optics, Lasers, Fiber Optics, Sound, Mechanics, Electricity & Magnetism and Basic Electronics.

Also the student is exposed to various tools like Screw gauge, Vernier Callipers, Physics Balance , Spectrometer and Microscope.

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. Bending losses of fibres & Evaluation of numerical aperture of a given fibre.
10. Energy gap of a material of p-n junction.
11. Torsional pendulum.
12. Wavelength of light –diffraction grating - using laser.
13. Characteristics of a solar cell

LABORATORY MANUAL:

1. Laboratory Manual of Engineering Physics by Dr.Y.Aparna & Dr.K.Venkateswara Rao (V.G.S Publishers)

Outcomes

The student is expected to learn from this laboratory course the concept of error and its analysis. It also allows the student to develop experimental skills to design new experiments in Engineering.

With the exposure to these experiments the student can compare the theory and correlate with experiment.

ENGINEERING CHEMISTRY LAB

List of Experiments (Any 12 of the following)

Titrimetry:

1. Estimation of ferrous iron by dichrometry.
2. Estimation of hardness of water by EDTA method.

Mineral analysis:

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

Instrumental Methods:

Colorimetry:

5. Determination of ferrous iron in cement by colorimetric method
6. Estimation of copper by colorimetric method.

Conductometry:

7. Conductometric titration of strong acid vs strong base.
8. Conductometric titration of mixture of acids vs strong base.

Potentiometry:

9. Titration of strong acid vs strong base by potentiometry.
10. Titration of weak acid vs strong base by potentiometry.

Physical properties:

11. Determination of viscosity of sample oil by redwood / oswald's viscometer.
12. Determination of Surface tension of lubricants.

Preparations:

13. Preparation of Aspirin
14. Preparation of Thiokol rubber

Adsorption:

15. Adsorption of acetic acid on charcoal.

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 Harrmendra Goel, Ane Books Private Ltd.,
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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I Year B.Tech. BME	**L**	**T/P/D**	**C**
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(A10083) 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

- To facilitate computer-aided multi-media instruction enabling individualized and independent language learning.
- To sensitise the students to the nuances of English speech sounds, word accent, intonation and rhythm.
- To bring about a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
- To improve the fluency in spoken English and neutralize mother tongue influence.
- To train students to use language appropriately for interviews, group discussion and public speaking.

Syllabus: English Language Communication Skills Lab shall have two parts:

a. Computer Assisted Language Learning (CALL) Lab

b. Interactive Communication Skills (ICS) Lab

The following course content is prescribed for the **English Language Communication Skills Lab**

Exercise – I

CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants

ICS Lab: Ice-Breaking activity and JAM session

Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II

CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.

ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations

– Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.

Concord (Subject in agreement with verb) and Words often misspelt-confused/misused

Exercise - III

CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.

ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.

Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV

CALL Lab: Intonation and Common errors in Pronunciation.

ICS Lab: Extempore- Public Speaking

Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V

CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice

ICS Lab: Information Transfer- Oral Presentation Skills

Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infra structural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:

The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

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

2. Interactive Communication Skills (ICS) Lab :

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System,

a T. V., a digital stereo –audio & video system and camcorder etc.

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. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories.* New Delhi: Foundation.
2. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
3. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews.* Tata McGraw Hill.
4. Hancock, M. 2009. *English Pronunciation in Use. Intermediate.* Cambridge: CUP.
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. Hewings, M. 2009. *English Pronunciation in Use. Advanced.* Cambridge: CUP.
7. Marks, J. 2009. *English Pronunciation in Use. Elementary.* Cambridge: CUP.
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation.
9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan*.
10. **Spoken English** (CIEFL) in 3 volumes with 6 cassettes, OUP.
11. **English Pronouncing Dictionary** Daniel Jones Current Edition with CD.
12. **A textbook of English Phonetics for Indian Students** by T. Balasubramanian (Macmillan).
13. **Prescribed Lab Manual:** A Manual entitled "***English Language Communication Skills (ELCS) Lab Manual- cum- Work Book***", published by Cengage Learning India Pvt. Ltd, New Delhi. 2013.

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

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 the teacher concerned with the help of another member of the staff of the same department of the same institution.

Outcomes:

- Better Understanding of nuances of language through audio- visual experience and group activities.
- Neutralization of accent for intelligibility.
- Speaking with clarity and confidence thereby enhancing employability skills of the students.

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I Year B.Tech. BME	**L**	**T/P/D**	**C**
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(A10082) 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 antivirus 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.

Week 11- Task 5: Develop your home page using HTML Consisting of your photo, name, address and education details as a table and your skill set as a list.

Productivity tools

LaTeX and Word

Week 12 – 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 13 - 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 14 - 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 15 - 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 16 - 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 17 - 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 18- 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 19 - 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.

REFERENCE BOOKS:

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 Publishers.
4. Upgrading and Repairing, PC's 18th 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)

Outcomes:

- Apply knowledge for computer assembling and software installation.
- Ability how to solve the trouble shooting problems.
- Apply the tools for preparation of PPT, Documentation and budget sheet etc.

ENGINEERING WORKSHOP

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

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

4. Black Smithy
5. House-wiring
6. Foundry
7. Welding
8. Power tools in construction, wood working, electrical engineering and mechanical Engineering.

2. TRADES FOR DEMONSTRATION & EXPOSURE:

1. Plumbing
2. Machine Shop
3. Metal Cutting (Water Plasma)

TEXT BOOK:

1. Work shop Manual - P.Kannaiah/ K.L.Narayana/ Scitech Publishers.
2. Workshop Manual / Venkat Reddy/ BS Publications/Sixth Edition

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
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(A30011) 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. Carbohydrate metabolism: respiration-types. glycolysis and kreb's cycle and energetics involved, Protein & Lipid metabolism (Briefly).

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

UNIT-III

Chemical nature of Enzymes - study of the Properties of Enzymes and kinetics by Spectrophotometer. Diagnostic and therapeutic uses of Enzymes. Metalions in biological catalysis (explanation with few examples).

UNIT-IV

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-V

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. 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 3rd 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.

REFERENCES:

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.
3. Bertini I, Gray HB, Stiefel EI, Valentine JS Biological inorganic chemistry. University Science Books, Sausalito, 2006.
4. Frausto da Silva JJR, Williams RJP The biological chemistry of the elements: the inorganic chemistry of life. Oxford University Press, New York, 2001
5. Bertini I, Sigel A, Sigel H Handbook on metalloproteins. Marcel Dekker, New York ,2001.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30404) ELECTRONIC DEVICES AND CIRCUITS

Objectives:

This is a fundamental course, basic knowledge of which is required by all the circuit branch engineers. This course focuses:

- To familiarize the student with the principle of operation, analysis and design of Junction diode, BJT and FET transistors and amplifier circuits.
- To understand diode as rectifier.
- To study basic principle of filter circuits and various types.

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 Semiconductor Diodes, Zener Diode Characteristics.

Special Purpose Electronic Devices: Principle of Operation and Characteristics of Tunnel Diode (with the help of Energy Band Diagram), Varactor Diode, SCR and Semiconductor Photo Diode.

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, p- Section Filters, Comparision of Filters, Voltage Regulation using Zener Diode.

UNIT-III:

Bipolar Junction Transistor and UJT: 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, BJT Hybrid Model, Determination of h-parameters from Transistor Characteristics, Comparison of CB, CE, and CC Amplifier Configurations, UJT and Characteristics.

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 VBE and ß, Bias Compensation using Diodes and Transistors, Thermal Runaway, Thermal Stability, Analysis of a Transistor Amplifier Circuit using h-Parameters.

UNIT-V:

Field Effect Transistor and FET Amplifiers

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.

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

TEXT BOOKS:

1. Millman's Electronic Devices and Circuits – J. Millman, C.C.Halkias, and Satyabrata Jit, 2 Ed.,1998, TMH.
2. Electronic Devices and Circuits – Mohammad Rashid, Cengage Learing, 2013
3. Electronic Devices and Circuits – David A. Bell, 5 Ed, Oxford

REFERENCE BOOKS:

1. Integrated Electronics – J. Millman and Christos C. Halkias, 1991 Ed., 2008, TMH.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, 9 Ed., 2006, PEI/PHI.
3. Electronic Devices and Circuits – B. P. Singh, Rekha Singh, Pearson, 2Ed, 2013.
4. Electronic Devices and Circuits --K. Lal Kishore, 2 Ed., 2005, BSP.
5. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal, 1 Ed., 2009, Wiley India Pvt. Ltd.
6. Electronic Devices and Circuits – S.Salivahanan, N.Suresh Kumar, A.Vallavaraj, 2 Ed., 2008, TMH.

Course Outcomes:

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

- Understand and Analyse the different types of diodes, operation and its characteristics
- Design and analyse the DC bias circuitry of BJT and FET
- Design biasing circuits using diodes and transistors.
- To analyze and design diode application circuits, amplifier circuits and oscillatorsemploying BJT, FET devices.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30210) 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 and Magnetic Circuits: Circuit Concept – R-L-C parameters – Voltage and Current sources – Independent and dependent sources-Source transformation – Voltage – Current relationship for passive elements – Kirchhoff's laws – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation.

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 – II:

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 – Resonance – series, parallel circuits, concept of band width and Q factor.

UNIT – III:

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 – IV:

DC Machines: Dc Machine- Principle & operation of DC Generators and DC Motors , Different types of generator and motors, characteristics of generator and motor, simple problems.(elementary treatment only).

UNIT – V:

AC Machines : Principle, construction and operation if 1-ϕ transformer, equivalent circuit, DC & AC test on 1-ϕ transformer, transformer regulation, 1-ϕ synchronous generator, principle, construction & operation,

characteristics. Principle operation construction of 1-ϕ induction motor, characteristics. (Elementary treatment only).

TEXT BOOKS:

1. Basic concepts of Electrical Engineering, PS Subramanyam, BS Publications.
2. Basic Electrical Engineering, S.N. Singh, PHI.

REFERENCE BOOKS:

1. Basic Electrical Engineering, Abhijit Chakrabarthi, Sudipta nath, Chandrakumar Chanda, Tata-McGraw-Hill.
2. Principles of Electrical Engineering, V.K Mehta, Rohit Mehta, S.Chand Publications.
3. Basic Electrical Engineering, T.K.Nagasarkar and M.S. Sukhija, Oxford University Press.
4. Fundamentals of Electrical Engineering, RajendraPrasad, PHI.
5. Basic Electrical Engineering by D.P.Kothari , I.J. Nagrath, McGraw-Hill.

Outcome:

After going through this course the student gets a thorough knowledge on basic electrical parameters and different types electrical (DC and AC)circuits and magnetic, the different methods to solve the voltages, currents , powers of the circuits , the network theorems to solve the circuits, elctromechanical energy conversion principle , construction operation characteristics DC and AC machines, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.

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II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A30406) SIGNALS AND SYSTEMS

Objectives:

This is a core subject, basic knowledge of which is required by all the engineers.

This course focuses on:

- To get an in-depth knowledge about signals, systems and analysis of the same using various transforms.

UNIT-I:

Signal Analysis and Fourier Series

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.

Fourier Series: 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-II:

Fourier Transforms and Sampling

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.

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

UNIT-III:

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-IV:

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-V:

Laplace Transforms and Z-Transforms

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.

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, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed., PHI.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen,Wiley, 2 Ed.
2. Signals and Signals – Iyer and K. Satya Prasad, Cengage Learning
3. Signals and Systems – A.Rama Krishna Rao – 2008, TMH.
4. Introduction to Signal and System Analysis – K.Gopalan 2009, Cengage Learning.
5. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
6. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.

Course Outcomes:

Upon completing this course the student will be able to:

- Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
- Express periodic signals in terms of Fourier series and express the spectrum and express the arbitrary signal (discrete) as Fourier transform to draw the spectrum.
- Understands the principle of linear system, filter characteristics of a system and its bandwidth, the concepts of auto correlation and cross correlation and power Density Spectrum.
- Can design a system for sampling a signal.
- For a given system, response can be obtained using Laplace transform, properties and ROC of L.T.
- Study the continuous and discrete signal relation and relation between F.T., L.T. & Z.T, properties, ROC of Z Transform.

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II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A31101) ANATOMY AND PHYSIOLOGY

The course objective is to make the learner understand

- The anatomical terms used to refer the human body.
- The systems of the human body i.e. skeletal system, cardiovascular system, respiratory system, endocrine system, digestive system, lymphatic system, reproductive and urinary system.
- Functioning of these systems.

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, Nervous system and special senses: Brain and spinal cord, Peripheral and Autonomic Nervous System, nerve physiology, Electroencephalogram and Electrocorticogram. Anatomy and physiology of Eye and Ear.

UNIT-II

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

UNIT-III

Respiratory system: Trachea and Lungs. Respiratory Physiology.

UNIT-IV

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

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

UNIT-V

Lymphatic system: Spleen, glands and Lymph nodes. 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. Chandhramoli; Textbook of physiology for Dental studies. Dorpan Publications.
3. Gorden Sears, W. S & Winwood W. S;Anatomy & Physiology for Nurses, Revised edition

Course outcomes:

At the end of this course, the learner will be able

- Explain the Anatomy and Physiology of all the major systems within the human body.
- Illustrate the anatomical location of the systems and explain their function.
- Identify the anatomical terms related to the human body.
- Match the anatomical terms with the appropriate physiology.

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II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A31112) MEDICAL INSTRUMENTATION

(Elective-II)

Objectives: To understand

- the genesis of biopotentials
- different types electrodes and bioamplifiers
- Electrical Safety

UNIT-I

Origin of Biopotentials : Cell Structure, Electrical activity – Resting State, Active State, Action Potential.

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

Propagation of impulses in unmyelinated and myelinated nerve fiber, Electrical properties of synaptic junctions - EPSP and IPSP, Electroneurogram (ENG), Electromyogram (EMG), Electrocardiogram (ECG), Electroretinogram (ERG), Electroencephalogram (EEG), Electrooculogram (EOG).

UNIT-II

Bio Potential Electrodes : The Electrode – Electrolyte Interface, Polarization, Polari able and Nonpolarizable Electrodes, Electrode Behavior and circuit Models, The Electrode – skin Interface and Motion Artifact, Body-surface Recording Electrodes, Internal Electrodes, Electrode Arrays, Microelectrodes and its equivalent circuit, Electrodes for Electric stimulation of Tissue.

UNIT-III

Bio Amplifiers : General considerations for signal Conditioners, Pre-Amplifiers, Differential amplifier, Instrumentation Amplifier, Carrier amplifier, Chopper amplifier, Isolation amplifier, Sources of Noise in Low – Level Measurements.

UNIT-IV

Basic Recording Systems: Writing Systems, Direct Writing Recorders, Thermal & Ink Systems the Ink Jet Recorder, Potentiometric Recorder, Digital Recorders, Thermal Array Recorder, Video Printers, Electrostatic Recorder, Medical oscilloscope, LCD Display.

UNIT-V

Electrical Safety : Physiological effects of Electricity, Important Susceptibility parameters, Distribution of Electric Power, Macro shock hazards, Micro Shock hazards, Electrical - Safety codes and Standards, Basic Approaches to protection against shock, Protection : Power distribution, Protection : Equipment Design, Electrical Safety Analyzers, Testing the Electrical System. Test of Electric Appliances.

TEXT BOOK:

1. John G. Webster. Medical Instrumentation.- Application and Design. John Wiley and Sons. Inc., New York. Third edition 2013.

REFERENCE:

1. R.S. Khandpur. Hand Book of Biomedical Instrumentation, McGraw Hill, 2nd Edition, 2003.
2. L. A Geddes, Principles of Applied Biomedical Instrumentation, John Willy & Sons, 1989.
3. Joseph .J. Carr, John M. Brown, Introduction to Biomedical Equipment Technology, Pearson-2001.

Outcomes:

- Know the basic levels of neuronal organization.
- Differentiate the electrodes used to acquire biopotentials and list the problems associated with acquisition.
- Recognize physiological parameters.

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II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A30482) 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

i. Multimeters (Analog and Digital)

ii. Function Generator

iii. Regulated Power Supplies

iv. 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 and h-parameter calculations.
4. Input & Output Characteristics of Transistor in CE Configuration and h-parameter calculations.
5. Half Wave Rectifier with & without filters.
6. Full Wave Rectifier with & without filters.
7. FET characteristics.
8. Design of Self-bias circuit.
9. Frequency Response of CC Amplifier.
10. Frequency Response of CE Amplifier.
11. Frequency Response of Common Source FET amplifier .
12. SCR characteristics.
13. UJT Characteristics

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 μA, 0-50μA, 0-100μA, 0-200μA, 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)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A31181) MEDICAL SCIENCES LAB

The **Course Objective** is to make the learner understand

- The histology slides of primary tissue and recording of B.P
- The qualitative analysis of glucose, urea and creatinine and serum proteins, A/G Ratio.
- The analysis of the urine sample and identify reducing sugars, proteins, ketone bodies, blood, bile salts and bile pigments.

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

Course Outcomes:

At the end of this course, the learner will be able

- Demonstrate technical skills in the clinical laboratory.
- Analyse the urine sample and identify reducing sugars, proteins, ketone bodies, blood, bile salts and bile pigments.
- Identify the histology slides of primary tissue, recording of B.P, demonstrate the upper limbs, pelvis and pelvic organs.
- Identify different parts of human body.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40009) ENVIRONMENTAL STUDIES

Objectives:

1. Understanding the importance of ecological balance for sustainable development.
2. Understanding the impacts of developmental activities and mitigation measures.
3. Understanding the environmental policies and regulations.

UNIT-I :

Ecosystems: Definition, Scope and Importance of ecosystem. Classification, structure and function of an ecosystem, Food chains, food webs and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity, Field visits.

UNIT-II:

Natural Resources: Classification of Resources: Living and Non-Living 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, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies.

UNIT-III:

Biodiversity and Biotic Resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ conservation. National Biodiversity act.

UNIT-IV:

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. **Noise Pollution:** Sources and Health hazards, standards, **Solid waste:** Municipal Solid Waste management, composition and

characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary,

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Problems And Global Efforts: C**limate change and 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-V:

Environmental Policy, Legislation & EIA: Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

SUGGESTED TEXT BOOKS:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.

2 Environmental Studies by R. Rajagopalan, Oxford 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.

3. Environmental Science by Daniel B.Botkin & Edward A.Keller, Wiley INDIA edition.

4. Environmental Studies by Anubha Kaushik, 4th Edition, New age international publishers.

5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.

Outcomes:

Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which inturn helps in sustainable development.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40407) SWITCHING THEORY AND LOGIC DESIGN

Course Objectives:

This course provides in-depth knowledge of switching theory and the design techniques of digital circuits, which is the basis for design of any digital circuit. The main objectives are:

- To learn basic tools for the design of digital circuits and fundamental concepts used in the design of digital systems.
- To understand common forms of number representation in digital electronic circuits and to be able to convert between different representations.
- To implement simple logical operations using combinational logic circuits
- To design combinational logic circuits, sequential logic circuits.
- To impart to student the concepts of sequential circuits, enabling them to analyze sequential systems in terms of state machines.
- To implement synchronous state machines using flip-flops.

UNIT -I:

Number System and Boolean Algebra And Switching Functions: Number Systems, Base Conversion Methods, Complements of Numbers, Codes-Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Alpha Numeric Codes, Error Detecting and Correcting Codes.

Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT -II:

Minimization and Design of Combinational Circuits: Introduction, The Minimization with theorem, The Karnaugh Map Method, Five and Six Variable Maps, Prime and Essential Implications, Don't Care Map Entries, Using the Maps for Simplifying, Tabular Method, Partially Specified Expressions, Multi-output Minimization, Minimization and Combinational Design, Arithmetic Circuits, Comparator, Multiplexers, Code Converters, Wired Logic, Tristate Bus System, Practical Aspects related to Combinational Logic Design, Hazards and Hazard Free Relations.

UNIT -III:

Sequential Machines Fundamentals: Introduction, Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, The Flip-Flop, The D-Latch Flip-Flop, The "Clocked T" Flip-Flop, The " Clocked J-K" Flip-Flop, Design of a Clocked Flip-Flop, Conversion from one type of Flip-Flop to another, Timing and Triggering Consideration, Clock Skew.

UNIT -IV:

Sequential Circuit Design and Analysis: Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Design Aspects, State Reduction, Design Steps, Realization using Flip-Flops.

Counters - Design of Single mode Counter, Ripple Counter, Ring Counter, Shift Register, Shift Register Sequences, Ring Counter Using Shift Register.

UNIT -V:

Sequential Circuits: Finite state machine-capabilities and limitations, Mealy and Moore models-minimization of completely specified and incompletely specified sequential machines, Partition techniques and Merger chart methods-concept of minimal cover table.

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.

TEXT BOOKS:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge.
2. Digital Design- Morris Mano, PHI, 3rd Edition.

REFERENCE BOOKS:

1. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
2. Digital Fundamentals – A Systems Approach – Thomas L. Floyd, Pearson, 2013.
3. Digital Logic Design - Ye Brian and HoldsWorth, Elsevier
4. Fundamentals of Logic Design- Charles H. Roth, Cengage LEanring, 5th, Edition, 2004.
5. Digital Logic Applications and Design- John M. Yarbrough, Thomson Publications, 2006.
6. Digital Logic and State Machine Design – Comer, 3rd, Oxford, 2013.

Course Outcomes:

Upon completion of the course, students should possess the following skills:

- Be able to manipulate numeric information in different forms, e.g. different bases, signed integers, various codes such as ASCII, gray, and BCD.
- Be able to manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions.
- Be able to design and analyse small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits.
- Be able to design and analyse small sequential circuits and devices and to use standard sequential functions/building blocks to build larger more complex circuits.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A40415) PULSE AND DIGITAL CIRCUITS

Objectives:

The main objectives are:

- To explain the complete response of R-C and R-L-C transient circuits.
- To explain clippers, clampers, switching characteristics of transistors and sampling gates.
- To construct various multivibrators using transistors, design of sweep circuits and sampling gates.
- To discuss and realize logic gates using diodes and transistors.

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

UNIT –IV:

Multivibrators: Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors, 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 -V:

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. **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 a
2. nd Mothiki S. Prakash Rao, 2 Ed., 2008, TMH.
3. Solid State Pulse Circuits –David A. Bell, 4 Ed., 2002 PHI.

REFERENCE BOOKS:

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.

Outcomes:

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

- Understand the applications of diode as integrator, differentiator, clippers, clampler circuits.
- Learn various switching devices such as diode, transistor, SCR.
- Difference between logic gates and sampling gates
- Design mutivibrators for various applications, synchronization techniques and sweep circuits.
- Realizing logic gates using diodes and transistors.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A41104) CLINICAL SCIENCES-I

The **course objective** is to make the learner understand

- The diseases that can affect the functioning the human systems.
- The anatomical and physiological terms used to refer the human body.
- The equipment in cardiology, neurology, nephrology, general surgery

UNIT-I

Nephrology: Principles of dialysis; Haemodialysis, Acetate dialysis, Bicarbonate dialysis. Peritonial dialysis, Chronic ambulatory peritoneal dialysis, Haemoperfusion, Sequential ultra-filtration. Haemofiltration, Adequacy of dialysis, Clearance, dialysance,Components of dialysing system, Dialysate, composition of dialysate, Types of dialysers, controls and monitoring devices for dialysers. Clinical significance. Renal transplantation: Basic principles.

UNIT-II

Neurology: Diseases of nervous system, spinal cord lesions, motor nervous disease, Prolapsed intravertebral disc, Neuropathies, Myasthenia gravis, Diseases of muscle. 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 axion reflexes. Disorders of neuromuscular transmission

UNIT-III

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-IV

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-V

General Surgery: Surgical patient. Clinically significant investigations, Pre-operative preparation. Study and operation of surgical equipment. laparoscopy and its use in various surgeries 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, 3rd 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 Procedures2nd ed, Marcel Dekker, 2004.

Course Outcomes:

By the end of this course, learner will be able to:

- Explain the abnormalities that can occur in the physiological systems.
- Explain the components of the important equipment in nephrology, cardiology, neurology and gastroenterology.
- Illustrate the anatomical location of the systems and explain their function.
- Identify the surgical equipment and explain pre-operative preparation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A41103) BIOTRANSDUCERS AND APPLICATIONS

The **course objective** is to make the learner understand

- Measurement of physical/chemical/biological variables relevant to medicine and biology using state-of-the-art instrumentation.
- Design of instruments useful to the medical community.
- Identify the biomedical problems that can be addressed by instrumentation. All this is done on a graduate level, and in-depth, focusing on transducers and the input stage of the associated electronics.

UNIT-I

Introduction: Classification, Basic requirements of bio transducers, Quasi state effects (linearity, Hysteresis), 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. TEMPERATURE TRANSDUCERS (Measurement Principle, Design and Applications): Thermo resistive, Thermo electric, PN junction diode- Thermometers, frequency change temperature Transducers, Chemical Thermometry, Radiation Thermometry.

UNIT-II

Displacement, Transducers: Potentiometric Transducers: Resistive, Resistive strain gauges. L V. D. T, Inductive displacement transducer, Capacitive displacement transducers, Ultrasonic methods. FORCE & VELOCITY **Transducers**: Differentiation and Integration methods, Doppler system, Methods based on the mass bauer effect, Electromagnetic methods. Acceleration transducers: Piezo electric transducers.

UNIT-III

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-IV

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- V

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.

Course Outcomes:

By the end of this course, students: will become competent in basic concepts and topics of Transducers shall be able to:

- Measure physical/ chemical /biological variables relevant to medicine and biology using state-of-the-art instrumentation.
- Design instruments useful to the medical community.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A41105) HOSPITAL SYSTEM MANAGEMENT

The **Course Objective** is to make the learner understand

- Role and functions of biomedical engineers in a hospital.
- The various aspects of hospital sytems and services.

UNIT-I

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

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

UNIT-II

.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.

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-III

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-IV

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

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

UNIT-V

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.

Course Outcomes

At the end of the course learner will be able to apply the concepts in

- Hospital planning
- Hospital services
- Computer and information management in hospitals
- Biomedical equipment services and maintenance
- Electrical factors in hospital design

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A41181) TRANSDUCERS LAB

Course objective: To understand the working principles different types of transducers

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

Course Outcome

To make the students

- Analyse the performance of different types of transducers
- Appreciate the applications of them

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

II Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A40481) BASIC SIMULATION LAB

Course Objective is to simulate various signals, systems and their characteristics in different domains like Fourier transform, Laplace transform and Z-transform using MATLAB

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 realiazability 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.

Course Outcome

Students successfully simulate various signals, systems and characteristics in different domain.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50010) MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Objectives:

To enable the student to understand and appreciate, with a practical insight, the importance of certain basic issues governing the business operations namely: demand and supply, production function, cost analysis, markets, forms of business organisations, capital budgeting and financial accounting and financial analysis.

Unit I

Introduction & Demand Analysis*:* Definition, Nature and Scope of Managerial Economics. Demand Analysis: Demand Determinants, Law of Demand and its exceptions. *Elasticity of Demand*: Definition, Types, Measurement and Significance of Elasticity of Demand. *Demand Forecasting,* Factors governing demand forecasting, methods of demand forecasting.

Unit II

Production & 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. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III

Markets & New Economic Environment: Types of competition and Markets, Features of Perfect competition, Monopoly and Monopolistic Competition. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Joint Stock Company, Public Enterprises and their types, *New Economic Environment*: Changing Business Environment in Post-liberalization scenario.

Unit IV

Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising capital - Trading Forecast, Capital Budget, Cash Budget. 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 V

Introduction to Financial Accounting & Financial Analysis: Accounting concepts and Conventions - Introduction IFRS - Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). *Financial Analysis***:** Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability ratios. Du Pont Chart.

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand, 2009.
2. S.A. Siddiqui & A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age international Publishers, Hyderabad 2013.
3. M. Kasi Reddy & Saraswathi, Managerial Economics and Financial Analysis, PHI New Delhi, 2012.

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.2012.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson, 2012.
3. Lipsey & Chrystel, Economics, Oxford University Press, 2012
4. Domnick Salvatore: Managerial Economics in a Global Economy, Thomson, 2012.
5. Narayanaswamy: Financial Accounting—A Managerial Perspective, Pearson, 2012.
6. S.N.Maheswari & S.K. Maheswari, Financial Accounting, Vikas, 2012.
7. Truet and Truet: Managerial Economics: Analysis, Problems and Cases, Wiley, 2012.
8. Dwivedi: Managerial Economics, Vikas, 2012.
9. Shailaja & Usha : MEFA, University Press, 2012.
10. Aryasri: Managerial Economics and Financial Analysis, TMH, 2012.
11. Vijay Kumar & Appa Rao, Managerial Economics & Financial Analysis, Cengage 2011.
12. J. V. Prabhakar Rao & P.V. Rao, Managerial Economics & Financial Analysis, Maruthi Publishers, 2011.

Outcomes:

At the end of the course, the student will

- Understand the market dynamics namely, demand and supply, demand forecasting , elasticity of demand and supply, pricing methods and pricing in different market structures.

- Gain an insight into how production function is carried out to achieve least cost combination of inputs and cost analysis
- Develop an understanding of
- Analyse how capital budgeting decisions are carried out
- Understand the framework for both manual and computerised accounting process
- Know how to analyse and interpret the financial statements through ratio analysis.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50414) PRINCIPLES OF COMMUNICATIONS

Course Objective: To provide the basic concepts of communication systems.

UNIT-I

Introduction : Block diagram of Electrical communication system, Radio communication : Types of communications, Analog, pulse and digital Types of signals, Noise – Types of noise, sources of noise, calculation of noise in Linear systems, and noise figure.

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.

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

UNIT- III

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

UNIT- IV

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

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

UNIT-V

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

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, 20th 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.

Course Outcome:

On successful completion of the module students will be able to…

- explain the main concepts of analogue and digital communication systems;
- analyze and design an AM and FM modulator/demodulator;
- explain, discuss, and compare different binary digital modulation techniques;
- explain types of noise & effects of noise on communication system

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50421) DIGITAL SIGNAL PROCESSING

Objectives: This course is an essential course that provides design techniques for processing all type of signals in various fields. The main objectives are:

- To provide background and fundamental material for the analysis and processing of digital signals.
- To familiarize the relationships between continuous-time and discrete-time signals and systems.
- To study fundamentals of time, frequency and Z-plane analysis and to discuss the inter-relationships of these analytic method.
- To study the designs and structures of digital (IIR and FIR) filters from analysis to synthesis for a given specifications.
- The impetus is to introduce a few real-world signal processing applications.
- To acquaint in FFT algorithms, Multi-rate signal processing techniques and finite word length effects.

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

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 -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.

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 -III:

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 -IV:

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 -V:

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion.

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, 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, 2nd Edition, Pearson Education, 2009.
6. Digital Signal Processing - Nagoor Khani, TMG, 2012

Course Outcomes:

On completion of this subject, the student should be able to:

- Perform time, frequency and Z -transform analysis on signals and

systems.

- Understand the inter-relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of round off errors.
- Design a digital filter for a given specification.
- Understand the fast computation of DFT and appreciate the FFT processing.
- Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A50425) LINEAR AND DIGITAL IC APPLICATIONS

Course Objectives:

The main objectives of the course are:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non - linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs.
- To understand and implement the working of basic digital circuits.

UNIT -I:

Operational Amplifier Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT -II:

Op-Amp, IC-555 & IC 565 Applications Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave,IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT -III:

Data Converters : Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT -IV:

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL

Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers , Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT -V:

Sequential Logic IC's and Memories : Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers**.**

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005.

REFERENCE BOOKS:

1. Op Amps and Linear Integrated Circuits-Concepts and Applications James M. Fiore, Cengage Learning/ Jaico, 2009.
2. Operational Amplifiers with Linear Integrated Circuits by K.Lal Kishore – Pearson, 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH.
4. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
5. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005.
6. Operational Amplifiers with Linear Integrated Circuits, 4/e William D.Stanley, Pearson Education India, 2009.

Course Outcomes:

On completion of this course, the students will have:

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Understanding of the different families of digital integrated circuits and their characteristics.

Also students will be able to design circuits using operational amplifiers for various applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
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(A51107) CLINICAL SCIENCES -II

The **course objective** is to make the learner understand

- The concepts in general Anesthesia and postoperative care and patient monitoring during surgery.
- Techniques of intravascular pressure, humidity and temperature measurement.
- The terms and principles of radiation therapy.
- Determination and distribution of radioactive material within the body.
- Organ imaging procedures in CNS, Cardiovascular system, Respiratory system, kidney, liver and spleen

UNIT-I

Orthopedics: classification of joints, reduction replacements

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

UNIT-II

Anesthesia: general Anesthesia, uptake of Anesthetic gases and vapors, 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-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. Radio therapy: Principles of radiation, cancer radio therapy. Perspective, Radio sensitivity, Radio resistance of tumors and Tissues. Classification of Tumors according to cell radio sensitivity.

Cell survival theory: Oxygen effect. Cell repair, radio curability of tumors. Therapeutic ratio. normal Tissue tolerance dose.

Modification of radiation response: Physical, chemical and Biomedical modifiers.

UNIT-IV

Management on radiation: Radioactive protection. Somatic effects, LD 50. Cause 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 defense. Physical measurements and medical tests.

UNIT-V

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. 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 Orthopedics. Churchill Livingstone, 2001.
2. Ronald. D. Miller., Miller's Anesthesia: 2 volume set, 2004.
3. W.J. Meredith & J.B.Massey, Fundamental Physics of Radiology. Johns and Cunningham

REFERENCES:

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

Course Outcomes:

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

- Explain the pathological investigations.
- Describe the terms and techniques of radiotherapy.
- Demonstrate Organ imaging procedures in CNS, Cardiovascular system, Respiratory system, kidney, liver and spleen.
- Explain the Therapeutic uses of radioisotopes.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A51106) BIOMEDICAL EQUIPMENT-I

The **Course Objective** is to make the learner understand

- Conduction system of heart, measurement of pH, pCO2, pO2
- Biomedical equipment related to heart and brain
- Different monitoring devices

UNIT-I

Electrocardiogram - Conduction System of Heart, ECG Lead Configurations, ECG Machine – Block Diagram and Circuits, Artifacts in ECG Recording, Multichannel ECG Machines, Vectorcardiograph, Frank Lead System and Phonocardiograph – Origin, Microphones, Amplifiers and Writing Methods.

Blood Pressure Measurement – Auscultatory, Oscillometric and Ultrasonic Techniques

Blood Flow Meters – Electromagnetic, Ultrasonic and Laser Doppler Techniques.

UNIT-II

Arrhythmia Monitor, Exercise Stress Testing, Ambulatory Monitor – Holter – Data recording, data replay and Analysis, Bedside Patient Monitoring System and Central Monitoring System – Block Diagram, Fetal Monitors, Apnea Monitors.

UNIT-III

E.E.G – 10-20 Electrode Placement, EEG Machine, Normal and Abnormal Waveforms, Evoked Potentials and their recording, E.M.G Machine – Block Diagram and Circuits

UNIT-IV

pH Meter, Conductivity Meter, Electrophoresis, Gas Liquid Chromatograph, Flame Photometer, SpectroPhotometer, Automated Chemical Analyser, Electrolyte Analysers, Cell Counter - Coulter.

UNIT-V

Oximetry, Ear Oximeter, Pulse Oximeter, Skin Reflectance Oximeter, Intravascular Oximeter.

Blood Gas Analyser – measurement of pH, pCO2, pO2, Intra-arterial blood gas monitoring, A Complete Blood Gas Analyser.

TEXT BOOKS

1. R. S. Khandpur, Handbook of Bio Medical Instrumentation, Tata

McGraw Hill, 2nd Edition, 2003

2. John G. Webster, Medical Instrumentation Application and Design, Wiley, 3rd Edition, 2013.

REFERENCE BOOKS

1. Joseph .J. Carr, John M. Brown, Introduction to Biomedical Equipment Technology, Pearson-2001.

2. Shakti Chatterjee and Aubert Miller, Biomedical Instrumentation, CENGAGE Learning, 2010.

Course Outcomes

At the end of this course the learner will have good understanding of measuring and monitoring equipment.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
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(A50086) ADVANCED COMMUNICATION SKILLS (ACS) LAB

Introduction

The introduction of the Advanced Communication Skills Lab is considered essential at 3rd 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 a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organise ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

Objectives:

This Lab focuses on using multi-media 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.
- To prepare all the students for their placements.

Syllabus:

The following course content to conduct the activities is prescribed for the Advanced Communication Skills (ACS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Minimum Requirement:

The Advanced Communication Skills (ACS) Laboratory shall have the following infra-structural facilities to accommodate at least 35 students in the lab:

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**

- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

Prescribed Lab Manual: A book titled ***A Course Book of Advanced Communication Skills (ACS) Lab*** published by Universities Press, Hyderabad.

Suggested Software:

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

- **Oxford Advanced Learner's Compass**, 7th 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**

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. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
4. Business and Professional Communication: Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
5. The Basics of Communication: A Relational Perspective. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications.

2012.

6. English Vocabulary in Use series, Cambridge University Press 2008.
7. Management Shapers Series by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
8. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
11. Job Hunting by Colm Downes, Cambridge University Press 2008.
12. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
13. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.
14. Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/ Cambridge University Press.
15. 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 ACS 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 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, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

1. **Seminar/ Professional Presentation**
2. **A Report on the same has to be prepared and presented.**

* ***Teachers may use their discretion to choose topics relevant and suitable to the needs of students.***
* ***Not more than two students to work on each mini project.***
* ***Students may be assessed by their performance both in oral presentation and written report.***

Outcomes

- Accomplishment of sound vocabulary and its proper use contextually.
- Flair in Writing and felicity in written expression.
- Enhanced job prospects.
- Effective Speaking Abilities

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
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(A50492) PULSE CIRCUITS AND IC APPLICATIONS LAB

PULSE AND DIGITAL CIRCUITS LAB

Minimum Twelve experiments to be conducted:

1. Linear Wave Shaping
   a. RC Low Pass Circuit for different time constants
   b. RC High Pass Circuit for different time constants
2. Non-linear wave shaping
   a. Transfer characteristics and response of Clippers:
      i) Positive and Negative Clippers
      ii) Clipping at two independent levels
   b. The steady state output waveform of clampers for a square wave input
      i) Positive and Negative Clampers
      ii) Clamping at reference voltage
3. Comparison Operation of Comparators
4. Switching characteristics of a transistor
5. Design a Bistable Multivibrator and draw its waveforms
6. Design an Astable Multivibrator and draw its waveforms
7. Design a Monostable Multivibrator and draw its waveforms
8. Response of Schmitt Trigger circuit for loop gain less than and greater than one
9. UJT relaxation oscillator
10. The output- voltage waveform of Boot strap sweep circuit
11. The output- voltage waveform of Miller sweep circuit
12. Pulse Synchronization of An Astable circuit
13. Response of a transistor Current sweep circuit
14. Sampling gates

a. Response of Unidirectional gate

b. Response of Bidirectional gate using transistors

15. Study of logic gates

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

Note:

- To perform any twelve experiments (choosing at least five from each part).
- Verify the functionality of the IC in the given application.

Part-I

Linear IC Experiments

1. OP AMP Applications – Adder, Subtractor, Comparators.
2. Integrator and Differentiator Circuits using IC 741.
3. Active Filter Applications – LPF, HPF (first order)
4. IC 741 Waveform Generators – Sine, Squarewave and Triangular waves.
5. IC 555 Timer – Monostable and Astable Multivibrator Circuits.
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. 3-8 decoder using 74138
2. 4-bit comparator using 7485.
3. 8*1 Multiplexer using 74151 and 2*4 Demultiplexer using 74155.
4. D, JK Flip Flops using 7474, 7483.
5. Decade counter using 7490.
6. UP/DOWN counter using 74163
7. Universal shift registers using 74194/195.

8. RAM (16*4) using 74189 (Read and Write operations).

EQUIPMENT REQUIRED:

1. 20 MHz/ 40 MHz/60 MHz Oscilloscope
2. 1 MHz Function Generator (Sine, Square, Triangular and TTL) .
3. Regulated Power Supply.
4. Multimeter / Volt Meter.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60117) DISASTER MANAGEMENT

(Open Elective)

Unit-I

Environmental Hazards & Disasters: Meaning of Environmental hazards, Environmental Disasters and Environmental stress. Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology - Landscape Approach - Ecosystem Approach - Perception approach - Human ecology & its application in geographical researches.

Unit –II

Types of Environmental hazards & Disasters: Natural hazards and Disasters - Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards –

Unit –III

Endogenous Hazards - Volcanic Eruption – Earthquakes – Landslides - Volcanic Hazards/ Disasters - Causes and distribution of Volcanoes - Hazardous effects of volcanic eruptions - Environmental impacts of volcanic eruptions - Earthquake Hazards/ disasters - Causes of Earthquakes - Distribution of earthquakes - Hazardous effects of - earthquakes - - Earthquake Hazards in India - - Human adjustment, perception & mitigation of earthquake.

Unit –IV

Exogenous hazards/ disasters - Infrequent events- Cumulative atmospheric hazards/ disasters

Infrequent events: Cyclones – Lightning – Hailstorms

Cyclones: Tropical cyclones & Local storms - Destruction by tropical cyclones & local storms (causes , distribution human adjustment, perception & mitigation) Cumulative atmospheric hazards/ disasters : - Floods- Droughts- Cold waves- Heat waves Floods:- Causes of floods- Flood hazards India- Flood control measures (Human adjustment, perception & mitigation) Droughts:- Impacts of droughts- Drought hazards in India- Drought control measures- Extra Palnetary Hazards/ Disasters- Man induced Hazards / Disasters- Physical hazards/ Disasters-Soil Erosion

Soil Erosion:— Mechanics & forms of Soil Erosion- Factors & causes of Soil Erosion- Conservation measures of Soil Erosion

Chemical hazards/ disasters:— Release of toxic chemicals, nuclear explosion- Sedimentation processes Sedimentation processes:- Global Sedimentation problems- Regional Sedimentation problems- Sedimentation & Environmental problems- Corrective measures of Erosion & Sedimentation

Biological hazards/ disasters:- Population Explosion.

Unit –V

Emerging approaches in Disaster Management- Three Stages

1. Pre- disaster stage (preparedness)
2. Emergency Stage
3. Post Disaster stage-Rehabilitation

TEXT BOOKS:

1. Disaster Mitigation: Experiences And Reflections by Pardeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman – Cengage Learning

REFERENCES

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
3. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
4. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
5. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
6. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
7. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
8. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
9. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi
10. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management,IIPA, New Delhi, 2001

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
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(A60018) HUMAN VALUES AND PROFESSONAL ETHICS

(Open Elective)

Objectives : This introductory course input is intended

a. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.

c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Unit I:

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self Exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration. Continuous Happiness and Prosperity- A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit II:

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the characteristics and activities of 'I' and harmony in 'I'. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in

detail. Programs to ensure Sanyam and Swasthya.

Unit III:

Understanding Harmony in the Family and Society- Harmony in Human - Human Relationship : Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; **Trust (Vishwas) and Respect (Samman) as the foundational values of relationship.** Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyawastha)- from family to world family!

Unit IV:

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence : Understanding the harmony in the Nature. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Unit V:

Implications of the above Holistic Understanding of Harmony on Professional Ethics : Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order,

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

Case studies of typical holistic technologies, management models and production systems. Strategy for transition from the present state to Universal

Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

TEXT BOOKS

1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

2. Prof. KV Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications,3rd Edition.

EFERENCE BOOKS

1. Ivan Illich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA

2. E.F. Schumacher, 1973, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.

3. A Nagraj, 1998, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak.

4. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991

5. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Purblishers.

6. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

7. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) Krishi Tantra Shodh, Amravati.

8. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

9. E G Seebauer & Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press

10. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethichs (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. Al Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charlie Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology – the Untold Story

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60017) 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.

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

UNIT – IV

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

Unfair competition : Misappropriation right of publicity, False advertising.

UNIT – V

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

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

TEXT BOOKS & REFERENCES:

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

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A61109) BIOLOGICAL CONTROL SYSTEMS

The **course objective** is to make the learner understand

- The principles and applications of the control systems in everyday life
- The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems
- The different aspects of stability analysis of the systems in frequency domain and time domain

UNIT-I

Dynamic Systems and their Control. Modelling and Block Diagrams. Open and Closed loop Systems. Principles and General Engineering Techniques of Feedback Control. Basic Closed Loop Relation. Closed Loop Dynamics of First Order and Second Order.

UNIT-II

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

UNIT-III

Examples of Biological Control Systems. Pupil Control System. Visual Fixation System. Oculo-motor System. Skeletal Muscle Servomechanism. The Semicircular Canal. Free Swinging Limbs. Thermo Regulation.

UNIT-IV

Respiration Models and Controls. Cardiovascular Control Systems. Sugar Level Control Mechanism. Endocrine Control System. Excretion Control.

UNIT-V

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

TEXT BOOKS

1. Ogata Katsuhika, Modem 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.

Course Outcomes:

At end of this course students will be able to:

- Explain Block Diagram, Transfer Function
- Do State Space Analysis
- Design in frequency domain
- Perform Stability Analysis(time and frequency)

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A60430) MICROPROCESSORS AND MICROCONTROLLERS

Course Objective:

- To develop an in-depth understanding of the operation of microprocessors and microcontrollers, machine language programming & interfacing techniques.

UNIT -I:

8086 Architecture: 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, 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, D/A and A/D Converter.

Interfacing with advanced devices: Memory Interfacing to 8086, Interrupt Structure of 8086, Vector Interrupt Table, Interrupt Service Routine.

Communication Interface: Serial Communication Standards, Serial Data Transfer Schemes, 8251 USART Architecture and Interfacing.

UNIT -IV:

Introduction to Microcontrollers: Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051, Simple Programs

UNIT -V:

8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

TEXT BOOKS:

1. D. V. Hall, Microprocessors and Interfacing, TMGH, 2nd Edition 2006.
2. Kenneth. J. Ayala, The 8051 Microcontroller , 3rd Ed., Cengage Learning.

REFERENCE BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2nd Edition 2006.
2. The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
3. Micro Computer System 8086/8088 Family Architecture, Programming and Design - Liu and GA Gibson, PHI, 2nd 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

Course Outcome:

- The student will learn the internal organization of popular 8086/8051 microprocessors/microcontrollers.
- The student will learn hardware and software interaction and integration.
- The students will learn the design of microprocessors/ microcontrollers-based systems.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A61111) MEDICAL IMAGE ACQUISITION TECHNIQUES

The course objective is to make the learner understand

- The principles of the medical imaging.
- The physical principles, usages and limitations of each imaging modality.
- The different imaging systems and their basic parts.
- Which physical or physiological properties can be measured with each modality?
- Biological effects of ionizing radiation.

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.

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-II

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

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-IV

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

UNIT-V

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. 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

Course Outcomes:

By the end of this course, students should be able to:

- Explain the mechanisms of radiation interaction with human body.
- Explain the concepts of medical imaging, image quality (noise, contrast and resolution).
- Explain X-ray machine, CT, Ultrasound and MRI Scanner.
- Implement various algorithms for image reconstruction.
- Compare different imaging techniques.
- Explain the biological effects of ionizing radiation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A61110) BIOMEDICAL EQUIPMENT-II

The **Course Objective** is to make the learner understand

- Various types of Pacemaker, Defibrillator, Dialysis and Diathermy equipment.
- The measurement of human hearing levels.

Unit-I

Pacemaker: Synchronous and Asynchronous, External and Internal, Demand and Fixed type Pacemaker, Programmable Pacemakers, Rate Responsive Pacemaker, Leads and Electrodes, Packing and Power Sources.

Defibrillators: AC and DC, Automatic External, Implantable Defibrillators, Cardioverter, Electrodes for Defibrillator, Defibrillator Analyzer.

UNIT-II

Dialysis Machines: Dialyzer – Parallel Flow, Coil, Hollow Fiber, Membranes for Haemo Dialysis, HaemoDialysis Machine – Electronic Control and Monitoring Systems, Portable Kidney Machines.

Heart Lung machine: Governing Principle, Qualitative Requirements, Bypass Circuits Functional details of types of blood oxygenerators.

Intra Aortic Balloon Pump - Principle and Application.

UNIT-III

Surgical Diathermy – Principle, Machine, Safety Aspects.

Anesthesia Machine – Need, Gas Supply, Vapour Delivery, Humidifier Systems.

Ventilators – Types, Microprocessor based.

Neubilisers

UNIT-IV

Shortwave Diathermy, Microwave Diathermy, Ultrasonic Diathermy, Electrodiagnosis and Electrotheraphy, Transcutaneous Electrical Nerve Stimulation,

Stimulators - Spinal, Phrenic Nerve, Bladder, Cerebellar.

Unit –V

Audiometer – Pure Tone, Speech, Bekesy, Evoked Response.

Infusion Pumps: Components. Implantable Infusion systems, Drop rate counter, Programmable Volumetric and Microprocessor based Infusion Pumps.

TEXT BOOKS

1. R. S. Khandpur, Handbook of Bio Medical Instrumentation, Tata McGraw Hill, 2nd Edition, 2003
2. John G. Webster, Medical Instrumentation Application and Design, Wiley, 3rd Edition, 2013.

REFERENCE BOOKS

1. S. Ananthi, A Textbook of Medical Instruments, A New Age International (P) Ltd. Publishers, 2006.
2. Joseph .J. Carr, John M. Brown, Introduction to Biomedical Equipment Technology, Pearson-2001.
3. Shakti Chatterjee and Aubert Miller, Biomedical Instrumentation, CENGAGE Learning, 2010.

Course Outcomes

At the end of this course the learner will have good understanding of different therapeutic Equipment.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A61108) BIOFLUIDS AND MECHANICS

The **Course Objective** is to make the learner understand

- The dynamics and problems associated with blood flow
- Respiratory mechanics
- Forces in the body and stress and deformation in human and animal tissues

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.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 extracarporeal blood flow.

UNIT-II

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.

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-III

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-IV

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.

Soft Tissue Mechanics: Pseudo elasticity, Non-Linear stress-strain relationship, Structure, Function and mechanical properties of skin, ligaments and tendons.

UNIT-V

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.

Course Outcomes

By the end of the course learner will be able to

- Analyze fluid mechanics in the human.
- To model the biological flow in human body.
- Identify specific diseases and how they are related to fluid dynamics.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A61182) BIOMEDICAL EQUIPMENT LAB

Course Objective

To learn the physiology of the human body and the Instrumentation related to Biomedical Systems.

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. Pneumotachograph 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

Course Outcomes

- To explain the concepts of physiology and the Electrical Components of a Biomedical System
- To discuss the measurement of physiological parameters.
- To explain the concepts of Imaging System and Telemetry ad the various Therapeutic Equipment used in Medicine.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A60494) MICROPROCESSORS AND MICROCONTROLLERS LAB

Note:

- Minimum of 12 experiments are o be conducted.
- The Following programs/experiments are to be written for assembler and to be executed the same with 8086 and 8051 kits.

List of Experiments:

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. Programming using arithmetic, logical and bit manipulation instructions of 8051.
11. Program and verify Timer/ Counter in 8051.
12. Program and verify Interrupt handling in 8051
13. UART Operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/ Keyboard to 8051.
17. Data Transfer from Peripheral to Memory through DMA controller 8237 / 8257.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A71114) MEDICAL IMAGE PROCESSING

The Course Objective is to make the learner understand

- the fundamental concepts of a digital image processing system
- Image Enhancement, Restoration, Compression
- Processing of Medical Images

UNIT-I

Digital Image fundamentals: Digital Image Processing System, Applications, Digitization of an image – Spatial and Intensity Quantization, Quality of an Image – Spatial resolution, Brightness Representation, Noise Content, Color Images

Image transforms: Unitary, 1D-DFT, 2D-DFT, Discrete Cosine Transform (DCT) and Discrete Sine Transform (DST)

UNIT II

Image Enhancement: Spatial domain, frequency domain methods, Histogram equalization, Mask Processing: Image Smoothing, Image sharpening (filters).

Image Segmentation – Masks – Point detection – Line Detection – Edge Detection.

UNIT III

Image Restoration – Model of the image Degradation Process, Restoration in the presence of noise only spatial filtering, periodic Noise reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error(Weiner) Filtering, Least Squares Filtering.

UNIT – IV

Image Compression – Fundamentals, Image compression Models, Error-free Compression, Lossy Compression, Image Compression Standards.

UNIT – V

Processing of Medical Images – Processing and Feature Extraction of CT, MRI, Ultrasound and PET Images.

TEXT BOOKS:

1. Geoff Dougherty, Digital Image Processing for medical Applications. Cambridge University Press, 2007.
2. Kayvan Najarian and Robert Splinter, Biomedical Signal and Image Processing, CRC Press, Taylor and Francis, 2006.
3. Digital Image Processing – by R.C. Gonzalez & R.E. Woods, Addison

Wesley.

REFERENCE

1. Pattern Recognition Principles – J.T.TOU.R.C. Gonzalez, Addison Wesley.
2. Fundamentals of Digital Image Processing – by A.K. Jain, PHI Pearson Education

Course Outcomes

At the end of the course students who shall be able to:

- Explain the fundamental concepts of a digital image processing system.
- Analyze images in spatial and frequency domain.
- Design and implement algorithms for digital image processing with the Signal and Image Processing Toolboxes.
- Apply image processing to Medical Images.

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IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A71115) REHABILITATION ENGINEERING

Course Objective is to understand

- the key concepts in sensory and motor rehabilitation and the augmentation and substitution devices
- the prosthetic and orthotic devices used in rehabilitation
- computer interface for visual perception and improved mobility

UNIT-I

Engineering concepts in Rehabilitation Engineering. Anthropometry: Methods for Static and dynamic Measurements, Area 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

Orthopedic Prosthetics and Orthotics in rehabilitation: Engineering Principles.

Prosthesis - Amputation Types and Prescribed Prostheses, Components of Upper Limb Prosthesis – Sockets and Liners, Suspension, Control Systems (Myoelectric), Shoulder, Elbow and Wrist Components, Terminal Devices. Components of Lower Limb Prosthesis – Sockets and Liners, Suspension, Hip, Pelvic, Knee and Ankle Components.

Orthotics – Biomechanical Principles, Spinal, Upper Extremity and Lower Extremity

FES Systems - Restoration of hand function, restoration of standing and walking.

UNIT-III

Engineering concepts in sensory rehabilitation Engineering. Sensory augmentation and substitution.

Assistive Technology for visually Impaired – General Purpose, Task Specific (Mobility, Reading, Writing, Computer Access, Communication)

Assistive Technology for Hearing Impaired – Hearing Assistance Solutions – Medical and Surgical Approach to restore function - Hearing aids, cochlear implantation, Assistive Listening Solutions, visual and tactual Substitution.

UNIT-IV

Alternative and Augmentative Communication (AAC) – user interface, Language Representation, Technology and Devices Features. Human

Factors, Performance Measurement.

Wheelchairs – Manual, Electric Power, Power Assisted, Multi Functional, Standards, Wheelchais Transportation System, Securement Systems.

UNIT-V

Rehabilitation Robotics – Intelligent Mobility Aids, Robotic Manipulation Aids, Therapeutic Robots

Environmental Control Systems.

Brain computer interface

TEXTBOOKS:

1. Rory A. Cooper, Hisaichi Ohnabe, Douglas A. Hobson – An introduction to Rehabilitation Engineering – CRC Press, Taylor and Francis Group, 2007.
2. Bronzino, Joseph; Handbook of biomedical engineering. 2nd edition,CRC Press, 2000.

REFERENCE:

1. Horia- Nocholai Teodorecu, L.C.Jain , intelligent systems and technologies in rehabilitation engineering; CRC; December 2000.
2. Robinson C.J Rehabilitation engineering. CRC press 1995

Course Outcome

At the end of this course, the learner will be able to answer the key questions faced by the rehabilitation engineers like.

- How can a diminished function or sense be successfully augmented?
- Is there a substitute way to return the function or to restore a sense?
- Is the solution appropriate and cost effective?

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70515) COMPUTER NETWORKS

Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.

UNIT-I

Overview of the Internet: Protocol, Layering Scenario, TCP/IP Protocol Suite: The OSI Model, Internet history standards and administration; Comparison of the OSI and TCP/IP reference model.

Physical Layer: Guided transmission media, wireless transmission media.

Data Link Layer – design issues, CRC Codes, Elementary Data link Layer protocols, sliding window protocol.

UNIT-II

Multiple Access Protocols –ALOHA, CSMA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, data link layer switching & use of bridges, learning bridges, spanning tree bridges, repeaters , hubs, bridges , switches, routers and gateways.

UNIT-III

Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Count to Infinity Problem, Hierarchical Routing, Congestion control algorithms, admission control.

UNIT-IV

Internetworking: Tunneling, Internetwork Routing, Packet fragmentation, IPv4, Ipv6 Protocol, IP addresses, CIDR, IMCP, ARP, RARP, DHCP.

Transport Layer: Services provided to the upper layers elements of transport protocol-addressing connection establishment, connection release, Connection Release, Crash Recovery.

UNIT-V

The Internet Transport Protocols UDP-RPC, Real Time Transport Protocols, The Internet Transport Protocols- Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP

Connection Release, The TCP Connection Management Modeling, The TCP Sliding Window, The TCP Congestion Control, The future of TCP.

Application Layer-Introduction ,providing services, Applications layer paradigms, Client server model, Standard client-server application-HTTP, FTP, electronic mail, TELNET, DNS, SSH.

TEXT BOOKS:

1. Data Communications and Networking – Behrouz A. Forouzan, Fifth Edition TMH, 2013.
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. Introduction to Computer Networks and Cyber Security, Chwan-Hwa (John) Wu, J. David Irwin, CRC Press.
4. Computer Networks, L.L.Peterson and B.S.Davie, 4th edition, ELSEVIER.
5. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose,K.W.Ross,3rd Edition, Pearson Education.

Outcomes:

- Students should be understand and explore the basics of Computer Networks and Various Protocols. He/She will be in a position to understand the World Wide Web concepts.
- Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and ad hoc networks.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A71113) BIOMEDICAL SIGNAL PROCESSING

The **course objective** is to make the learner understand

- The fundamental concepts of a basic signal processing.
- The key components of a biomedical signal processing.
- Analysis tools for biological signals.
- The various biological phenomena.

UNIT-I

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

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

UNIT-III

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-IV

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

UNIT-V

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. 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. Weitkunat 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.

Course Outcomes:

By the end of this course, students should be able to:

- Explain the basic signal processing techniques.
- Develop basic mathematical, scientific and computational skills necessary to analyze biomedical signals.
- Formulate problems in biomedical signals.
- Design analysis tools for biological signals.
- Explain the complexity of biological signals and the impact, promise of biomedical engineering in understanding these signals.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70441) LASERS & FIBER OPTIC INSTRUMENTATION

(Elective-I)

Objective: To make the students under stand the application of Opto Electronics and Lasers in the quantifying**.**

UNIT – I

Optical Fibers and Their Properties: Introduction to optical fiber - fiber characteristics - principles of light propagation through a fiber - Different types of fibers and their properties - Losses in the optical fiber - Dispersion - advantages and disadvantages of optical fibers.

UNIT – II

Laser Fundamentals: Introduction to lasers - Laser characteristics – Laser configuration – Three level and four level lasers – Q-switching – Mode locking – Types of lasers: Gas lasers, Solid lasers, Liquid lasers and Semiconductor lasers.

UNIT – III

Opto-Electronic Components: Optical sources: LED, LD - Optical detectors: PIN, APD - Electro-optic, Magneto optic and Acousto-optic Modulators.

UNIT – IV

Industrial Applications of Optical Fibers: Interferometer method of measurement of length – Moire fringes – Measurement of pressure, Temperature, Current, Voltage, Liquid level and strain - fiber optic Gyroscope – Polarization maintaining fibers – Applications.

UNIT–V

Laser instrumentation: Industrial applications of lasers – Lasers for measurement of distance, length, velocity, acceleration, current, voltage and atmospheric effect - Bio-medical applications - Holography: Principle, Methods, Holographic Interferometers and applications.

TEXT BOOKS

1. ‘Optical Fiber Communication – Principles and Practice’, J.M. Senior, Prentice Hall of India, 1985.
2. ‘Introduction to Opto Electronics’, J. Wilson and J.F.B. Hawkes, Prentice Hall of India, 2001.

REFERENCES

1. Understanding Fiber Optics, 4th or 5th edition; Jeff Hecht; Prentice Hall publishers.

2. 'Optical Fibre Communication and Sensors', M. Arumugam, Anuradha Agencies, 2002.
3. 'Optical Fibre Communication', G. Keiser, 'McGraw Hill, 1995.
4. Lasers: Theory and Applications – by Thyagarajan K. and Ghatak A.K., Plenum Press
5. Monte Ross, 'Laser Applications', McGraw Hill, 1968

Outcome:

Upon completion of this course the student shall be able to apply his instrumentation knowledge and understand how light and LASER can be used for measurements.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70527) ARTIFICIAL NEURAL NETWORKS

(Elective-I)

Course Objectives:

The objectives of this course are to:

- Understand the basic building blocks of artificial neural networks (ANNs).
- Understand the role of neural networks in engineering and artificial intelligence modelling.
- Provide knowledge of supervised/unsupervised learning in neural networks.
- Provide knowledge of single layer and multilayer perceptions.
- To know about self-organizational maps and Hopfield models.

UNIT -I:

Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks.

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 -II:

Single Layer Perceptions: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perception –Convergence Theorem, Relation Between Perception and Bayes Classifier for a Gaussian Environment.

Multilayer Perception: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection.

UNIT -III:

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 -IV:

Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-

Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification.

UNIT -V:

Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm.

Hopfield Models – Hopfield Models, Computer Experiment.

TEXT BOOKS:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.

REFERENCE BOOKS:

1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005.
2. Neural Networks in Computer Inteligance, 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.

Learning outcomes

After the course the student should be able to:

- Explain the function of artificial neural networks of the Back-prop, Hopfield and SOM type.
- Explain the difference between supervised and unsupervised learning.
- Describe the assumptions behind, and the derivations of the ANN algorithms dealt with in the course.
- Give example of design and implementation for small problems.
- Implement ANN algorithms to achieve signal processing, optimization, classification and process modeling.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A72909) NANO TECHNOLOGY

(Elective-I)

Objective:

Nano Technology is one of the core subjects of multidisciplinary nature. This has extensive applications in the field of energy, electronics, Biomedical Engg. Etc. Built to specifications by manufacturing matter on the atomic scale, the Nano products would exhibit an order of magnitude improvement in strength, toughness and efficiency. The objective here is impart the basic knowledge in Nano Science and Technology.

Unit-I:

Introduction: History and Scope, Can Small Things Make a Big Difference? Classification of Nanostructured Materials, Fascinating Nanostructures, Applications of Nanomaterials, Nature: The Best of Nanotechnologist, Challenges and Future Prospects.

Unit-II:

Unique Properties of Nanomaterials: Microstructure and Defects in Nanocrystalline Materials:Dislocations, Twins,stacking faults and voids, Grain.

Boundaries, triple and disclinations, **Effect of Nano-dimensions on Materials Behavior:** Elastic properties, Melting Point, Diffusivity, Grain growth characteristics, Enhanced solid solubility, **Magnetic Properties**: Soft magnetic nanocrystalline alloy, Permanent magnetic nanocrystalline materials, Giant Magnetic Resonance, Electrical Properties, Optical Properties, Thermal Properties and Mechanical Properties.

Unit-III:

Synthesis Routes: Bottom up approaches: Physical Vapor Deposition, Inert Gas Condensation, Laser Ablation, Chemical Vapor Deposition, Molecular Beam Epitaxy, Sol-gel method ,Self assembly, **Top down approaches:** Mechanical alloying, Nano-lithography, **Consolidation of Nanopowders**: Shock wave consolidation, Hot isostatic pressing and Cold isostatic pressing Spark plasma sintering.

Unit-IV:

Tools to Characterize nanomaterials: X-Ray Diffraction (XRD), Small Angle X-ray scattering (SAXS), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), Atomic Force Microscopy (AFM), Scanning Tunneling Microscope (STM), Field Ion Microscope (FEM), Three-dimensional

Atom Probe (3DAP), Nanoindentation.

Unit-V:

Applications of Nanomaterials: Nano-electronics, Micro- and Nano-electromechanical systems (MEMS/NEMS), Nanosensors, Nanocatalysts, Food and Agricultural Industry, Cosmetic and Consumer Goods, Structure and Engineering, Automotive Industry, Water- Treatment and the environment, Nano-medical applications, Textiles, Paints, Energy, Defence and Space Applications, Concerns and challenges of Nanotechnology.

TEXT BOOKS:

1. Text Book of Nano Science and Nano Technology – B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Munday, University Press-IIM.
2. Introduction to Nanotechnology – Charles P. Poole, Jr., and Frank J. Owens, Wley India Edition, 2012.

REFERENCES BOOKS:

1. Nano: The Essentials by T.Pradeep, Mc Graw- Hill Education.
2. Nanomaterials, Nanotechnologies and Design by Michael F. Ashby, Paulo J. Ferreira and Daniel L.Schodek.
3. Transport in Nano structures- David Ferry, Cambridge University press 2000.
4. Nanofabrication towards biomedical application: Techniques, tools, Application and impact – Ed. Challa S.,S. R. Kumar, J. H. Carola.
5. Carbon Nanotubes: Properties and Applications- Michael J. O'Connell.
6. Electron Transport in Mesoscopic systems - S. Dutta, Cambridge University press.

Outcome:

The present syllabus of "Introduction to Nano Technology" will give insight into many aspects of Nanoscience, technology and their applications in the prospective of materials science.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70438) EMBEDDED & REAL TIME SYSTEMS

(Elective – II)

Objective: To learn the method of designing real time systems.

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.

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- II:

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.

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

UNIT -III :

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.

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.

UNIT -IV:

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.

UNIT – V:

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, Elseveir.

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.

Outcomes:

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

- Understand the basics of an embedded system
- Design, implement and test an embedded system.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70432) VLSI DESIGN

(Elective-II)

Course Objectives: The objectives of the course are to:

- Give exposure to different steps involved in the fabrication of ICs using MOS transistor, CMOS/BICMOS transistors and passive components.
- Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters designed with various loads.
- Give exposure to the design rules to be followed to draw the layout of any logic circuit.
- Provide concept to design different types of logic gates using CMOS inverter and analyze their transfer characteristics.
- Provide design concepts to design building blocks of data path of any system using gates.
- Understand basic programmable logic devices and testing of CMOS circuits.

UNIT –I:

Introduction: Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS

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 ωo; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.

UNIT -II:

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

UNIT –III:

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 -IV:

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

Array Subsystems: SRAM, DRAM, ROM, Serial Access Memories.

UNIT -V:

Programmable Logic Devices: PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach, Parameters influencing low power design.

CMOS Testing: CMOS Testing, Need for testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005 Edition
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3rd Ed, Pearson, 2009.
3. VLSI Design – M. Michael Vai, 2001, CRC Press.

REFERENCE BOOKS:

3. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011
4. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
5. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
6. VLSI Design- K .Lal Kishore, V. S. V. Prabhakar, I.K International, 2009.
7. Introduction to VLSI – Mead & Convey, BS Publications, 2010.

Course Outcomes:

Upon successfully completing the course, the student should be able to:

- Acquire qualitative knowledge about the fabrication process of integrated circuit using MOS transistors.
- Choose an appropriate inverter depending on specifications required for a circuit
- Draw the layout of any logic circuit which helps to understand and estimate parasitics of any logic circuit
- Design different types of logic gates using CMOS inverter and analyze their transfer characteristics

- Provide design concepts required to design building blocks of data path using gates.
- Design simple memories using MOS transistors and can understand Design of large memories.
- design simple logic circuit using PLA, PAL, FPGA and CPLD.
- Understand different types of faults that can occur in a system and learn the concept of testing and adding extra hardware to improve testability of system.

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IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A70437) DSP PROCESSORS AND ARCHITECTURES

(Elective-II)

Course Objectives:

The objectives of the course are:

- To recall digital transform techniques.
- To introduce architectural features of programmable DSP Processors of TI and Analog Devices..
- To give practical examples of DSP Processor architectures for better understanding.
- To develop the programming knowledge using Instruction set of DSP Processors.
- To understand interfacing techniques to memory and I/O devices.

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.

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 –II:

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 -III:

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 –IV:

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices – ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.

Introduction to Blackfin Processor - The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT –V:

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).

TEXT BOOKS:

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach To Digital Signal Processing - K Padmanabhan, R. Vijayarajeswaran, Ananthi. S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007.

REFERENCE BOOKS:

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features – Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes.

Course Outcomes: Upon completion of the course, the student

- Be able to distinguish between the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320C54xx and ADSP 2100 DSP devices.
- Be able to write simple assembly language programs using instruction set of TMS320C54xx.
- Can interface various devices to DSP Processors.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A71183) BIOMEDICAL SIGNAL PROCESSING LAB

Course Objective

To understand

- Signal Conditioning
- Filters
- Data Compression Techniques
- Noise Cancellation Techniques

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 or I I R Filter.
8. Design of F I R 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)

Course Outcome

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

- Design filters
- Apply various data compression and noise cancellation techniques to biomedical signals

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-I Sem	**L**	**T/P/D**	**C**
	-	**-/3/-**	**2**

(A71184) MEDICAL IMAGING LAB

Course Objective

Understand medical diagnostic image reconstruction and enhancement techniques using MATLAB

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. Point Detection.
6. Line Detection.
7. Edge Detection.
8. Reconstruction Algorithm for Parallel and Fan Beam Projections.
9. Back Projection Algorithm.
10. A.R.T. (Algebraic Reconstruction Techniques).
11. S. A. R. T. (Simultaneous Algebraic Reconstruction Technique)
12. S. I. R T (Simultaneous Iterative Reconstruction Technique)
11. Image Enhancement –Histogram.

Additional requirements along with the computer facilities C compiler

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

Course Outcome

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

- Apply filtering and detection techniques to images.
- Implement reconstruction techniques.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80241) RELIABILITY ENGINEERING

(Elective-III)

Unit - I

Basic Concepts of Reliability: Introduction, Reliability and quality, Failures and failure modes ,Causes of failures and reliability, Maintainability and availability, History of reliability ,reliability literature.

Unit-II

Reliability Mathematics: Introduction, Random experiment , Probability , Random variables, Distribution functions, Discrete distribution ,Continuous distribution, Numerical characteristics of random variables , Laplace transform.

Component Reliability and Hazard Models: Introduction, Component reliability from test data, Mean time to failure, Time – dependent hazard models, Stress- Dependent hazard models , Derivation of reliability function using Markov, Treatment of field data.

Unit-III

System Reliability Models: Introduction - Systems with series components - Systems with parallel components - k-out – of- m systems - Non series parallel systems - Systems with - mixed – mode failures - Fault- tree technique

Unit-IV

Maintainability and Availability Concepts: Introduction - Maintainability function - Availability function - Frequency of failures - Two-unit parallel systems with repair - k-out-of-m systems - Preventive maintenance.

Reliability Improvement: Introduction - Improvement components - Redundancy - Element redundancy - Unit redundancy - Stand by redundancy - Optimization - Reliability – cost trade – off .

Unit-V

Economics of Reliability Engineering: Economic issues -Manufacture's cost- Customer's cost - Reliability achievement cost - models - Reliability utility cost models - Depreciation cost models - Availability – cost – model of parallel systems.

Reliability Management: Reliability programming - Management policies and decision - Reliability management by objectives - Reliability group - Reliability data : Acquisition and analysis - Managing people for reliability

TEXT BOOKS :

1. Reliability Evaluation of Engineering Systems. R. Billington, RN Allan, BS Publications 2007.
2. Reliability, Maintenance and safety Engineering - Dr. A.K. Gupta, Laxmi Publications.

REFERENCE BOOKS:

1. Reliability Engineering- Patrick DTO-Wiley India.
2. Reliability Engineering and life testing –Naikan-PHI.
3. Engineering Maintenance a Modern Approach, B.S.Dhillon,2002 CRR Publications.
4. Maintenance Engineering and Management – RC Misra, PHI.
5. Reliability Engineering – Balaguruswamy- TMH.
6. Reliability Engineering- L.S.Srinath.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A81121) TRANSPORTATION PHENOMENA IN LIVING SYSTEMS

(Elective – III)

The **course objective** is to make the learner understand

- The fundamental conservation principles and laws that govern heat, mass and momentum transport processes and systems and constitutive properties that are encountered in typical biological problems.
- The principles to biomedical applications such as oxygen transport from the lungs, blood transport by cardiovascular system, and mass transfer of solutes in the renal tubules in the kidney.

UNIT-I

Heat Transport: Body temperature regulation modes of heat transfer, processes of Head loss and heat gain from the human body. Heat transportation in Tissues, Muscles, Skin and other Organs in different environmental temperatures. Models of heat transfer in the body.

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

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

TEXT BOOKS:

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

REFERENCES:

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 Taylar.

Course Outcomes:

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

- Explain the heat, gas and mass transport in biological systems.
- Apply knowledge of biological and physical sciences, mathematics, and engineering to solve problems at the interface of engineering and biology.
- Solve a number of key problems in biomedical engineering involving various forms of transport phenomenon.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A81120) TELEMEDICINE

(Elective-III)

The **course objective** is to make the learner understand

- The fundamental concepts and technologies associated with telemedicine.
- The implementation of telemedicine networks.
- How technology and e-health services can be exploited strategically to create new ways of working together.
- Realize the importance of the global standards in the field of telemedicine.

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. 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 –II:

Data Exchange: Network Configration, circuit and packet switching, H. 320 series (Video phone based ISBN) T. 120, H.324 (Video phone based PSTN). Video Conferencing. Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Ecryption. Protocols: TCP/IP, ISO-OSI, Standards to followed DICOM, HL7.

Unit – III:

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 – IV:

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 – V

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

Course Outcomes:

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

- Demostrate Knowledge on current Telemedicine Technologies.
- Implement the process of telemedicine networks.
- Conduct an effective telemedicine consultation.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A80357) ROBOTICS AND AUTOMATION

(Elective-IV)

OBJECTIVES:

i. To study the various parts of robots and fields of robotics.

ii. To study the various kinematics and inverse kinematics of robots.

iii. To study the Euler, Lagrangian formulation of Robot dynamics.

iv. To study the trajectory planning for robot.

v. To study the control of robots for some specific applications.

UNIT-I

Basic Concepts : Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov's laws of robotics – dynamic stabilization of robots.

UNIT- II

Power Sources And Sensors : Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT- III

Manipulators, Actuators and Grippers : Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT-IV

Kinematics and Path Planning : Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill climbing techniques – robot programming languages.

UNIT-V

Case Studies : Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, 1996.

2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES

1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991.
5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A81119) MEDICAL INFORMATICS

(Elective-IV)

The **Course Objective** is to make the learner understand

- The fundamental concepts of a medical information system in modern world.
- Transforming patient data into medical information using classification and coding systems.
- The decision support, information and information security systems in hospitals.
- The organization of health information to support action.

UNIT-I

Introduction and Overview of hospital information system. Patient history taking mechanisms. Patient Data Processing, Database Management, Communication of Medical data across different hospital units. Networking and Integration of patient data.

UNIT-II

Data from Patients, Coding and Classification, The Patient Record, Biosignal Analysis, Medical Imaging, Image Processing and Analysis. Patient-Centered Information Systems, Primary Care, Clinical Departmental Systems, Clinical Support Systems, Nursing Information Systems.

UNIT-III

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-IV

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

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. Bemmel, 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.), 3rd Edition Springer-2008.

Course Outcomes

By the end of the course, the students will

- Acquire familiarity with core concepts in medical informatics including decision support systems in clinical environments and other health care settings.
- Be able to manage healthcare data in the context of emerging regulations.
- Develop software, networking, and communications within a health care context.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A81118) BIOMETRIC SYSTEMS

(Elective-IV)

The **Course Objective** is to make the learner understand

The fundamentals of biometric systems.

The technology and application of fingerprint identification.

The technology and applications of iris face and voice recognition.

UNIT I

Biometric Fundamentals : Key Biometric terms and Processes – Definitions-verification and identification – matching, Accuracy in Biometric Systems – False match rate - False nonmatch rate - Failure to enroll rate – Derived metrics - An Introduction to Biometric Authentication Systems- a taxonomy of application environment, a system model, biometrics and privacy.

UNIT II

Fingerprint Identification Technology : History, Components, Application of Fingerprints, The Technology- Finger Scan Strengths and Weaknesses, Criminal Applications, Civil Applications, Commercial Applications, Technology Evaluation of Fingerprint Verification Algorithms.

UNIT III

IRIS Recognition : Introduction, Anatomical and Physiological underpinnings, Components, Sensing, Iris Scan Representation and Matching, Iris Scan Strengths and Weaknesses, System Performance, Future Directions.

UNIT IV

Face Recognition : Introduction, components, Facial Scan Technologies, Face Detection, Face Recognition- Representation and Classification, Kernel-based Methods and 3D Models, Learning the Face Spare, Facial Scan Strengths and Weaknesses, Methods for assessing progress in Face Recognition.

UNIT V

Voice Scan : Introduction, Components, Features and Models, Addition Method for managing Variability, Measuring Performance, Alternative Approaches, Voice Scan Strengths and Weaknesses, NIST Speaker Recognition Evaluation Program, Biometric System Integration.

TEXT BOOKS:

1. James Wayman & Anil Jain, Biometric Systems – Technology, Design

and Performance Evaluation, Springer-verlag London Ltd, USA, 2005.

2. Sanir Nanavati, Michael Thieme, Biometrics Identity Verification in a Networked world, Wiley Computer Publishing Ltd, New Delhi, 2003.

REFERENCE:

1. John D. Woodword Jr., Biometrics, Dreamtech Press, New Delhi, 2003.

Course Outcome

- To gain a broader knowledge of biometric technologies.
- To understand differences among biometric technologies.
- To design a biometric systems.
- To evaluate biometric systems in real world applications.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	4	**-/-/-**	**4**

(A81117) BIOMATERIALS

The **course objective** is to make the learner understand

- The basic biology types and of biomaterials.
- The tissue material interactions in vivo.
- The different types metallic, ceramic, polymeric and composite bio materials in biomedical applications like orthopedics , dentistry & in artificial organs.
- FDA rules and regulations.

UNIT I

Classification of materials used in medicine, Properties of Materials.

UNIT-II

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

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

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-IV

Orthopedic biomaterials, Materials for fixation screws, plates, intramedullar nails. Sutures. Burn dressings and Skin substitutes. Artificial organs and tissues: Implantable cardiac assist devices. Materials for extracorporeal devices. Cochlear implants. Artificial red blood cell substitutes.

UNIT-V

Sterilization of implants and Devices implants and Device failure. Implant retrieval and Evaluation. 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.

Course Outcomes:

By the end of the course the students will be able:

- Identify the biomaterials based on application types and sites.
- Analyze different types of tissue material interactions.
- Differentiate various biomaterials used in artificial organs, orthopedics and dentistry etc.
- To know FDA rules and regulations.

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-IISem	**L**	**T/P/D**	**C**
	-	**-/-/-**	**2**

(A80087) INDUSTRY ORIENTED MINI PROJECT

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/6/-**	**2**

(A80089) SEMINAR

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/15/-**	**10**

(A80088) PROJECT WORK

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

IV Year B.Tech. BME-II Sem	**L**	**T/P/D**	**C**
	-	**-/-/-**	**2**

(A80090) COMPREHENSIVE VIVA