ACADEMIC REGULATIONS, COURSE STRUCTURE

AND DETAILED SYLLABUS

UNDER

CHOICE BASED CREDIT SYSTEM (CBCS)

Effective from the Academic Year 2015-16

ELECTRONICS & COMMUNICATION ENGINEERING

(ECE)

For

B. Tech. Four Year Degree Course

(MR-15 Regulations)

MALLAREDDY ENGINEERING COLLEGE (Autonomous)

(An Autonomous Institution approved by UGC and affiliated to JNTUH, Approved by AICTE & Accredited by NAAC with 'A' Grade and NBA & Recipient of World Bank Assistance under TEQIP Phase – II, S.C 1.1)

Maisammaguda, Dhulapally (Post & Via Kompally), Secunderabad-500 100

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MALLA REDDY ENGINEERING COLLEGE (AUTONOMOUS)

MR 15 – ACADEMIC REGULATIONS (CBCS) FOR B. Tech. (REGULAR) DEGREE PROGRAMME

Applicable for the students of B. Tech. (Regular) programme from the Academic Year ***2015-16*** and onwards

The B.Tech. Degree of Jawaharlal Nehru Technological University Hyderabad shall be conferred on candidates who are admitted to the programme and who fulfill all the requirements for the award of the Degree.

INSTITUTE VISION

To establish a reputable professional education centre, to impart high quality trend setting technologies in an ambience of humanity, wisdom, intellect and innovation to nurture the students to become competent and committed professionals with disciplined ethical values.

INSTITUTE MISSION

Commitment to progress in mining new knowledge by adopting cutting-edge technologies to promote academic growth by offering state-of-the-art undergraduate and postgraduate programmes based on well-versed perceptions of global areas of specialization to serve the nation with advanced technical knowledge.

DEPARTMENT VISION

Attempting to develop innovative, competent and quality electronic engineers. To impart state of art technology and to foster a climate of professionalism and ethical values.

DEPARTMENT MISSION

To enrich the knowledge of students through value based education and organize various effective training programs in order to compete the advanced technology and produce employable under graduates and post graduates.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO I: Graduates should emphasize their insight in mathematics, sciences, computing and fundamentals of engineering including breadth to meet global demand and competitiveness in terms of technological aspects.

PEO II: Our graduates should excel in the best post graduate schools, reaching advanced degrees in engineering and related disciplines; should have skills for continued independent, learning to become experts in their professions.

PEO III: Graduates should succeed with effective communicative skills and work efficiently on team based projects in electronics, communication, computational, or manufacturing firms with a sense of social responsibility

PROGRAM OUTCOMES (POs)

a) An ability to apply knowledge of mathematics, science, and engineering,

b) An ability to design and conduct experiments, as well as to analyze and interpret data,

c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,

d) An ability to function on multidisciplinary teams,

e) An ability to identify, formulate, and solve engineering problems,

f) An understanding of professional and ethical responsibility,

g) An ability to communicate effectively,

h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,

i) A recognition of the need for, and an ability to engage in life-long learning,

j) A knowledge of contemporary issues, and

k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

1. Under-Graduate Degree Programme in Engineering & Technology (UGP in E&T):

MREC (Autonomous) offers 4 Year (8 Semesters) **Bachelor of Technology** (B.Tech.) Degree Programme, under Choice Based Credit System (CBCS) with effect from the Academic Year 2015 - 16 onwards, in the following branches of Engineering

Serial Number	Branch Code	Branch
1	01	CIVIL ENGINEERING (CE)
2	02	ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)
3	03	MECHANICAL ENGINEERING (ME)
4	04	ELECTRONICS AND COMMUNICATION ENGINEERING (ECE)
5	05	COMPUTER SCIENCE AND ENGINEERING (CSE)
6	25	MINING ENGINEERING (MinE)

2. Eligibility for Admission:

2.1 Admission to the UGP shall be made either on the basis of the merit rank obtained by the qualifying candidate at an Entrance Test conducted by the Telangana State Government (TSEAMCET), or the University, or on the basis of any other order of merit approved by the University, subject to reservations as prescribed by the Government from time to time.

2.2 The medium of instructions for the entire UGP in E&T will be ENGLISH only.

3. B.Tech. Programme (UGP) Structure:

3.1 The B.Tech. Programmes of MREC (A) are of Semester Pattern, with 8 Semesters. Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

3.2 UGC/ AICTE specified Definitions/ Descriptions are adopted appropriately for various terms and abbreviations used in these Academic Regulations/ Norms, which are as listed below.

3.2.1 Semester Scheme:

Each UGP is of 8 Semesters, with the academic year being divided into two Semesters of 22 weeks each, each Semester having - '**Continuous Internal Evaluation (CIE)**' and '**Semester End Examination (SEE)**'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC, and Curriculum/ Course Structure as suggested by AICTE are followed.

3.2.2 Credit Courses:

All Subjects/ Courses are to be registered by a student in a Semester to earn Credits. Credits shall be assigned to each Subject/ Course in a L: T: P: C (Lecture Periods: Tutorial Periods: Practical Periods: Credits) Structure, based on the following general pattern

- One Credit - for One hour/ Week/ Semester for Theory/Lecture (L) Courses; and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses or Tutorials (T).

Other student activities like NCC, NSS, Study Tour, Guest Lecture etc., and identified Mandatory / Audit Courses will not carry Credits.

3.2.3 Subject/ Course Classification:

All Subjects/ Courses offered for the UGP are broadly classified as:

(a) Foundation Courses (FC),
(b) Core Courses (CC),
(c) Elective Courses (EC),
(d) Mandatory Courses (MC),
(e) Audit Courses (AC),
(f) Minor Courses (MiC)

- **Foundation Courses (FC**) are further categorized as:
  (i) Humanities and Social Sciences (HS)
  (ii) Basic Sciences (BS)
  (iii) Engineering Sciences (ES).
- **Core Courses (CC) and Elective Courses (EC)** are categorized as Professional Subjects (PS), which are further subdivided as –
  (i) Professional/ Departmental Core (PC) Subjects,
  (ii) Professional/ Departmental Electives (PE),
  (iii) Open Electives (OE);
  (iv) Project Related (PR).
- **Mandatory Courses** (**MC** - Non-credit with evaluation).
- **Audit Courses** (**AC** – Non- credit without evaluation).
- **Minor Courses** (**MiC** – One or two credit courses)

3.2.4 Course Nomenclature:

The Curriculum Nomenclature or Course-Structure Grouping for the each of the UGP in E&T (B.Tech. Degree Programmes), is as listed below (along with AICTE specified % Range of Total Credits)

Sl. No.	**Classification**		**Course Work – Subject Area**	**Distribution of credits**	**as per AICTE**
	AICTE	**UGC**			
1	HS	Foundation Courses	Humanities and Social sciences including English, Environmental Sciences and Management subjects	9.23	5- 10 %
2	BS		Basic Sciences (BS) including Mathematics, Physics, Chemistry.	13.58	15- 20%
3	ES		Engineering sciences (ES), including Engineering Workshop, Engineering Graphics, Basics of Electrical Electronics / Mechanical / Computer Engineering	19.02	15 – 20%
4	PC	Core Courses	Professional Core subjects are relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required.	33.69	30 – 40%
5	PR	Project Related	Minor and Major Projects, Technical Seminar and comprehensive viva-voce.	9.78	10 – 15%
6	PE	Professional Electives	Professional Electives are relevant to the chosen specialization/ branch;	9.78	10– 15 %
7	OE	Open Electives	Open Electives are the courses from other technical and/or emerging subject areas	4.89	5 – 10 %
8	MC	Mandatory Courses	These courses are non-credit courses with evaluation.	-	-
9	AC	Audit Courses	These courses are non-credit courses without evaluation	-	-
10	MiC	Minor Courses	These are one or two credit courses intended to improve the skills of the student in placements and entrepreneurship.	-	-
				Total credits for UGP (B.Tech.)	**184 (100%)**

4. Course Work:

4.1 A student, after securing admission, shall pursue the B.Tech. UGP in a minimum period of 4 Academic Years, and a maximum period of 8 Academic Years (starting from the Date of Commencement of I year course work). Further 2 years of extension is allowed for appearing examinations.

4.2 Each student shall Register for and Secure the specified number of Credits required for the completion of the UGP and Award of the B.Tech. Degree in respective Branch of Engineering.

4.3 Total number of credits to be secured are 184 out of 184 for the entire B.Tech. Programme.

5.0 Course Registration:

5.1 A 'Faculty Advisor or Counselor' shall be assigned to each student, who will advise him on the Under Graduate Programme (UGP), its Course Structure and Curriculum, Choice/Option for Subjects/ Courses, based on his competence, progress, pre-requisites and interest.

5.2 Academic Section of the College invites 'Registration Forms' from students within 15 days from the commencement of class work for the first semester through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'SUBSEQUENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examinations) of the 'CURRENT SEMESTER'.

5.3 A Student can apply for ON-LINE Registration, ONLY AFTER obtaining the 'WRITTEN APPROVAL' from the Faculty Advisor, which should be submitted to the College Academic Section through the Head of Department (a copy of it being retained with Head of Department, Faculty Advisor and the Student).

5.4 A Student may be permitted to Register for his Subjects/ Course of CHOICE with a typical deviation of ± 3 credits of the semester with minimum credits of 19 and maximum credits of 27, based on his PROGRESS and SGPA/CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/Courses, in the Department Course Structure and Syllabus contents. It needs specific approval and signature of the Faculty Advisor/Counselor and Head of the Department.

5.5 If the Student submits ambiguous choices or multiple options or erroneous entries during ON-LINE Registration for the Subject(s) / Course(s) under a given specified Course/ Group/ Category as listed in the Course Structure, only the first mentioned Subject/ Course in that Category will be taken into consideration.

5.6 Subject/ Course Options exercised through ON-LINE Registration are final and CANNOT be changed, nor can they be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of the Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.7 For Audit Courses like Sports and NSS, Computational Mathematics Lab etc, a '**Satisfactory Participation Certificate**' from the concerned authorities for the relevant Semester is essential. No Marks or Credits shall be awarded for these activities.

5.8 For Mandatory Courses, a '**Satisfactory / Not Satisfactory' grade** is awarded based on the performance in both CIE and SEE.

6. Subjects/ Courses to be offered:

6.1 A typical Section (or Class) Strength for each Semester shall be 60.

6.2 A Subject/ Course may be offered to the Students, ONLY IF a Minimum of 40 Students opt for the same. The Maximum Strength of a Section is limited to 70.

6.3 More than ONE TEACHER may offer the SAME SUBJECT (Lab / Practical may be included with the corresponding Theory Subject in the same Semester) in any Semester. However, selection choice for students will be based on - 'FIRST COME FIRST SERVE Basis and CGPA Criterion' (ie., the first focus shall be on early ON-LINE ENTRY from the student for Registration in that Semester, and the second focus, if needed, will be on CGPA of the student).

6.4 If more entries for Registration of a Subject come into picture, then the concerned Head of the Department shall take necessary action, whether to offer such a Subject/ Course for TWO (or multiple) SECTIONS or NOT .

6.5 In case of options coming from Students of other Departments/ Branches/ Disciplines (not considering OPEN ELECTIVES), PRIORITY shall be given to the student of the 'Parent Department' first.

7. Attendance Requirements:

7.1 A student shall be eligible to appear for the Semester End Examinations, if he acquires a minimum of 75% of attendance in aggregate of all the Subjects/ Courses (excluding Non-Credit Courses) for that Semester.

7.2 Condoning of shortage of attendance in aggregate up to 10% (65% and above, and below 75%) in each Semester may be granted by the College Academic Committee on genuine and **valid grounds such as Medical, NSS, Sports and Games,** based on the student's representation with supporting evidence.

7.3 A stipulated fee shall be payable towards condoning of shortage of attendance.

7.4 Shortage of Attendance below 65% in aggregate shall in NO case be condoned.

7.5 Students, whose shortage of attendance is not condoned in any Semester, are not eligible to register their Semester End Examinations, they get detained and their registration for that Semester shall stand cancelled. They will not be promoted to the next Semester. They may seek re-registration for all those Subjects registered in that Semester in which he got detained, by seeking re-admission for that Semester as and when offered; in case if there are any Professional Electives and/ or Open Electives, the same may also be **re-registered** if offered, however, if those Electives are not offered in later Semesters, then alternate Electives may be chosen from the **same** set of Elective Subjects offered under that category.

8. Academic Requirements:

The following Academic Requirements have to be satisfied, in addition to the Attendance Requirements mentioned in Item No.**7.**

8.1 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% marks (24 out of 60 marks) in the Semester End Examination, and a minimum of 40% of the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) marks taken together (i.e. 40 marks); in terms of Letter Grades, this implies securing P Grade or above in that Subject/ Course.

8.2 A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to – Minor Project/Technical Seminar/Major Project, if he secures not less than 40% of the total marks to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Minor Project / Technical Seminar / Major Project, or does not make a presentation of the same before the Evaluation Committee as per schedule, or (ii) secures less than 40% of marks in Minor Project/ Technical Seminar/Major Project evaluations.

He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such **'one-reappearance'** evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

8.3 Promotion Rules:

Every Student has to fulfil the Attendance and Academic Requirements by securing the required credits as shown below:

S.No.	Semester		Requirement
	From (Even)	To (Odd)	
1	II	III	**50%** of registered credits are required upto II Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
2	IV	V	**60%** of registered credits are required upto IV Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.
3	VI	VII	**60%** of registered credits are required upto VI Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student shall - register for all Subjects covering 184 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, put up all the Attendance and Academic requirements for 184 Credits securing a minimum of P Grade (Pass Grade) or above in each Subject, and 'earn all 184 Credits securing SGPA $\geq$ 5.0 (in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0, to successfully complete the UGP.

8.5 After securing the necessary 184 Credits as specified for the successful completion of the entire UGP, an exemption of 6 secured Credits (in terms of two of their corresponding Subjects/Courses) may be permitted for optional drop out from these 184 Credits earned; resulting in 178 Credits for UGP performance evaluation, i.e., the performance of the Student in these 178 Credits shall alone be taken into account for the calculation of 'the final CGPA (at the end of UGP, which takes the SGPA of the VIII Semester into account)' , and shall be indicated in the Grade Card of VIII Semester; however, the Student's Performances in the earlier individual Semesters, with the corresponding SGPA and CGPA for which already Grade Cards are given, will not be altered. **Further, optional drop out for such 6 secured Credits shall be allowed only for professional and open electives**.

8.6 If a Student registers for some more **'Extra Subjects'** (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 184 Credits as specified in the Course Structure of his Department, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 184 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 7 and 8.1 to 8.7 above.

8.7 When a Student is detained due to shortage of attendance in any Semester, he may be re-admitted into that Semester, as and when offered, with the Academic Regulations of that Batch into which he gets readmitted. However, no Grade Allotments or SGPA/ CGPA calculations will be done for that entire Semester in which he got detained.

8.8 When a Student is detained due to lack of Credits in any year, he may be readmitted in the next year, after fulfilment of the Academic Requirements, with the Academic Regulations of that Batch into which he gets readmitted.

8.9 A student eligible to appear in the Semester End Examination in any Subject/ Course, but absent at it or failed (thereby failing to secure P Grade or above), may reappear for that Subject/ Course at the supplementary examination as and when conducted. In such cases, his Internal Marks (CIE) assessed earlier for that Subject/Course will be carried over, and added to the Marks to be obtained in the SEE supplementary examination, for evaluating his performance in that Subject.

9. Evaluation - Distribution and Weightage of Marks:

The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Minor Project or Minor Course, etc., For all Subjects/ Courses, the distribution shall be 40 marks for CIE, and 60 marks for the SEE inclusive of minor and mandatory courses. However, the B.Tech. Major Project will be evaluated for 200 Marks. These evaluations shall be based on 20% CIE (Continuous Internal Evaluation) and 80% SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given. Students have to choose Open Electives from the given list. However, Students should not choose an Open Elective offered by their own (parent) Department, if it is already listed under any category of the courses offered by parent Department in any Semester.

9.1 Theory Courses:

9.1.1 Continuous Internal Evaluation (CIE):

During the Semester, there shall be **2 mid-term examinations** for 40 marks each. Each mid-term examination consists of online **objective paper** for 10 marks with duration of **20 minutes** and **subjective paper** for 20 marks with duration of **90 minutes**. Further, there will be an allocation of 5 marks each for Assignment and Attendance. Objective paper may be set with multiple choice questions. Subjective paper shall contain 6 questions, out of which the Student has to answer 4 questions, each for 5 marks.

The allotment of 5 marks for attendance is as given below:

S.No.	% of Attendance Range	Marks
1	> 90 and ≤ 100	5
2	> 85 and ≤ 90	4
3	> 80 and ≤ 85	3
4	> 75 and ≤ 80	2
5	≥ 70 and ≤ 75	1

The first mid-term examination shall be conducted for the first 50% of the syllabus, and the second mid-term examination shall be conducted for the remaining 50% of the syllabus.

First Assignment should be submitted before the conduct of the first mid-term examinations, and the Second Assignment should be submitted before the conduct of the second midterm examinations. The Assignments shall be as specified by the concerned subject teacher.

The first mid-term examination Marks, first Assignment Marks and relative attendance marks shall make one set of CIE Marks, and the second mid-term examination Marks, second Assignment Marks and relative attendance marks shall make second set of CIE Marks; and 70% of the best performed plus 30% of the other shall be taken as the final marks secured by the Student towards Continuous Internal Evaluation in that Theory Subject.

9.1.2 Semester End Examination (SEE):

The distribution of marks is as given below:

Semester End Examination				
Part	**Type of Questions**	**No. of questions to be answered**	**Marks per question**	**Total**
Part A	Compulsory Questions (One from each module)	5	2	10
Part B	Choice Questions (5 out of 8) (Minimum one from each module)	5	10	50
Grand Total				60

9.2 Practical Courses:

9.2.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks, shall be awarded with a distribution of 20 marks for day-to-day performance and timely submission of lab records, 5 marks for viva-voce, 15 marks for internal lab exam (best out of two exams).

9.2.2 Semester End Examination (SEE):

There will be SEE for 60 marks, shall be awarded with a distribution of 20 marks for write-up on the given experiment, 20 marks for proficiency in the exam, 10 marks for results and 10 marks for viva-voce. For conducting SEE, one internal examiner and one external examiner will be appointed by the Chief Controller of Examinations of the College. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

9.3 Design and/or Drawing:

For these Subjects, (such as Engineering Graphics, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 40 marks for **CIE** (20 marks for day-to-day work, 20 marks for internal test with a duration of 120 minutes(better out of two exams)). There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests. The **SEE** will be evaluated for 60 marks.

9.4 Gender Sensitization:

9.4.1 Continuous Internal Evaluation (CIE):

There will be CIE for 40 marks shall be awarded with a distribution of 25 marks for day-to-day performance and 15 marks for internal practical exam in the form of assignments shall be given and evaluated by the teacher concerned.

9.4.2 Semester End Examination (SEE):

The SEE for 60 marks shall be conducted with an external examiner and the laboratory teacher. To reduce the burden on the students, the External Lab Exam should be conducted as an open-book system for the duration of 120 minutes. Eight questions have to be given from **Essential Reading "Towards a World of Equals: A Bilingual Textbook on Gender"**, out of which students should answer only 5. Each question carries 12 marks. So, each answer will take nearly 24 minutes.

9.5 Projects:

9.5.1 Minor Project:

Minor Project has to be taken up for about eight weeks including summer vacation after VI semester. **CIE** of 40 marks are awarded based on the performance in two presentations and **SEE** of 60 marks will be evaluated by a committee consisting of Head of the Department, supervisor and an external examiner. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department. The Minor Project shall be evaluated in the VII Semester.

9.5.2 Major Project:

Major Project has to be carried out during the VIII Semester, as per the instructions of the Project Supervisor assigned by the Head of the Department. Out of total 200 marks allotted for the Major Project, 40 marks shall be for **CIE** (Continuous Internal Evaluation) and 160 marks for the **SEE** (Semester End Viva-voce Examination). CIE 40 marks shall be awarded by a Departmental Committee consisting of Head of the Department, a senior faculty member and Project Supervisor, based on the work carried out and the presentation made by the Student during the Major Project. The Major Project Viva-voce shall be conducted by a Committee comprising of an External Examiner, Head of the Department and Project Supervisor. The external examiner should be selected from outside the College among the autonomous/reputed institutions from a panel of three examiners submitted by the concerned Head of the Department.

9.6 Technical Seminar:

For Technical Seminar Presentation, the student shall collect the information on a specialized topic, prepare a Technical Report and submit to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by a committee consisting of Head of the Department and Two Faculty Members for 100 marks. There shall be no external evaluation.

9.7 Comprehensive Viva-Voce:

The Comprehensive Viva-Voce shall be conducted in VIII Semester for 100 marks. This Viva-Voce is intended to assess the students' understanding of various subjects studied during the B. Tech. programme of study and will be evaluated by a Committee, consisting of the Head of the Department and two senior faculty members. There shall be no external evaluation.

9.8 Non-Credit Courses:

9.8.1 Audit Courses:

For Audit Courses offered in any Semester, a '**Satisfactory Participation Certificate**' shall be issued to the Student from the concerned authorities, only after securing ≥ 65% attendance in such a Course. No marks or Letter Grade shall be allotted for these activities.

9.8.2 Mandatory Courses:

For Mandatory Non-Credit Courses offered in any semester, a 'Satisfactory / Not Satisfactory' shall be awarded to the student based on the performance in both CIE and SEE

10. Grading Procedure

10.1 Marks will be awarded to indicate the performance of each student in each Theory Subject, or Lab/ Practical, or Seminar, or Project, or Minor-Project or Minor Course etc., based on the % marks obtained in CIE + SEE (Continuous Internal Evaluation + Semester End Examination, both taken together) as specified in Item 9 above, and a corresponding Letter Grade shall be given.

10.2 As a measure of the student's performance, a 10-point Absolute Grading System using the following Letter Grades (UGC Guidelines) and corresponding percentage of marks shall be followed

% of Marks	Grade Points	Letter Grade
≥80	10	O (Out Standing)
≥70 to < 80	9	A^+ (Excellent)
≥60 to < 70	8	A (Very Good)
≥55 to < 60	7	B^+ (Good)
≥50 to < 55	6	B (Above Average)
≥45 to < 50	5	C (Average)
≥40 to < 45	4	P (Pass)
< 40	0	F (Fail)
Absent	Ab	Ab

10.3 A student obtaining F Grade in any Subject shall be considered 'Failed' and will be required to reappear as 'Supplementary Candidate' in the Semester End Examination (SEE), as and when conducted. In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

10.4 A Letter Grade does not imply any specific % of Marks.

10.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, he has to repeat all the Subjects/ Courses pertaining to that Semester, when he is detained (as listed in Items 8.10- 8.11).

10.6 A student earns Grade Point (GP) in each Subject/ Course, on the basis of the Letter Grade obtained by him in that Subject/ Course (excluding Mandatory non-credit Courses). Then the corresponding 'Credit Points' (CP) are computed by multiplying the Grade Point with Credits for that particular Subject/ Course.

Credit Points (CP) = Grade Point (GP) x Credits … For a Course

10.7 The Student passes the Subject/ Course only when he gets GP ≥ 4 (P Grade or above).

10.8 The Semester Grade Point Average (SGPA) is calculated by dividing the Sum of Credit Points (ΣCP) secured from ALL Subjects/ Courses registered in a Semester, by the Total Number of Credits registered during that Semester. SGPA is rounded off to TWO Decimal Places. SGPA is thus computed as

$\text{SGPA} = \left\{\sum_{i=1}^{N} C_i G_i\right\} / \left\{\sum_{i=1}^{N} C_i\right\}$ … for each Semester

where 'i' is the Subject indicator index (takes into account all Subjects in a Semester), 'N' is the no. of Subjects 'REGISTERED' for the Semester (as specifically required and listed under the Course Structure of the parent Department), is the no. of Credits allotted to the ith Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

10.9 The Cumulative Grade Point Average (CGPA) is a measure of the overall cumulative performance of a student over all Semesters considered for registration. The CGPA is the ratio of the Total Credit Points secured by a student in ALL registered Courses in ALL Semesters, and the Total Number of Credits registered in ALL the Semesters. CGPA is rounded off to TWO Decimal Places. CGPA is thus computed from the II Semester onwards, at the end of each Semester, as per the formula

$\text{CGPA} = \left\{\sum_{j=1}^{M} C_j G_j\right\} / \left\{\sum_{j=1}^{M} C_j\right\}$ … for all S semesters registered

(i.e., upto and inclusive of S semesters, S ≥ 2)

where 'M' is the TOTAL no. of Subjects (as specifically required and listed under the Course Structure of the parent Department) the Student has 'REGISTERED' from the 1st Semester onwards upto and inclusive of the Semester S (obviously M > N), 'j' is the Subject indicator index (takes into account all Subjects from 1 to S Semesters), is the no. of Credits allotted to the jth Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

10.10 For Merit Ranking or Comparison Purposes or any other listing, ONLY the 'ROUNDED OFF' values of the CGPAs will be used.

10.11 For Calculations listed in Item 10.6 – 10.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

10.12 Passing Standards:

10.12.1 A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA ≥ 5.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when he gets a CGPA ≥ 5.00; subject to the condition that he secures a GP ≥ 4 (P Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP) for the Degree Award, as required.

10.12.2 Inspite of securing P Grade or above in some (or all) Subjects/ Courses in any Semester, if a Student receives a SGPA < 5.00 and/ or CGPA < 5.00 at the end of such a Semester, then he 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) - (i) to go into the next subsequent Semester (subject to fulfilling all other attendance and academic requirements as listed under Items 7&8); (ii) to 'improve his SGPA of such a Semester (and hence CGPA) to 5.00 or above', by reappearing for ONE or MORE (as per Student's choice) of the same Course(s) in which he has secured P Grade(s) in that Semester, at the Supplementary Examinations to be held in the next subsequent Semester(s). In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier. In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

10.12.3 A Student shall be declared successful in any Non-Credit Course, if he secures a 'Satisfactory Participation Certificate' for that Audit Course and "Satisfactory Certificate' for Mandatory Course.

10.13 After the completion of each Semester, a Grade Card or Grade Sheet (or Transcript) shall be issued to all the Registered Students of that Semester, indicating the Letter Grades and Credits earned. It will show the details of the Courses Registered (Course Code, Title, No. of Credits, and Grade Earned etc.), Credits earned, SGPA, and CGPA.

11. Declaration of Results

11.1 Computation of SGPA and CGPA are done using the procedure listed in 10.6 – 10.10.

11.2 For Final % of Marks equivalent to the computed final CGPA, the following formula may be used …

% of Marks = (final CGPA – 0.5) x 10

12. Award of Degree

12.1 A Student who register for all the specified Courses as listed in the Course Structure, satisfies all the Course Requirements, passes all the examinations prescribed in the entire UG Programme (UGP) within the specified period (refer 4.1), and secures the required number of 184 Credits (with CGPA ≥ 5.0), shall be declared to have 'QUALIFIED' for the Award of the B.Tech. Degree in the chosen Branch of Engineering as selected at the time of Admission.

12.2 A Student who qualifies for the Award of the Degree as listed in Item 12.1, shall be placed in the following Classes:

Class Awarded	CGPA
First Class with Distinction	≥ 8.00
First Class	≥ 6.50 and < 8.00
Second Class	≥ 5.50 and < 6.50
Pass Class	≥ 5.00 and < 5.50

12.3 A student with final CGPA (at the end of the UGP) < 5.00 will not be eligible for the Award of the Degree.

13. Withholding of Results

If the student has not paid fees to College at any stage, or has pending dues against his name due to any reason whatsoever, or if any case of indiscipline is pending against him, the result of the student may be withheld, and he will not be allowed to go into the next higher Semester. The Award or issue of the Degree may also be withheld in such cases.

14. Transitory Regulations

Student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the Degree Programme, may be considered eligible for readmission to the same Subjects/ Courses (or equivalent Subjects/Courses, as the case may be), and same Professional Electives/ Open Electives (or from set/category of Electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 8 years from the Date of Commencement of his I Semester).

15. Student Transfers

There shall be no Branch transfers after the completion of Admission Process.

16. Scope

i) Where the words "he", "him", "his", occur in the write-up of regulations, they include "she", "her", "hers".

ii) Where the words "Subject" or "Subjects", occur in these regulations, they also imply "Course" or "Courses".

iii) The Academic Regulations should be read as a whole, for the purpose of any interpretation.

iv) In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

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 SEE)	Expulsion from the examination hall and cancellation of the performance in that course 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 course 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 that course of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the courses of that Semester. The Hall Ticket of the candidate shall be cancelled.
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 courses of the

		examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course.
6	Refuses to obey the orders of the Chief Controller of Examinations (CCE) / Controller of Examinations (CE) / Assistant Controller of Examinations (ACE) / 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	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of 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-incharge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination	courses of that semester. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police cases 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 course and all the other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all SEE. The continuation of the programme 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. 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.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester. 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 course and all other courses the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the courses of that semester.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that SEE.
12	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the CCE for further action toward suitable punishment.	

Note: ***The student(s) found indulging in malpractices during the CIE also will be punished based on the recommendations of the College Academic Committee.***

MALLAREDDY ENGINEERING COLLEGE (Autonomous)

Academic Year 2015-16 (Choice Based Credit System)

COURSE STRUCTURE – B.TECH. ELECTRONICS & COMMUNICATION ENGINEERING (ECE)

(MR15 Regulations)

I SEMESTER

S. No.	Category	Course code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	HS	50H01	English	2	-	-	2	40	60	100
2	BS	50B01	Engineering Mathematics	3	2	-	4	40	60	100
3	BS	50B02	Applied Physics - I	2	2	-	3	40	60	100
4	ES	50580	Computer Programming and Numerical Methods	3	1	-	3	40	60	100
5	ES	50201	Electrical Circuits	3	2	-	4	40	60	100
6	HS	50H02	English Language Lab	-	-	4	2	40	60	100
7	BS	50B04	Applied Physics Lab	-	-	4	2	40	60	100
8	ES	50581	Computer Programming and Numerical Methods lab	-	-	4	2	40	60	100
9	AC	50A01	NSS & Sports	-	-	2	-	-	-	-
			Total	13	7	14	22	Contact Hours:34		

II-SEMESTER

S. No.	Category	Course code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	ES	50582	Data Structures through C	3	-	-	3	40	60	100
2	BS	50B07	Applied Physics - II	2	2	-	3	40	60	100
3	BS	50B03	Applied Chemistry	2	2	-	3	40	60	100
4	ES	50401	Electronic Devices and Circuits	3	1	-	3	40	60	100
5	ES	50301	Engineering Graphics	1	1	3	3	40	60	100
6	BS	50B05	Applied Chemistry Lab	-	-	4	2	40	60	100
7	ES	50402	Electronic Devices and Circuits Lab	-	-	4	2	40	60	100
8	ES	50302	Engineering Workshop	-	-	4	2	40	60	100
9	ES	50583	Data Structures through C Lab	-	-	4	2	40	60	100
			Total	11	6	19	23	Contact Hours:36		

III SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	BS	50B08	Elementary Calculus and Transforms	3	2	-	4	40	60	100
2	HS	50H16	Environmental Sciences	2	-	-	2	40	60	100
3	PC	50403	Electronic Circuit Analysis	3	-	-	3	40	60	100
4	PC	50404	Signals and Systems	3	-	-	3	40	60	100
5	PC	50405	Probability Theory and Random Processes	3	-	-	3	40	60	100
6	ES	50241	Principles of Electrical Engineering	3	-	-	3	40	60	100
7	PC	50406	Electronic Circuit Analysis Lab	-	-	4	2	40	60	100
8	ES	50407	Basic Simulation Lab	-	-	4	2	40	60	100
9	HS	50H17	Gender Sensitization	-	-	4	2	40	60	100
10	AC	50A03	Law for Engineers	-	2	-	-	-	-	-
			Total	17	4	12	22	Contact Periods: 33		

IV SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	BS	50B10	Special Functions and Complex Analysis	3	2	-	4	40	60	100
2	ES	50408	Digital Electronics	3	-	-	3	40	60	100
3	PC	50409	Electromagnetic Theory and Transmission Lines	3	-	-	3	40	60	100
4	PC	50410	Pulse and Digital Circuits	3	-	-	3	40	60	100
5	PC	50411	Analog Communications	3	-	-	3	40	60	100
6	ES	50584	Computer Organization and Operating Systems	3	-	-	3	40	60	100
7	PC	50412	Analog Communications Lab	-	-	4	2	40	60	100
8	PC	50413	Pulse and Digital Circuits Lab	-	-	4	2	40	60	100
9	MC	50H11	Human Values and Professional Ethics	-	2	-	-	40	60	100
			Total	18	4	8	23	Contact Periods: 30		

V SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PC	50414	Micro Processors and Interfacing	3	-	-	3	40	60	100
2	HS	50H03	Technical Communication and Presentation Skills	2	-	-	2	40	60	100
3	PC	50415	Antennas and Wave Propagation	3	-	-	3	40	60	100
4	PC	50416	Linear and Digital IC Applications	3	-	-	3	40	60	100
5	PE-I	50417	Electronic Measurements and Instrumentation	2	2	-	3	40	60	100
		50418	Digital Design Using Verilog HDL							
		50517	Computer Networks							
6	OE-I		Open Elective-1	2	2	-	3	40	60	100
7	PC	50419	Micro Processors and Interfacing Lab	-	-	2	1	40	60	100
8	HS	50H04	Technical Communication and Presentation Skills Lab	-	-	4	2	40	60	100
9	PC	50420	Linear and Digital IC Applications Lab	-	-	4	2	40	60	100
10	PR	50421	Technical Seminar	-	-	4	2	100	-	100
Total				15	4	14	24	Contact Periods: 33		

VI SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	HS	50H12	Engineering Economics and Accountancy	2	2	-	3	40	60	100
2	PC	50422	Digital Signal Processing	3	-	-	3	40	60	100
3	PC	50423	Microcontrollers and Embedded Systems	3	-	-	3	40	60	100
4	PC	50424	Digital Communications	3	-	-	3	40	60	100
5	PE-II	50425	Cellular and Mobile Communications	3	-	-	3	40	60	100
		50426	Introduction to Nano Science and Nano Technology							
		50505	Object Oriented Programming							
6	PE-III	50427	Wireless Communications and Networks	3	-	-	3	40	60	100
		50428	Embedded Real Time Operating Systems							
		50429	Design for Testability							
7	PC	50430	Digital Signal Processing Lab	-	-	4	2	40	60	100
8	PC	50431	Microcontrollers Lab	-	-	4	2	40	60	100
9	PR	50H05	Soft Skills	-	-	2	1	40	60	100
Total				17	2	10	23	Contact Periods: 29		

VII SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PC	50208	Control Systems	2	2	-	3	40	60	100
2	PC	50432	Microwave Engineering	3	-	-	3	40	60	100
3	PC	50433	VLSI Design	3	-	-	3	40	60	100
4	HS	50H13	Management Science	2	-	-	2	40	60	100
5	PE-IV	50434	Digital Image Processing	3	-	-	3	40	60	100
		50435	Advanced Microcontrollers							
		50436	Television Engineering							
6	PE-V	50437	Optical Communications	3	-	-	3	40	60	100
		50438	Hardware Software Co-Design							
		50439	Advanced Digital Signal Processing							
7	PC	50440	Microwave Engineering and Digital Communications Lab	-	-	4	2	40	60	100
8	PC	50441	VLSI Design Lab	-	-	4	2	40	60	100
9	PR	50442	Minor Project	-	-	4	2	40	60	100
Total				16	2	12	23	Contact Periods: 30		

VIII SEMESTER

S. No.	Category	Course Code	Name of the course	Contact hours/week			Credits	Scheme of Valuation		Total Marks
				L	T	P		Internal (CIE)	External (SEE)	
1	PE-VI	50443	RADAR Systems	3	-	-	3	40	60	100
		50444	Digital Signal Processors and Architectures							
		50445	Low Power VLSI Design							
2	OE-II		Open Elective - II	2	2	-	3	40	60	100
3	OE-III		Open Elective - III	2	2	-	3	40	60	100
4	PR	50446	Major Project	-	-	20	10	40	160	200
5	PR	50447	Comprehensive Viva Voce	-	-	4	2	100	-	100
6	HS	50H15	Entrepreneurship Skills	-	2	-	1	40	60	100
7	AC	50A04	Foreign Language/ Fine Arts	-	2	-	-	-	-	-
Total				7	8	24	22	Contact Periods: 39		

List of Open Electives

S. No.	Branch	Course Code	Name of the course
1	CIVIL	50102	Surveying
2		50123	Air pollution and control
3		50124	Disaster Management
4		50150	Green Buildings
5	EEE	50203	Network Theory
6		50229	Energy Auditing & Conservation
7	MECHANICAL	50303	Engineering Mechanics
8		50305	Mechanics of Solids
9		50307	Metallurgy and Materials Science
10		50342	Renewable Energy Sources
11		50344	Robotics
12	CSE	50511	Database Management Systems
13		50518	Software Engineering
14		50571	Computer Graphics
15		50553	Big Data
16		50578	Cloud and Distributed Computing
17		50579	Internet of Things
18		50564	Artificial Intelligence
19	MINING	52501	Fundamentals of Geology
20		52511	Mine Construction Engineering
21		52528	Introduction to Mineral Processing
22	ENGLISH	50H08	Interpretation of Literature and Analytical Writing
23		50H09	Business Communication
24		50H10	World Literatures
25	MATHEMATICS	50B23	Advanced Optimization Techniques
26		50B24	Mathematical Modeling
27		50B25	Differential Equations and Dynamical Systems
28	PHYSICS	50B20	Advanced Physics for Engineers
29		50B21	Nano Materials: Synthesis and Characterization
30		50B22	NDT and Vacuum Technology
31	CHEMISTRY	50B17	Chemistry of Engineering Materials
32		50B18	Nano Chemistry
33		50B19	Photochemistry and Spectroscopy

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50H01 **Credits: 2**

B. Tech. – I Semester
ENGLISH
(Common for EEE, ECE and CSE)

OBJECTIVE:

To facilitate for the improvement of the English language competency of the students in English with emphasis on all language components namely grammar, vocabulary, listening skills, speaking skills, reading skills and writing skills.

To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.

Module I: **[6 Periods]**

Chapter entitled '**Going Places: Travel'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Speech **:** Grammar of Anarchy by Dr. B. R. Ambedkar
Vocabulary **:** Formation of words, prefixes, suffixes and root words
Grammar **:** Tense, aspect and concord
Reading **:** Skimming and Scanning
Writing **:** Introduction to writing skills, characteristics of effective writing

Module II : **[6 Periods]**

Chapter entitled **'Reaching Out: Mass Media**' from *Resonance: English for Engineers and Technologists published* by Foundation Books

Speech **:** Need of Discipline and Visionary Young India by Dr.APJ Abdul Kalam
Vocabulary **:** Homonyms, homophones, homographs
Grammar **:** Direct and Indirect Speech
Reading **:** Intensive Reading and Extensive Reading
Writing **:** Paragraph writing- use of cohesive devices; arranging jumbled sentences into Paragraph

Module III : **[6 Periods]**

Chapter entitled **'Ushering in a New Era: Networking'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short Story **:** Death of a Hero by Jai Nimbkar
Grammar **:** Question Tags; Degrees of Comparison
Vocabulary **:** Idiomatic Expressions; Phrasal Verbs
Reading **:** Reading for theme and gist.
Writing **:** Essay Writing

Module IV: **[6 Periods]**

Chapters entitled '**Morphed Universe: Technology as a Double- edged Sword'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short Story : The Doctor's Word by R.K. Narayan
Grammar : Voice – exercises
Vocabulary : One word substitutions; synonyms and antonyms
Reading : Reading for interpretation
Writing : Letter writing- both formal and informal

Module V: **[6 Periods]**

Chapter entitled **'The Indomitable Human Spirit: Facing Disasters'** from *Resonance: English for Engineers and Technologists* published by Foundation Books

Short story : Once There was a King by Rabindranath Tagore
Grammar : Types of Sentences, Conditionals
Vocabulary : Gender sensitive language, integrated exercises in vocabulary
Reading : Reading for specific purposes
Writing : Summarizing

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

Text books :

In order to improve the proficiency of the student in the acquisition of grammar, error free language, the following text and course content, divided into Five Units, is prescribed.

1. Elango, et all **,** ***Resonance: "English for Engineers and Technologists",*** published by Foundation Books, 2nd Edition, 2012.
2. Sudha Rani, et all, ***"The Enriched Reading",*** published by Pearson Publications, New Delhi, 1st edition, 2015.

For Grammar practice:

1. Sudha Rani Et all, ***"A Work Book on English Grammar and Composition",*** published by Tata Mac Graw –Hill, New Delhi, 2nd Edition, 2012.

Reference Books:

1. Azar, Betty and Stacy A. Hagen ***: "Understanding and Using English Grammar***", Foundation Books, 4th Edition, 2009.
2. Chaudhuri, Santanu Sinha: ***"Learn English: A Fun Book of Functional Language, Grammar, and Vocabulary",*** Tata McGraw Hill Education, New Delhi, Paper Back Edition. 2013.
3. Eastwod, John: "***Oxford Guide to English Grammar",*** Oxford University Press, 4th Edition, 1994.
4. Field, Marion**: "*Improve Your Written English"*,** Kindle books, 5th Edition, 2009.
5. G. Leech and J. Svartvik (1975), "***A Communicative Grammar of English"***, London: Longman, 3rd Edition, 2002.
6. Murphy, Raymond**: "*Intermediate English Grammar"*,** Foundation Books Pvt Limited, 2nd Edition, 2013.
7. Murphy, Raymond: "***Essential English Grammar: A Self-Study Reference and Practice Book for Intermediate Students of English with Answer*s",** Cambridge University Press, 2nd Edition, 2007.

8. Swan, Michael: "***Basic English Usage",*** Oxford University Press, 1st Edition, 1984.

Related Websites:

1. http://www.slideshare.net/aszardini/word-formationroot-words-prefixes-and-suffixes
2. http://www.scribd.com/doc/37085980/Circulars-Circular-Letters-Notices-Memo#scribd
3. http://www.zsme.tarnow.pl/jezykiobce/wp-content/uploads/2013/11/writing-letters1.pdf.

OUTCOMES:

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

1. Use of English Language, written and spoken.
2. Enrichment of language accuracy and fluency.
3. Gaining confidence in using English language and skills for writing in real life situations.
4. Ready to employ extensive and intensive reading skills

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Course Code: 50B01 **Credits: 4**

B. Tech. – I Semester

ENGINEERING MATHEMATICS

(Common for CE, ME, EEE, ECE, CSE and Min. Engineering)

Prerequisites: Pre calculus, concepts of Trigonometry etc.,

OBJECTIVE: This course provides knowledge of Matrices, Eigen values and Eigen Vectors, which are useful in signal processing and stability theory. The concept of Differential equation is essential to the learner to write the associated mathematical model and solving real time engineering problems using Laplace Transforms.

Syllabus:

MODULE – I: Matrices and Linear systems of equations: [12 Periods]

A: Rank of the matrix - Elementary transformations –Echelon form – Normal form – PAQ Form - Inverse of a Matrix by applying Elementary transformations.

B: Solution of Linear Systems – Consistency of linear system of equations – Gauss elimination method – Gauss-Jacobi method - Gauss-Seidal method- LU-Decomposition method –Solution of Tri-diagonal Systems (Thomas Algorithm).

MODULE – II: Eigen Values & Eigen Vectors [12 Periods]

A: Linear transformation - Eigen values - Eigen vectors – properties – Linearly independent and dependent vectors - Cayley-Hamilton Theorem (without Proof) - Inverse and powers of a matrix by Cayley-Hamilton theorem, Orthogonal Matrix.

B: Diagonolization of matrix-Calculation of powers of matrix, Quadratic forms – Modal and spectral matrices. Real matrices – Symmetric - skew – symmetric, Similarity Transformation, Orthogonal Transformation, Principle axis.

MODULE – III: Differential Equations of first order and first degree [12 Periods]

A: Formation of Differential Equations - Solutions of First order Differential Equations: Homogeneous - Non-homogeneous – Exact - Non-exact.

B: Leibnitz's Linear Equation - Bernoulli's Differential Equation
Applications of First Order Differential Equations: Orthogonal trajectories - Newton's Law of cooling - Law of natural growth and decay.

MODULE – IV: Differential Equations of Second & Higher Order [12 Periods]

A: Rules for finding Complementary function-Particular integral (Non-homogeneous term of the type e^{ax} , $Sin\, bx$ / $Cos\, bx$, x^n, $e^{ax}V(x)$, $x^nV(x)only$)
Method of variation of parameters.

B: Equations reducible to constant coefficients - Cauchy - Euler and Legendre's differential equations. Applications to simple harmonic motion and LCR Circuits.

MODULE-V: Laplace Transforms [12 Periods]

A: Definition of Laplace transform - Condition for existence –Laplace transform of standard functions –Properties of Laplace transform – Laplace transform of function when they are multiplied or divided by 't' - Evalution of Integrals by using Laplace transforms.

B: Inverse transforms: Finding inverse using partial fractions – first shifting theorem – Inverse Laplace transforms of derivatives - Convolution theorem, Dirac's delta function – Unit step function. Application of Laplace transforms to ordinary differential equations

TEXT BOOKS:

1) Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers, 10th Edition, Reprint 2010.
2) Higher Engineering Mathematics by B.S. Grewal, Khanna Publishers, 43rd Edition, Reprint 2011.
3) Introduction to Matrix Analysis by Richard Bellman, Dover Publications, 2nd Edition, 1970.

REFERENCES:

1) Advanced Engineering Mathematics by R.K. Jain & S.R.K. Iyengar, 3rd edition, Narosa Pub. House, Delhi.
2) Mathematical Methods of Science and Engineering by Kanti B.Datta ,Cengage Learning
3) Engineering Mathematics – I by T.K. V. Iyengar, B. Krishna Gandhi & Others, S. Chand.
4) Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
5) Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

OUTCOMES:

After completion of this course, students will be able to:

1. Do operations on Matrices like Row, Column operations, Rank of the Matrix etc.,
2. Able to check the Consistency and Inconsistency of the system of equations.
3. Find out Eigen values and Eigen vectors of the given Matrix.
4. Solve the first order first degree and higher order differential equations and apply them in real time environments.
5. Understand Laplace Transforms and perform various transformations and apply for linear differential equations and real-time signals.

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Course Code: 50B02 **Credits: 3**

B. Tech. - I Semester

APPLIED PHYSICS - I

(Common for CE, ME, EEE, ECE, CSE and Min. Engineering)

Prerequisites: NIL

OBJECTIVE: The objective is to provide clear understanding of LASER, Optical Fiber, Ultrasonic and basic concepts of Statistical Mechanics to apply for Engineering and Technology problems.

Module- I: Optics **[9 Periods]**

Principle of superposition, Coherence - Spatial and Temporal; Introduction to Interference, Young's double slit experiment - Optical path difference and Fringe width - Interference in thin films (Reflected light) Cosine law – Newton's rings experiment - Determination of wavelength of light. Concept of diffraction, Diffraction grating as monochromator.

Module II: Laser and Optical Fibers

A: Laser: **[8 Periods]**

Characteristics of LASER; Absorption, Spontaneous and Stimulated transitions; Einstein's Coefficients and Relations between them; Population Inversion; Pumping - Optical and Electrical; Meta-stable State; Three and Four level pumping schemes; Ruby LASER; Helium-Neon LASER; Semiconductor Diode LASER; Applications of LASER - drilling, welding, data storage, optical signal processing and nuclear fusion.

B: Optical Fibers **[4 Periods]**

Principle of Optical Fiber; Acceptance angle and Acceptance cone, Numerical Aperture; Step and Graded index Optical Fibers and their Refractive Index profiles; Attenuation in Optical Fibers, Application of Optical Fibers - Medical, Level sensor and Communication system.

Module III: Acoustics & Ultrasonics

A: Acoustics **[4 Periods]**

Reverberation & Reverberation time, basic requirements of acoustically good hall; absorption Coefficient, Determination of absorption coefficient based on the standard times of reverberation, Sabine's formula (Qualitative treatment); Factors affecting the architectural acoustics and their remedies.

B: Ultrasonics **[8 Periods]**

Introduction, Concept of Magnetostriciton, Piezo and inverse Piezo electric effects; Production of Ultrasonic waves - Magnetostriction method; Piezo electric crystal method; Properties of Ultrasonic waves; Detection of Ultrasonics - Piezo electric detector, Kundt's tube, Sensitive flame method, Thermal detector; Applications - Communication, Industrial, Biological and Medical;

Module - IV: Waves and Vibrations **[9 Periods]**

Introduction, Differential equation for SHM and its solution; expression for energy of the oscillator; superposition of two linear SHMs (with same frequencies) - Lissajous figures; Damped vibrations - differential equation and its solution; Critical damping, under damping and over damping, logarithmic decrement; Qualitative treatment of Forced vibrations, sharpness of resonance, analogy between mechanical and electrical oscillator.

Module -V: Elements of Statistical Mechanics **[8 Periods]**

Introduction, Qualitative discussion on Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics, Properties of the Fermi-Dirac statistics, Photon Gas, Wien's displacement law, Rayleigh-Jeans Law, Planck's Law of black body radiation, Concept of Electron gas.

Text Books:

1. K Vijay Kumar, S Chandralingam, "**Modern Engineering Physics**'', S. Chand and Company, 1st Edition, 2010.
2. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.

Reference Books:

1) Eugene Hecht and A R Ganeshan, "**Optics**", Pearson Education, 4th Edition, 2015.
2) P K Palanisamy, **"Engineering Physics"**, SciTech Publication, 4th Edition, 2014.
3) B K Pandey and S. Chaturvedi, "**Engineering Physics**" Cengage Learning India
   Revised Edition, 2014.
4) R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, Eighth Revised Edition, 2006.

OUTCOMES:

After completion of the course, student will be able to:

1. Understand the concepts of Interference, diffraction, applications of LASER and Optical fibers.
2. Analyze the basic requirements of acoustically good hall, various production and Detection methods of ultrasonic besides the applications of ultrasonics.
3. Distinguish free, damped and forced vibrations.
4. Develop basic knowledge on the distribution functions and simple applications

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Course Code: 50580 **Credits: 3**

B. Tech. - I Semester
COMPUTER PROGRAMMING AND NUMERICAL METHODS
(Common for ECE and EEE)

Prerequisites: Nil.

OBJECTIVE: To develop programming concepts using C language to solve engineering and technology related problems using numerical methods.

Module I : Fundamentals & Introduction to C Language

A: Fundamentals: **[4 Periods]**

Hardware, Software, Programming languages, Translators, Introduction to Operating System, Program Development steps-Algorithm, Flow chart, Number Systems.

B: Introduction to C Language **[8 Periods]**

History, Simple C Program, Identifiers, Basic data types, User-defined data types, Variables, Constants, Type qualifiers, Managing Input / Output, Operators, Precedence and Associativity, Expression Evaluation, Type conversions, Simple C Programming examples.

Module II: Control Statements & Arrays

A: Control Statements: **[6 Periods]**

Conditional statements- if and switch statements, ? Operator; Loop Control Statements - while, for, do-while statements, C Programming examples, Other statements related to control statements - break, continue, go to, C Programming examples.

B: Arrays **[4 Periods]**

Basic concepts, One-dimensional arrays, Two-dimensional arrays, Multi-dimensional arrays, C programming examples.

Module III: Strings & Functions

A: Strings: **[5 Periods]**

Basic concepts, String Input / Output functions, Arrays of strings, String handling functions, C programming examples.

B: Functions **[6 Periods]**

Basics, User defined functions, Inter function communication, Standard functions, Storage Classes-auto, register, static, extern, Scope rules, Array and string manipulations using functions, Recursive functions, C programming examples.

Module IV: Derived types & Pointers

A: Derived types: **[3 Periods]**

Structures - Basic concepts, Nested structures, Arrays of structures, Structure manipulations using functions, Unions, bit fields, C programming examples.

B: Pointers: **[6 Periods]**

Basic concepts, Pointer arithmetic, Pointers and functions, Pointers and strings, Pointers and arrays, Pointers and structures, Self-referential structures, Dynamic Memory Allocation, C programming examples.

Module V: Numerical Methods

A: Algebraic Equations: The Bisection Method, The Method of False Position (Regular-Falsi Method), Newton-Raphson Method.

B: Numerical Integration: Trapezoidal Rule, Simpson's 1/3 Rule and Simpson's 3/8 Rule.

C: Numerical solution of Ordinary Differential Equations: Runge-Kutta Methods - Predictor-Corrector Methods: Milne‟s method - Adams- Bashforth Method.

Text Books:

1. Pradip Dey, Manas Ghosh, **"Programming in C**", Oxford University Press, 2nd Edition, 2011.
2. E Balagurusamy, "**Computer Programming"**, Tata McGraw Hill,. 1st Edition, 2013.
3. B.S. Grewal, "**Numerical Methods in Engineerithng & Science (with Programs in C, C++ &MATLAB)"**, Khanna Publisher, 10th Edition, 2014.

References:

1. Brian W. Kernighan, Dennis M. Ritchie, "**The C Programming Language"**, PHI, 2nd Edition, 1990.
2. Greg Perry and Dean Miller, "**C Programming Absolute beginner's guide**", QUE Publishers, 3rd Edition, 2013.
3. Paul Deitel and Harvey Deitel, "**C How to Program"**, PHI, 7th Edition, 2012.
4. S.S. Sastry, "**Introductory Methods of Numerical Analysis"**, Prentice-Hall of India Private Limited, 5th Edition, 2003.

OUTCOMES:

After completion of this course, student will be able to:

1. Write, compile and debug programs in C language.
2. Design programs involving decision structures, loops, arrays and functions.
3. Explain the difference between call-by-value and call-by-reference
4. Solve the technological problems using numerical methods

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Course Code: 50201 **Credits: 4**

B. Tech. – I Semester
ELECTRICAL CIRCUITS
(Common for EEE and ECE)

Prerequisites: Basic concepts of physics

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 magnetic circuits, single phase circuits.

Module I: Introduction To Electrical Circuits [12 periods]
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-KCL-KVL – network reduction techniques – series, parallel, series parallel, star-to-delta or delta-to-star transformation.

Module II: Network Topology [10 Periods]
Definitions – Graph – Tree, Basic cut-set and Basic Tie-set matrices for planar networks – Loop and Nodal analysis of Networks with independent voltage and current sources - Duality & Dual networks

Module III: Magnetic Circuits [12 Periods]
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. Hysteresis and eddy currents.

Module IV: Single Phase A.C Circuits [13 Periods]
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

Module V: Resonance& Locus Diagrams [12 periods]
Resonance – series, parallel circuits, concept of band width and Q factor
Locus diagrams- Series R-L, R-C, R-L-C and parallel combination with variation of various parameters

Text Books:

1. William Hayt and Jack E. Kimmerly, "**Engineering Circuit Analysis**", McGrawHill Company, 6th Edition, 2005.
2. Joseph Edminister & Mahmood Nahvi, "**Electric Circuits**", Schaum Soutline Series – Tata McGraw Hill, 3rd Edition, 1999..

References:

1. Vanvalken burg, "**Network Analysis**", Prentice Hall of India, 3rd Edition, 1994.
2. A. Chakrabarthy, "**Circuit Theory**", Dhanipat Rai & Co., 6th Edition, 2010.
3. N. N. Parker Smith, "**Problems in Electrical Engineering**", Prentice Hall of India , 9th Edition, 1981.

OUTCOMES:

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

1. Learn how to develop and employ circuit models for elementary electrical components
2. Apply various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method to solve electrical circuit problems.
3. Analyze the sinusoidal-steady-state response of first and second-order systems.
4. Calculate resonance frequency, bandwidth and Q factor for the given electrical circuit.

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Course Code: 50H02 **Credits: 2**

B. Tech. – I Semester
ENGLISH LANGUAGE LAB
(Common for EEE, ECE, and CSE)

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

OBJECTIVE:

To sensitize the students to the intelligibility in their pronunciation of English, speech sounds, word accent, intonation and rhythm
To improve the fluency in spoken English and neutralize mother tongue influence
To facilitate honing of listening and speaking skills of students
To train students to understand nuances of both verbal and non verbal communication during all activities
To develop confidence to face the audience and participate in activities
To help the students shed inhibitions and communicate with clarity

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 recognize them, awareness regarding stress and recognize 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

• Just A Minute(JAM) Sessions.

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

Module I:
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session
Listening: listening for sounds in context, for ideas.
Speaking: ideation and translation of ideas into sentences.

Module 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.
Listening: listening for specific purposes, for details.
Speaking: speaking in the above situations with clarity, connectivity, maintaining voice characters.

Module III:
CALL Lab: Word accent and Listening Comprehension-reading(aloud) meaningfully.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Listening: listening for intelligible English
Speaking: formal and informal conversations, register.

Module IV:
CALL Lab: Intonation and Common errors in Pronunciation- reading aloud(evaluating through recording).
ICS Lab: Extempore- Public Speaking, Oral Presentation Skills
Listening: note taking and listening for speaker's tone/attitude
Speaking: organizing, connecting ideas and sentences, short forms in spoken English, errors in spoken English

Module V:
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer, Debate
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:

a) P – IV Processor b) Speed – 2.8 GHZ, c) RAM – 512 MB Minimum

d) Hard Disk – 80 GB, e) 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):

Prescribed Lab Manual: Rani Sudha, "***English Language Communication Skills laboratory"*** *Manual* Published by **Pearson Publication**, 5 edition, New Delhi 2014

Reference Books:

1. Gairns ,Ruth and Redman , Stuart: "***Oxford Word Skills"****, Learn and Practice English Vocabulary,* 2nd Edition, 2008.
2. Hughes , John and Mallett , Andrew: "***Successful Presentations":*** DVD and Student's Book Pack: "**A Video Series Teaching Business Communication Skills"** for Adult Professionals
3. Karia , Akash: "***Public Speaking Mastery, Speak Like a Winner*** ", Kindle Edition, 2013.
4. Lucas, Stephen: "***The Art of Public Speaking"*** : Tata McGraw Hill, 11th Edition, 2011.

Websites:

1. http://www.mindtools.com/CommSkll/ActiveListening.htm
2. http://www.slideshare.net/alisonkis/dialogue-and-roleplay-activity
3. http://www.hse.ru/pubs/lib/data/access/ram/ticket/2/14309868938d576a532b71360b7354268380727a22/An%20article%20for%20Monika%20(2010).pdf

OUTCOMES:

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

1. Better Understanding of nuances of language through audio- visual experience and group activities
2. Neutralization of accent for intelligibility
3. Speaking with clarity and confidence thereby enhancing employability skills of the students
4. Good understanding of listening skills and speaking skills and their application in real life situations.
5. Good understanding of non-verbal communication and developing confidence to face Audience, shed inhibitions.

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Course Code: 50B04 **Credits: 2**

B. Tech. – I Semester
APPLIED PHYSICS LAB
(Common for EEE, ECE and CSE)

List of Experiments:

1. Dispersion of Light –Dispersive power of material of a given glass and calcite prism.
2. Diffraction grating – Determination of the wavelength of a Sodium vapour lamp.
3. Melde's Experiment – Longitudinal and Transverse modes.
4. The RLC series circuit – Determination of resonant frequency, bandwidth and quality factor.
5. Magnetic field along the axis of current carrying circular coil- Stewart and Gee's experiment.
6. LASER- Diffraction due to single slit.
7. Evaluation of Numerical aperture of the given fiber.
8. Energy band –gap of a material of a P-N junction diode.
9. Torsional Pendulum- Determination of Rigidity modulus of two different wires.
10. Sonometer- Frequency of A.C supply.
11. Newton's Rings (Demonstration only).
12. Michelson interferometer (Demonstration only).

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Course Code: 50581 **Credits: 2**

B. Tech. - I Semester
COMPUTER PROGRAMMING AND NUMERICAL METHODS LAB
(Common for ECE AND EEE)

1.
a) Practice various Menu items and debugging techniques in IDE.
b) Practicing sample C programs using Conversion specification.
c) Implement various programs logics using algorithms and flowcharts.

2.
a) Write a C program to find smallest and largest of given three numbers.
b) Write a C program to find the roots of a quadratic equation.
c) Write a C program to implement basic arithmetic operations.

3
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 find whether the given number is palindrome, perfect, Armstrong or strong.
d) Write a C program to generate all the prime numbers between n1 and n2, where n1 and n2 are values supplied by the user.

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

5.
a) Write a C program to find both the largest and smallest number 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

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a)Write a C program that uses functions to perform the following operations:
i) To insert a sub-string into 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 c) Write a C program to find substring in a given string.
d) Write a C program to count the lines, words and characters in a given text.

7.
a) Write a C program to construct a pyramid of numbers.
b)Write a C program to generate Pascal„s triangle.

8.
Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression: 1+x+x2+x3+... + xn
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.

9.
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.

10.
a) 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.)
b) Write a C program to find grades of a student‟s using structures and unions.

11. Write a C program to find out the roots of non-linear equation using:
a) Bisection method
b) Regular-Falsi method
c) Newton-Raphson method

12 Write a C program to find numerical integration using:
a) Trapezoidal rule.
b) Simpson's 1/3rd Rule
c) Simpson's 3/8th Rule

13. Numerical solution of first order ordinary differential equation using 4th order Runge-Kutta method.

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Course Code: 50A01 **Audit Course**

B. Tech. – I Semester
NSS & SPORTS
(Common for CE, EEE, ME, ECE, CSE and Min.E)

OBJECTIVE:

- To develop physical skills and fitness specific to a particular sport.
- It also is intended to help them appreciate the sport while being able to execute the strategies while playing the game/sport.
- Provide them the training and coaching towards achieving their group goals.
- To give the students health and physical fitness to ensure mental and emotional balance.
- NSS (**National Service Scheme)** provides ample opportunities for the students to participate in the community service programs
- To encourage them to become socially and environmentally sensitive, empathetic and responsible individuals of the nation.

Module I: **[2 Periods]**

Introduction of physical education: Importance of physical education, Athletics (Track events and combined events), Basket ball, Throw ball, Foot ball.

Module II: **[2 Periods]**

Youth and yoga- yoga as a tool for healthy lifestyle, Yoga as a preventive, promotive & curative method. Pranayam and Different Yoga traditions and their impacts.

Various competitions at different levels- Athletics (field events), volleyball, handball, cricket. Indoor games: Table Tennis, Caroms, chess

Module III : **[4 Periods]**

Introduction and Basic concepts of NSS: History, Philosophy, aims & Objectives of NSS, Emblem, Motto, Song and Other Components of NSS, **NSS Programmes and Activities-Concept of regular activities,** Special camping, Day camps. Basis of adoption of villages/ slums & methodology of survey.

Module IV: **[6 Periods]**

Volunteerism and Shramdan- needs &Importance of Volunteerism, Motivation and Constraints of Volunteerism, Shramdan as a part of Volunteerism. **Environmental Issues-** Natural Resource Management (Rain water Harvesting, energy conservation etc.). Waste Management, Disaster Management- Role of youth in Disaster Management.

Civil / Self Defense- Aims and objectives of Civil defense and need for self defense training.

Reference books:

1. Pamela Grundy & Susan Shackleford, "**Shattering the Glass: The Remarkable History of Women in Basketball**" Published 15th May, 2007.
2. Roger Kahn, " **The Boys of Summer**" , 1st Edition, May 9th 1973.
3. Jaci Burton, "**Perfect Play"**, 1st Edition, Feb 1st 2011, series 1.
4. Silva Mehta, Mira Mehta and Shyam Mehta, **"Yoga: The Iyengar Way",** Published by Knopp, 7th April, 1990.
5. Vishnu-Devananda, **"The Complete Illustrated Book of Yoga",** 18th April, 1995.
6. Timothy McCall, **"Yoga as Medicine: The Yogic Prescription for Health and Healing",** published by Harmony, 31st July 2007.
7. Christopher G. Petre, **"Social Work with Children and Their Families: Pragmatic Foundations "**, Journal Vol:24, No.3, September 18th, 2003, 2nd Edition.
8. Rashmi Bansal, "**Stay Hungry Stay Foolish",** 1st December 2008.
9. Beverly Schwartz, "**Rippling: How Social Entrepreneurs Spread Innovation Throughout the World"**, Published by Jossey – Bass, May 27th 2012.

OUTCOMES: After completion of the course students will be able to:

1. Develop physical fitness and will know the rules and regulations of various games.
2. emerge victorious in Inter College and inter University competitions.
3. Will build a sense of social and civic responsibility in the students.
4. Participate with confidence and leadership qualities.

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Course Code: 50582 **Credits: 3**

B. Tech. - II Semester

DATA STRUCTURES THROUGH C

(Common for ECE and EEE)

Prerequisites: Programming knowledge in C language.

OBJECTIVE:

The main objective of this course is to deliver the knowledge in various data structures such as linked lists, stacks, queues, trees and graphs along with the applications. It also provides an overview of the fundamentals in performance analysis of algorithms.

Module - I : Introduction to data structures and Performance Analysis

A : Introduction to data structures, **[4 Periods]**

Types of data structures: Primitive and Non-primitive data structures, Linear and Non-liner data structures. Definition of Algorithm.

B : Performance Analysis: **[6 Periods]**

Time and Space complexities. Asymptotic Notations - BigO, Omega and Theta notations, Recursion definition, Design methodology and implementation of recursive algorithms, Linear and Binary recursion, Recursive algorithms for Factorial of a given number, GCD Computation, Fibonacci sequence, Towers of Hanoi.

Module – II : Preprocessor Directives , File I/O & Searching and Sorting:

A: Preprocessor Directives **[2 Periods]**

#include, define.

B: File I/O: **[5 Periods]**

Basic concepts, Text files and Binary files, File input / output operations, File status functions (error handling), Command-Line Arguments, C programming examples

C: Searching and Sorting: **[5 Periods]**

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

Module - III Linked lists **[12 Periods]**

Single Linked Lists, Operations-Insertion, Deletion, Concatenating single linked lists, Circular linked lists, Operations- Insertion, Deletion. Double Linked Lists, Operations-Insertion, Deletion. Sparse matrices - Array and linked representations.

Module - IV Stacks and Queues

A: Stacks: **[6 Periods]**

Basic stack operations, Representation of a stack using arrays and linked lists, Stack Applications - Reversing list, factorial calculation, postfix expression evaluation, infix-to-postfix conversion.

B: Queues: **[6 Periods]**

Basic queue operations, Representation of a queue using array and Linked list, Classification and implementation - Circular, Enqueue and Dequeues, Applications of Queues - Round

Robin Algorithm, Priority queues.

Module - V Trees and Graphs

A: Trees: **[8 Periods]**

Basic concepts, Binary Trees: Properties, Representation of binary trees using arrays and linked lists, operations on a binary tree, binary tree traversals, creation of binary tree from in, pre and post -order traversals, Tree travels using stack, Threaded binary trees.

B: Graphs: **[6 Periods]**

Basic concepts, Representations of Graphs using Linked list and Adjacency matrix, Graph algorithms, Graph traversals (BFS & DFS)

Text Books:

1. Jean Paul Tremblay, Paul G Sorenson, "**An Introduction to Data Structures with Applications**", Tata Mc Graw Hills, 2nd Edition, 1984.
2. Richard F. Gilberg, Behrouz A. Forouzan - "**Data Structures: A Pseudo code approach with C**", Thomson (India), 2nd Edition, 2004.

Reference Books:

1. Horowitz, Ellis, Sahni, Sartaj, Anderson-Freed, Susan - "**Fundamentals of Data Structure in C"**, University Press (India), 2nd Edition, 2008..
2. A.K.Sharma, **"Data structures using C"**, Pearson, 2nd Edition, June, 2013.
3. R.Thareja, **"Data Structures using C"**, Oxford University Press, 2nd Edition, 2014.

OUTCOMES:

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

1. Be capable to identity and apply the appropriate data structures for real world problems.
2. Understand and implement single, double, and circular linked-lists.
3. Implement the Stacks and Queues using both array based and linked-list based representations.
4. Understand tree data structures, including binary tree, and implements both array based and reference based representations.
5. Implement various algorithms on graph data structures, including finding the minimum spanning tree and shortest path.

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Course Code: 50B07 **Credits: 3**

B. Tech. - II Semester

APPLIED PHYSICS - II

(Common for CE, ME, EEE, ECE, CSE and Min. Engineering))

Prerequisites: NIL

OBJECTIVE:

The objective to provide clear understanding of magnetism and super conductivity, quantum Mechanics and nanomaterial to apply for Engineering and Technical problems

Module I: Magnetism & Superconductivity **[9 Periods]**

Magnetic field and Magnetization, magnetic susceptibility, paramagnetism in transition, rare earth elements; magnetization and total angular momentum (definition and relationship); Ferromagnetism, Anti ferromagnetism and Ferrimagnetism; Curie temperature, Hysteresis; Concept of Perfect Diamagnetism; Meissner effect ; Type I and II Superconductors; BCS theory (qualitative); Applications of Superconductors - Smart magnets, SQUIDs, transmission lines, Mag-Lev Train.

Module II: Quantum Mechanics **[8 Periods]**

Louis De-Broglie's concept of Matter Waves; Davisson and Germer's experiment; Heisenberg's Uncertainty Principle, Illustration - Why an electron cannot exist in the nucleus?; Schrödinger's Time Independent Wave Equation - Physical Significance of the Wave Function; Energy of a particle in a one dimensional infinite potential well; Concept of Potential barrier (Tunneling effect)

Module III: Band Theory of Solids & Semiconductor Physics

A: Band Theory of Solids: **[8 Periods]**

Qualitative discussion of Classical free electron theory, Fermi - Dirac distribution, Qualitative discussion of Quantum free electron theory; Electron in a periodic Potential (Bloch Theorem), Kronig-Penny Model (Qualitative Treatment), Origin of energy Band formation in solids, Classification of materials into Conductors, Semi-Conductors &Insulators, Concept of effective mass of an electron.

B: Semiconductor Physics **[9 Periods]**

Direct and Indirect band gap semiconductors, Expression for Charge carrier concentration in Intrinsic semiconductors; Fermi Level in Intrinsic Semiconductors (Derivation) and Extrinsic semiconductor (dependence on temperature and doping concentration); concept of drift and diffusion currents, Continuity equation, Hall Effect; Photo conductivity, optical response, LED materials, Construction of LED; LCD- characteristics of Liquid crystal materials; actionof LCD display device; numeric displays;

Module IV: Physics of Nanomaterials **[9 Periods]**

Introduction - Nano scale, Surface to volume ratio and Quantum confinement; Optical

Properties, Electrical properties; brief description of different methods of synthesis of nano materials - physical (LASER ablation, Ball milling), chemical (Vapor deposition, Sol - gel); Carbon nanotubes - properties and applications**,** Applications of nano materials - automobiles, electronics, medical, cosmetics, textile.

Module V: Electromagnetic Theory [7 Periods]

Gradient of Scalar field and its Physical Significance; Divergence and Curl of Vector field; Qualitative treatment of Gauss's Law of electrostatics and Gauss law of magnetostatics, Ampere's law, Faraday's law of electromagnetic induction, Induced E.M.F in a conductor, Lenz's Law , Displacement current, Maxwell equations in differential form, wave equation for free space.

Text Books:

1. K Vijay Kumar, S Chandralingam, "**Modern Engineering Physics**'', S. Chand and Company, 1st Edition 2010.
2. D K Bhattacharya, Poonam Tandon, "**Engineering Physics**", Oxford University Press, 1st Edition, 2015.
3. David J Griffiths "**Introduction to Electrodynamics**" Prentice Hall, 4th Edition, 2012.

Reference Books:

1. Callister W D Jr, "**Material Science and Engineering: An introduction**", John Wiley & Sons Publications, 8th Edition, 2010.
2. P K Palanisamy, "**Engineering Physics"**, 4th Edition, SciTech Publications, 2014.
3. Ghatak Ajay and Lokanatham, "**Quantum Mechanics"**, Springer Publications, 1st Edition, 2014.
4. G Prasad and Bhimashankaram, "**Engineering Physics"**, B S Publications, 3rd Edition, 2008.
5. Sulabha K. Kulkarni, "**Nano technology - Principles and practices"**, Springer Publications. 3rd Edition, 2014.
6. A K Sawhney, "**Electrical and Electronic Measurements and Instrumentation"**, Dhanpatrai and Sons publications, 19th revised Edition, 2014.

OUTCOMES:

After completion of the course, student will be able to:

1. Distinguish ferro, ferri and anti-ferro magnetic materials and understands different types of superconductors.
2. Understand the Kronig penny model after having learnt one dimensional infinite Potential well problem. This knowledge will further help them to understand the concepts related to semi conductors.
3. The various synthesis methods of nano materials and different applications.
4. Students able to get basic knowledge on electromagnetic theory.

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Course Code: 50B03 **Credits: 3**

B. Tech. - II Semester
APPLIED CHEMISTRY
(Common for CE, ME, EEE, ECE, CSE and Min. Engineering)

OBJECTIVE:

The objective to make the learners aware of the standards and cleaning processes to maintain quality of water and to provide basic knowledge on electrochemistry, corrosion, polymers and energy science to apply for real-life situations.

Module I: Water [10 Periods]

Hardness of Water: causes of hardness, expression of hardness – units – types of hardness, Alkalinity of water specifications for drinking water (BIS and WHO standards); Estimation of temporary & permanent hardness of water by EDTA method - numerical problems. Boiler troubles – Scale &sludge, Priming and foaming, caustic embrittlement; Treatment of boiler feed water – Internal treatment (Phosphate, carbonate and calgon conditioning).External treatment – Lime Soda process and ion exchange process, Numerical Problems. Disinfection of water by chlorination and ozonisation. Desalination by Reverse osmosis.

Module II: Electrochemistry and Corrosion

A: Electrochemistry [6 Periods]

Introduction-Conductance-Specific and Equivalent conductance. Electrochemical cells-EMF, Galvanic Cells, calomel Electrode; Nernst equation and its applications- Batteries: Primary cells (dry cells) and secondary cells (lead-Acid cell, Ni-Cd cell). Applications of batteries. Fuel cells – Hydrogen – Oxygen fuel cell; Applications.

B: Corrosion: [6 Periods]

Causes and effects of corrosion: Theories of corrosion – Chemical & Electrochemical corrosion; Factors affecting rate of corrosion – Nature of metal and Nature of Environment – Corrosion control methods – Cathodic protection (Sacrificial anodic). Surface coatings: Metallic coatings & methods of application of metallic coatings - hot dipping (Galvanization), Cementation, Electroplating (Copper plating).

Module III: Polymers [12Periods]

Types of Polymerization-Chain (Free radical Mechanism)&Step growth. Plastics: Thermoplastic & Thermo setting plastics, Compounding& fabrication of plastics (Compression and injection moulding). Preparation, properties, engineering applications of PVC, Teflon of Nylon – 6,6 and Bakelite. Conducting polymers: Polyacetylene, Polyaniline, Mechanism of Conduction, doping; applications of Conducting polymers.Bio degradable polymers: poly lactic acid and poly vinyl acetate. Elastomers: Rubber-vulcanization.Synthetic Rubber-preparatrion,properties and applications of BUNA-S,SBR. Fibre-reinforced polymers-properties and applications.

Module IV: Energy sciences & Combustion

A: Fuels [6 Periods]

Classification – solid fuels: coal – analysis of coal - proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining. cracking- fixed bed catalytic cracking. Knocking – octane and cetane rating. Bio-diesels-advantages. Gaseous fuels - constituents, characteristics and applications of natural gas, LPG and CNG.

B: Combustion **[6 Periods]**

Definition, Calorific value of fuel – HCV, LCV; Determination of calorific value by Junkers gas calorimeter – Numerical problems on combustion. Renewable energy sources-solar, wind, hydro power and biomass energy advantages, disadvantages and Applications

Module V: Composites, Nano Chemistry and Green Chemistry

A: Composites: **[3 Periods]**

Basics of composites, composition and characteristics-types of composites –particle and fiber reinforced composites and their applications..Concept of Bio-fuels,Bio sensors,BiSurfactants.

B: Nano Chemistry: **[3 Periods]**

Introduction and classification of Nanomaterials (Fullerence, Carbon nano tubes and nanowires only) - Application of nanomaterials. Brief introduction to nanocomposites

C: Green Chemistry: **[4 Periods]**

Introduction, principles of green chemistry, introduction to ultrasonic and microwave assisted reactions. Concept of R4M4 (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking and Multi-tracking).

Text Books:

1. P.C.Jain and Monica Jain, "**A text Book of Engineering Chemistry"**, DhanpatRai Publications, New Delhi, 12th Edition 2006.
2. Engineering chemistry by M.Thirumala Chary and E.Laxminarayana,Sci-Tech publications.
3. Engineering chemistry by R.P. Mani and B.Rama Devi by Cengage Learning India Pvt.Ltd.

Reference Books:

1. F.W. Billmeyer, "**Text Book of Polymer Science"**, John Wiley & Sons, 4th Edition, 1996.
2. M.G. Fontana, N. D. Greene, "**Corrosion Engineering"**, McGraw Hill Publications, New York, 3rd Edition, 1996.
3. B.R.Puri,L.R.Sharma&M.S.Pathania,"**Principles of Physical Chemistry",** S.Nagin Chand &Co., New Delhi, 23rd Edition, 1993.
4. P.W. Atkins and de Paula Julio, "**Physical Chemistry**", Oxford University Press, 8th Edition, (Indian Student Edition), 2009.
5. G.A.Ozin and A.C. Arsenault,"**Nanochemistry: A Chemical Approach to Nanomaterials**", RSC Publishing, 3rd Edition, 2005.

OUTCOMES:

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

1. Understand Water treatment, specifically hardness of water.
2. Acquire knowledge on Electrochemical cell, fuel cells, batteries and its applications.
3. Understand the properties and uses of polymeric materials.
4. Analyze the combustion mechanism of various types of fuels(solid,liquid,gas)
5. Acquire basic knowledge on the concepts of Composites,Nano and Green Chemistry

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Course Code: 50401 **Credits: 3**

B. Tech. – II Semester

ELECTRONIC DEVICES AND CIRCUITS

Prerequisites: Fundamental concepts of Physics

OBJECTIVE:

This course introduces the construction, principle of operation and characteristics of electronic devices like diodes, transistors, FET's etc.. This course also provides the knowledge on biasing of BJT's & FET's, transistor as an amplifier and applications of diodes.

Module I: Semiconductor Diode Characteristics [15 periods]

Review of Semiconductor Physics, Qualitative theory of the p-n Junction, the p-n junction as a diode, band structure of an open circuited p-n junction, the current components in a p-n diode, quantitative theory of the p-n diode currents, the volt ampere characteristics, the temperature dependence of V-I characteristics, diode resistance, ideal versus practical diodes, diode equivalent circuits, space charge or transition capacitance C_T, diffusion capacitance, breakdown mechanism in diode.

Module II : Rectifiers, Filters & Special Semiconductor Devices

A: Rectifiers, Filters: [7 periods]

Introduction, load line analysis, half-wave rectification, full-wave rectification, general filter considerations, Inductive, Capacitive, LC and CLC filters.

B: Special Semiconductor Devices: [8 periods]

Zener diode**,** V-I characteristics of Zener diode, Zener diode as voltage regulator ,Principle of operation, Characteristics and applications of Tunnel diode, Varactor diode, UJT, Photo Diode, LED, LCD, SCR.

Module III: Bipolar Junction Transistors [7 periods]

Introduction, transistor construction, transistor operation, transistor current components, transistor as an amplifier, common base configuration, common emitter configuration, common collector configuration, limits of operation, transistor specifications.

Module IV: Field Effect Transistors [8 periods]

Junction Field Effect Transistor (JFET) - Principle of operation, volt ampere characteristics, advantages of JFET over BJT. Introduction to MOSFETs - depletion and enhancement type MOSFETs, operation and volt-ampere characteristics.

Module V A: BJT Biasing & FET Biasing

A: BJT Biasing: [8 periods]

Need for biasing, Operating point, load line analysis, bias stabilization techniques: fixed bias, collector to base bias, self-bias, Stabilization against variations in I_{co}, V_{BE} and β for the

self bias circuit, bias compensation techniques, thermal runaway and thermal stability.

B: FET Biasing **[7 periods]**

Biasing techniques: Fixed bias, Source self-bias, Voltage divider bias.

Text Books:

1. Jacob Milliman, Christos C .Halkias, Satyabrata Jit, "**Electronic Devices and Circuits"**, McGraw Hill (India) ,3rd edition, 2013.
2. S. Shalivahanan, N. Suresh Kumar, A. Vallavaraj**, "Electronic Devices and Circuits"**, Tata McGraw Hill(India), 3rd edition, 2007.
3. Robert Boylestad, Lowis Nashelsky, "**Electronic Devices and Circuit Theory"**, Prentice Hall of India, 5th edition, 1993.

References:

1. David. A. Bell, "**Electronic Devices and Circuits"**, Prentice Hall of India, 4th Edition, 1986.
2. G. K. Mittal, "**Electronic Devices and Circuits"**, Khanna Publications, 22nd Edition, 1999.
3. Theodore. F. Bogart Jr. Jeffrey S. Beasley, Guillermo Rico, "**Electronic Devices and Circuits",** Pearson Education(India), 6th edition , 2004.

OUTCOMES:

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

1. Analyze operating principles of major electronic devices, its characteristics and applications
2. Know applications of diodes and transistors in rectifiers and amplifiers circuits.
3. Design and analyze the DC bias circuitry of BJT & FET.

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Course Code: 50301 **Credits: 3**

B. Tech. – II Semester

ENGINEERING GRAPHICS

(Common for EEE, ECE and CSE)

Prerequisites: Mathematical Geometry.

OBJECTIVES: Ability to transform data into drawing to communicate with engineers manually and with the help of AutoCAD software.

Module I: Introduction to Engineering Drawing **[Periods: 6T+12P]**

Principles of Engineering Drawing – Drawing instruments – BIS Conventions - Lettering and Dimensioning practices.

Curves: Constructions of Curves used in Engineering Practice:

a) Conic Sections- General method only

b) Cycloid, Epicycloid and Hypocycloid

c) Involutes

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

Module II: Orthographic Projections: **[Periods: 5T+10P]**

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

Projection of Points- Including Points in all four quadrants.

Projection of Lines - Parallel, perpendicular, inclined to one reference plane and inclined to both reference planes. True length and true angle of a line.

Module III : Projection of Planes & Projection of Solids

A: Projection of Planes : **[Periods: 3T+6P]**

Plane parallel, perpendicular, inclined to one reference plane and Plane inclined to both the reference planes.

B: Projection of Solids: **[Periods: 3T+6P]**

Projections of regular solids, cube, prism, pyramid, tetrahedron, cylinder and cone. Axis inclined to both the reference planes.

Module IV: Development of Surfaces & **Isometric Projections**

A: Development of Surfaces : **[Periods: 3T+6P]**

Development of Surfaces of Right Regular Solids – Prism, Pyramid, Cylinder, and Cone. Frustum and Truncated solids.

B:Isometric Projections: **[Periods: 3T+6P]**

Principles of Isometric Projection – Isometric Scale – Isometric Views– Conventions –Plane Figures, Simple and Compound Solids

Module V: Transformation of Projections & Introduction to Auto CAD:

A: Transformation of Projections : **[Periods: 4T+8P]**

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

B:Introduction to AutoCAD: **[Periods: 1T+2P]**

Basic Display, Construction, Editing and dimensioning Commands.

Text Books:

1. N.D. Bhat, **"Engineering Drawing"**, Charotar Publishing House, 53rd Edition, 2014.
2. BasantAgrawal**, "Engineering Drawing"** – Tata McGraw Hill, 2nd Edition, 2013.

Reference Books:

1. K.L.Narayana, P. Kannaiah, "**Engineering Drawing"**, SciTech Publishers. 2nd Edition, 2013
2. K. Venugopal, "**Engineering Drawing"**, New Age International Publishers, 3rd Edition, 2014.
3. Trymbaka Murthy, "**Computer Aided Engineering Drawing"**, I.K. international Publishing House, 3rd Edition, 2011.

OUTCOMES:

After completion of the course, students will be able to

1. Understand the importance of curves, Projection of lines, planes and solids in Engineering applications
2. Convert orthographic views to isometric views and vice-versa.
3. Familiarize with AutoCAD two dimensional Commands.

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Course Code: 50B05 **Credits: 2**

B. Tech. – II Semester

APPLIED CHEMISTRY LAB

(Common for CE, ME, EEE, ECE, CSE and Min. Engineering)

List of Experiments:

1. Calibration of Volumetric apparatus.
2. Estimation of Hardness of water by EDTA Method.
3. Estimation of acid by pH metry.
4. Estimation of alkalinity of water.
5. Estimation of strong acid by Conductometry.
6. Estimation of strong acid by Potentiometry.
7. Determination of ferrous iron in cement by colorimetry.
8. Determination viscosity of given liquids.
9. Preparation of Bakelite.
10. Preparation of Thiokol Rubber.
11. Determination of surface tension of given sample using stalagnometer.
12. To Study the inversion of cane sugar by polarimeter.

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Course Code: 50402 **Credits: 2**

B. Tech. – II Semester

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

1. Forward & Reverse Bias Characteristics of PN Junction Diode.
2. Zener diode characteristics and Zener as voltage Regulator.
3. Half Wave Rectifier with & without filters.
4. Full Wave Rectifier with & without filters.
5. Input & Output Characteristics of Transistor in CB Configuration.
6. Input & Output Characteristics of Transistor in CE Configuration.
7. Input & Output Characteristics of Transistor in CC Configuration.
8. FET Characteristics. (Using any Simulation Software)
9. SCR Characteristics. (Using any Simulation Software)
10. UJT Characteristics. (Using any Simulation Software)

Equipment required for Laboratories:

Sl.No.	Equipment Description	Specifications / Range
1.	Regulated Power supplies (RPS)	0-30 V
2.	CRO's	0-30 MHz
3.	Function Generators	0-1 MHz
4.	Multimeters	--
5.	Decade Resistance Boxes/Rheostats	--
6.	Decade Capacitance Boxes	--
7.	Decade Inductance Boxes	--
8.	Digital Ammeters	0-10μA, 0-200μA, 0-20 mA
9.	Digital Voltmeters	0-20V,0-100V
10.	Discrete Electronic Components	Resistors, Capacitors, BJTs, UJTs, LEDs, Diodes-Ge or Si, Step down Transformers.

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Course Code: 50302 **Credits: 2**

B. Tech. – II Semester

ENGINEERING WORKSHOP

(Common for EEE, ECE and CSE)

I. 1. Trades for Exercises:

At least two exercises from each trade:

a) Carpentry
b) Fitting
c) Tin-Smithy
d) House-wiring
e) Foundry
f) IT workshop – Hardware identification and connectivity, assembling, disassembling and OS Installation.

II. Trades for Demonstration

a) Machine shop
b) Plumbing
c) Identification of Electronic Components.

Text Books:

1. P. Kanniah, K. L. Narayana, "**Work Shop Manual"**, SciTech Publishers, 2nd Edition, 2009.

2. K. Venkat Reddy, "**Work Shop Practice Manual"** by, B.S. Publications, 6th Edition, 2015.

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Course Code: 50583 **Credits: 2**

B. Tech. - II Semester

DATA STRUCTURES THROUGH C LAB

(Common for ECE and EEE)

Prerequisites:

Programming knowledge in C language and data structures

1. Write a recursive program to:
a) Compute the nth Fibonacci number and also display the series.
b) Compute Factorial of a positive integer.
c) Find the GCD (n, m).
d) Solve Towers of Hanoi problem - N disks are to be transferred from peg S to peg D with Peg I as the intermediate peg.

2.
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)

3.
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.

4.
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.

5. Write a program that uses functions to perform the following:
a) Create a single linked list of integers.
b) Insert an element in all locations of the single linked list.
c) Implement all delete operations on single linked list.
d) Display the contents of the single linked list after insertion/deletion.

6. Write a program that uses functions to perform the following:
a) Create a circular linked list of integers.
b) Insert an element in all locations of the circular linked list.
c) Implement all delete operations on circular linked list.

d) Display the contents of the circular link list after insertion/deletion.

7.Write a program that uses functions to perform the following:
a)Create a double linked list of integers.
b)Insert an element in all locations of the double linked list.
c)Implement all delete operations on double linked list.
d)display the contents of the double linked list after insertion/deletion.

8. Write a program to implement the sparse matrices using:
a) Arrays
b) Linked list

9. Write a program that implements stack operations using:
a) Arrays
b) Linked lists

10. Write a program that uses Stack operations to:
a) Evaluate Postfix expression.
b) Convert infix expression into postfix expression

11. Write a program that implements Linear Queue operations using:
a) Arrays
b) Linked lists

12. Write a program that implements Circular Queue operations using Arrays

13. Write a program that implements Double-ended Queue operations using Arrays

14.
a) Write a recursive program to create a Binary Tree of integers, traverse the tree in preorder, in order and post order and also print the number of leaf nodes and height of the tree.
b) Write a non-recursive program to create a Binary Tree of integers, traverse the tree in pre-order, in order, post order and also print the number of leaf nodes and height

15. Write a program for implementing the following graph traversal algorithms:
a) Depth First Traversal (DFT)
b) Breadth First Traversal (BFT)

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Course Code: 50B08 **Credits: 4**

B. Tech. – III Semester

ELEMENTARY CALCULUS AND TRANSFORMS

PREREQUISITES: Basics of Mathematics.

OBJECTIVE: The main objective of the course is to teach transforms based calculus like Laplace transforms and its applications to real life problems. Particularly while solving the differential equations transforms are the powerful aid to simplify the labor involved in calculation part. For time –invariant systems z-Transforms are useful. Fourier Transforms plays important role to solve some partial differential equations. Curve tracing is a draftsman art to identify the curve nature and by using it one can evaluate multiple integrals in the specified domain.

MODULE – I: Fourier series and transforms [12 Periods]

Fourier series: Determination of Fourier coefficients – Fourier series – even and odd functions – Half-range Fourier sine and cosine expansions.
Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.
Fourier Transforms: Fourier integral theorem - Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms - Finite Fourier transforms – Parsvel's Identity

MODULE –II: Z-Transforms &Partial Differential Equations [12 Periods]

Introduction: Definition, Region of convergence, Linearity property, Damping rule, shifting theorems multiplication theorem, initial value theorem, final value theorem.

Inverse z-transforms: power series method, partial fraction method, convolution theorem, Introduction to Partial differential equations, Formation, Linear partial differential equation (Lagrangian Equation) , Non-Linear Partial Differential equation of first order (standard forms).

MODULE – III: Curve Tracing and Multiple Integrals [12 Periods]

Tracing of curves in Cartesian and Polar forms.

Multiple integrals, double and triple integrals, Change of order of integration, change of variables, polar , spherical, cylindrical coordinates.

MODULE –IV: Differential Calculus [12 Periods]
Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's mean value Theorem, Generalized Mean Value theorem. (Only statements with geometrical interpretation)

Differentiability of multivariable functions: Jacobian, Functional dependence, Maxima and Minima of functions of two variables with constraints and without constraints (Lagrange's method of multipliers).

MODULE – V: Vector Calculus: [12 Periods]

Point function, Gradient, Divergence, Curl, Directional derivative, angle between two surfaces. Line integral – Application to work done by a force, Circulation, Potential function. Surface integrals, volume integrals.Vector integral theorems: Green's theorem-Stoke's and Gauss's Divergence Theorem (without proof). verification.

TEXT BOOKS:

1. Kreyszig, **"Advanced engineering Mathematics"**, John Wiley & Sons, 10th Edition, 2010. (Modules I, II, III, IV & V)
2. B.S. Grewal, **"Higher Engineering Mathematics"**, Khanna Publishers, 43rd Edition, 2014. (Modules I, II, III, IV & V)
3. Ian Sneddon, **"Elements of Partial Differential equations"**, Dover Publishers, 4th Edition, 2006. (Module II)

REFERENCES:

1. R.K. Jain & S.R.K. Iyengar, **"Advanced Engineering Mathematics"**, Narosa Publications, 4th Edition, 2014.
2. Kanti B. Datta, **"Mathematical Methods of Science and Engineering"**, Cengage Learning, 1st Edition, 2011.
3. T.K. V. Iyengar, **"Engineering Mathematics – I "**,S Chand, 13th Edition, 2014.
4. D. S. Chandrasekhar, **"Engineering Mathematics – I"**, Prism Books pvt. LTD, 5th Edition, 1999.

OUTCOMES:

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

1. Learn the basic rules in Laplace transformations and able to find associated transformations of the defined function.
2. Solve ordinary differential equations by using Laplace Transformations.
3. Learn the concept of region of convergence for the time-invariant systems and associated transformations.
4. Learn the basic rules to form the partial differential equation and solution techniques.
5. Learn the concept of slope of a curve which can be mapped to functions to evaluate mean values.
6. Learn the concept of curve tracing which can use in evaluating the multiple integrals
7. Find the Gradient, Divergence and Curl of a vector valued function in order to evaluate work done by a force, Angular velocity.
8. Know the concept of Line integral, surface integral and volume integral which are used in verifying the Green's and Gauss and Stokes theorems.

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Course Code: 50H16 **Credits: 2**

B. Tech. – III Semester

ENVIRONMENTAL SCIENCES

PREREQUISITES: Environment

OBJECTIVE: An interdisciplinary approach to complex environmental problems using basic tools of the natural and social sciences including geo systems, biology, chemistry, economics, political science and international processes. The ability to work effectively as a member of an interdisciplinary team on complex problems of environment.

MODULE - I: Ecosystems **[07 Periods]**

Definition, Scope and Importance of ecosystem, Concept of ecosystem, Classification of ecosystems, Structural Components of an ecosystem, Functions of ecosystem, Food chains, food webs and ecological pyramids. Flow of energy.

MODULE - II: Natural resources, Biodiversity and biotic resources **[09 Periods]**

Natural resources: Classification of Resources: Living and Non-Living resources, Renewable and non-renewable resources. Water resources: use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources – case studies. Growing energy needs-Energy resources: renewable and non renewable energy sources.

Biodiversity and biotic resources: Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and intrinsic values.

MODULE - III: Environmental pollution and control **[09 Periods]**

Classification of pollution and pollutants, causes, effects and control technologies. Air Pollution: Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. Water pollution: Point and non-point sources of pollution, Major pollutants of water and their sources, drinking water quality standards, Soil Pollution: Soil as sink for pollutants, Impact of modern agriculture on soil, degradation of soil. Marine Pollution: Misuse of International water for dumping of hazardous waste, coastal pollution due to sewage and marine disposal of industrial effluents.

MODULE - IV: Global environmental problems and global efforts **[06 Periods]**

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

MODULE - V: Towards Sustainable Future **[08 Periods]**

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

TEXT BOOKS:

1. R. Rajagopalan, **"Environmental studies From crisis to cure"**, Oxford University Press, 2nd Edition, 2005. (Modules I, II, III, IV)
2. Anubha Kaushik, C. P. Kaushik, **"Environmental studies"** New age International Publishers, 4th Edition, 2012. (Modules I, II, III, IV & V)
3. Erach Bharucha, **"Environmental studies"** University Grants Commission, and University Press, 1st Edition, 2005. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. M. Anji Reddy "**Text book of Environmental Science and Technology"** 3rd Edition, 2007.
2. Richard T. Wright, **"Environmental Science: towards a sustainable future"** PHL Learning, Private Ltd. New Delhi, 2nd Edition, 2008.
3. Gilbert McMasters and Wendell P. Ela, **"Environmental Engineering and science"**, 3rd Edition, PHI Learning Pvt. Ltd., 2008.

OUTCOMES:

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

1. Enable the students to realize the importance of the sustainable use of natural resources.
2. Make the students aware of the impacts of human actions on environment and measures to minimize and mitigate them.
3. Enable the students to become aware of the current issues and problems pertaining to the environment.

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Course Code: 50403 **Credits: 3**

B. Tech. – III Semester

ELECTRONIC CIRCUIT ANALYSIS

PREREQUISITES: Electronic Devices and Circuits, Electrical Circuits.

OBJECTIVE:

This course enables the students to design and analyse transistor amplifiers, feedback amplifiers, oscillators and tuned amplifiers. The course also enables the students to familiarize with the concepts of feedback and stability in designing amplifier circuits.

MODULE - I: Small Signal Amplifiers [15 Periods]

Multistage Amplifiers: Review of single stage amplifiers**,** Different Coupling Schemes used in Amplifiers, General Analysis of Cascaded RC Coupled BJT Amplifiers Choice of Transistor configuration in a Cascade Amplifier, RC Coupled Amplifier, Transformer Coupled Amplifier, Direct Coupled (DC) Amplifiers, and Darlington Pair.

Frequency Response: General Frequency Considerations, Low Frequency Response of BJT Amplifiers, High Frequency Hybrid π Model for Common Emitter Transistor Model Emitter Follower at Higher Frequencies, Miller`s theorem. Design of Single - stage RC Coupled Amplifier using BJT.

MODULE - II: Feedback Amplifiers [9 Periods]

Feedback concept and types, Transfer Gain with feedback, General Characteristics of Negative Feedback Amplifiers, Types of Negative Feedback Connections, Method of Identifying Feedback Topology , Stability of Feedback Amplifier.

MODULE - III: Oscillators [12 Periods]

Constituents of an Oscillator, Barkhausen Criterion, Classification of Oscillators, Sine Wave Feedback Oscillators Of LC Type-General Form Of Oscillator Circuit, Hartley Oscillator, Colpitts Oscillator, Sine Wave Feedback Oscillator of RC type- RC Phase Shift Oscillator, Wein Bridge Oscillator, Crystal Oscillator, Frequency Stability. Design of an RC Phase-Shift Oscillator, LC Oscillator using CE amplifier.

MODULE - IV: Large Signal Amplifiers [16 Periods]

Introduction, Classification Based on Biasing Condition, Class A Large Signal Amplifiers, Second Harmonic Distortion, Higher-Order Harmonic Generation, Transformer Coupled Class A Audio Power Amplifier, Maximum Value of Efficiency of Class A Amplifiers, Class B Amplifier, Efficiency of Class B Amplifier, Push-Pull Amplifier (Class-B), Distortion in Power Amplifiers, Complementary Symmetry (Class B) Push-Pull Amplifier, Thermal Stability, Heat Sink.

MODULE - V: Tuned Amplifiers [8 Periods]

Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading Single Tuned Amplifiers on Bandwidth, Effect of Cascading Double Tuned Amplifiers on Bandwidth, Stagger Tuned Amplifiers, Large Signal Tuned Amplifiers, Stability of Tuned Amplifier.

TEXT BOOKS:

1. Jacob Milliman, Christos C. Halkias, Chetan D. Parikh **"Integrated Electronics-Analog and Digital Circuits and Systems"**, Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2011. (Module I).
2. S. Salivahanan, N Suresh Kumar, **"Electronic Circuit Analysis"**, Tata McGraw Hill Education Private Limited, New Delhi, 2nd Edition, 2012. (Modules II, III, IV & V)

REFERENCE BOOKS:

1. Jacob Millman, Arvin Grabel, **"Microelectronics"**, Tata McGraw Hill, New Delhi, 2nd Edition, 2003.
2. G. K. Mithal, **"Electronic Devices and Circuits"**, Khanna Publishers, New Delhi, 2nd Edition, 1998.

OUTCOMES:

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

1. Design transistor amplifiers, particularly, single stage, multistage CE, CS amplifiers and analyse the gain, impedance, bandwidth of amplifiers.
2. Design an oscillator circuit of desired frequency.
3. Understand the Class A, Class B, Class AB amplifiers and also able to understand the use of tuned amplifiers.

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Course Code: 50404 **Credits: 3**

B. Tech. – III Semester

SIGNALS AND SYSTEMS

PREREQUISITES: Basic Mathematics.

OBJECTIVE:

To get an in-depth knowledge about signals, systems and analysis of the same using various transforms and also able to generate different types of signals and frequency domain analysis of different signals and the similarities between two signals in frequency domain.

MODULE - I: Introduction to Signals [15 Periods]

Definition, Classification of Signals (continuous-time and discrete-time), Elementary signals (continuous-time and discrete-time), Basic operations on signals (continuous-time and discrete-time).

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.

Fourier series: Overview of Fourier series with examples.

MODULE -II: Fourier Transforms & Sampling [15 Periods]

Fourier Transforms: Derivation of Fourier Transform from Fourier Series, Existence of Fourier Transform, Fourier Transform of Standard signals, Properties of Fourier Transform, Fourier Transform of periodic signals, and Introduction to Hilbert Transform.

Sampling: Sampling theorem – Graphical and analytical proof for Band Limited Signals, Types 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.

MODULE -III: LTI System, Convolution and Correlation [14 Periods]

Signal Transmission through Linear Systems: System Definition, Classification of systems, Properties of LTI systems, Transfer Function of an LTI system, Filter Characteristics of Linear System, Distortionless Transmission through a system.

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 functions, Properties of Correlation function, Energy density spectrum, Parseval's Theorem, Detection of periodic signals in the presence of Noise by Correlation, Extraction of signal from noise by filtering.

MODULE -IV: Laplace Transforms: [08 Periods]

Unilateral and Bilateral Laplace Transform, Relation between Laplace Transform and Fourier Transform, Laplace Transform of some commonly used signals and its Region of Convergence (ROC), Properties of Laplace Transform, Inverse Laplace Transform, Solution of Differential equations using Laplace Transform, Laplace Transform of signals using waveform synthesis.

MODULE -V: Z–Transforms: [08 Periods]

One sided and Bilateral Z-Transform, Z-Transform of some commonly used signals and its Region of Convergence (ROC), Properties of Z-Transform, Inverse Z-Transform- Long Division, Partial Fraction and Residue Methods, Solutions of Difference equations using Z-Transform.

TEXT BOOKS:

1. B. P. Lathi, **"Signals Systems & Communications"**, BSP, 2nd Edition, 2013. (Modules I, II, III & IV)
2. P Ramakrishna Rao and Shankar Parkriya, **"Signals and Systems"**, MGH International, 2nd Edition, 2013. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. A.V. Oppenheim, A. S. Willsky, S.H. Nawab, **"Signals and Systems"**, PHI, 2nd Edition, 2014.
2. A. Anand Kumar, **"Signals and Systems"**, PHI, 3rd Edition, 2013.
3. Simon Haykin and Van Veen, **"Signals & Systems"**, Wiley, 2nd Edition, 2007.

OUTCOMES:

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

1. Represent any arbitrary signals in terms of complete sets of orthogonal functions and understands the principles of impulse functions, step function and signum function.
2. 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.
3. Understand 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.

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Course Code: 50405 **Credits: 3**

B. Tech. – III Semester

PROBABILITY THEORY AND RANDOM PROCESSES

PREREQUISITES: Basic Mathematics.

OBJECTIVE:

This course enables the students to understand the fundamentals of the probability theory and the concept of the random variable and its expectation with the help of probability theory. The course also enables the students to characterize random processes in the context of communication engineering problems.

MODULE - I: One Random Variable & Operations [16 Periods]

Review of Probability Theory: Probability Definitions and Axioms, Probability as a Relative Frequency, Joint Probability, Conditional Probability, Total Probability, Bayes' Theorem, Independent Events

Random variables: Definition of A Random Variable, Classification Of Random Variables, Probability Distribution Function(PDF) and its properties, Probability Density function(pdf) and its Properties, Types of Random Variable – Uniform, Exponential, Gaussian, Rayleigh, Conditional distribution and density functions.

Operations on Single Random Variable: Expectation, Moments, Variance and Skew, Characteristic Function, Moment Generating Function, Transformation Of Random Variables

MODULE -II: Multiple Random Variables & Operations [10 Periods]

Multiple Random Variables: Joint Distribution and its Properties, Joint Density and its Properties, Conditional Distribution and Density, Statistical Independence, Sum of Two Random Variables, Central Limit Theorem (With Proof).

Operations On Two Random Variables: Joint Moments about the origin, Joint Central Moments, Joint Characteristic functions. Transformation of Multiple Random Variables, Linear Transformation of Gaussian Random Variable.

MODULE - III: Random Processes & Temporal Characteristics [10 Periods]

Classification of Random Processes, Stationary – WSS and SSS Processes, Time Averages and Ergodicity, Mean - Ergodic Processes, Autocorrelation Function and its Properties, Cross-Correlation Function and its Properties, Covariance and its Properties.

MODULE -IV: Random Processes & Spectral Characteristics [10 Periods]

Power Density Spectrum and its Properties, Relationship between PSD and Autocorrelation Function, Cross-Power Density Spectrum and its Properties, Relationship between Cross PSD and Cross-correlation Function.

MODULE -V: Linear Systems with Random Inputs [14 Periods]

Linear System Response of Mean and Mean-squared Value, Autocorrelation Function, Cross-Correlation Functions. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Spectral Density of Input and Output of a Linear System

Some Practical Applications: Characteristics of Random Computer-type Waveform, Radar Detection Using Single Observation.

TEXT BOOKS:

1. Peyton Z. Peebles, **"Probability, Random Variables & Random Signal Principles"**, TMH, 4th Edition, 2001. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Y. Mallikarjuna Reddy, **"Probability Theory and Stochastic Process"**, University Press, 4th Edition, 2013.
2. Athanasius Papoulis and S. Unnikrishna Pillai, **"Probability, Random Variables and Stochastic Processes"**, TMH, 4th Edition, 2002.
3. Henry Stark and John W. Woods, **"Probability and Random Processes with Application to Signal Processing"**, PE, 3rd Edition, 2001.

OUTCOMES:

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

1. Apply the knowledge of Probability Theory to understand the concept of the random variable and to find the expectation of random variable.
2. Apply the concept of random variable to characterize random processes in the context of communication engineering problems.

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Course Code: 50241 **Credits: 3**

B. Tech. – III Semester

PRINCIPLES OF ELECTRICAL ENGINEERING

PREREQUISITES: Electrical Circuits.

OBJECTIVE:

This course introduces the basic concepts of transient analysis of the circuits, the basic two-port network parameters, the design analysis of filters and attenuators and their use in circuit theory. The emphasis of this course is laid on the operation of the transformers and basic Principle of operation of three phase Induction Motor and Alternators.

MODULE – I: Transient Analysis (First and Second Order Circuits) [13 Periods]

Transient Response of RL , RC Series, RLC Circuits for DC excitations, Initial Conditions, Solution using Differential Equations approach and Laplace Transform Method.

MODULE – II: Two Port Networks [13 Periods]

Impedance Parameters, Admittance Parameters, Hybrid Parameters, Transmission (ABCD) Parameters, Conversion of one Parameter to another, Conditions for Reciprocity and Symmetry, Interconnection of Two Port networks in Series, Parallel and Cascaded configurations, Image Parameters, Illustrative problems.

MODULE – III: Filters and Symmetrical Attenuators [10 Periods]

Classification of Filters, Filter Networks, Classification of Pass band and Stop band, Characteristic Impedance in the Pass and Stop Bands, Constant-k Low Pass Filter, High Pass Filter, m-derived T-Section, Band Pass filter and Band Elimination filter, Illustrative Problems. Symmetrical Attenuators – T-Type Attenuator, π–Type Attenuator, Bridged T type Attenuator, Lattice Attenuator.

MODULE – IV: Network Theorems (A.C. & D.C) [12 Periods]

Tellegen's, Superposition, Reciprocity, Thevinin's, Norton's, Maximum Power Transfer, Milliman's and Compensation theorems for A.C & D.C excitations.

MODULE – V: Electrical Machines [12 Periods]

Principle of Operation of Single Phase transformer, Types, Constructional Features, Phasor Diagram on No Load and Load, Equivalent Circuit, Losses and Efficiency of Transformer and Regulation, OC and SC Tests (Simple Problems). Principle of operation of 3Ø Induction Motor and Attenuators.

TEXT BOOKS:

1. A. Chakrabarhty, **"Electric Circuits",** Dhanipat Rai & Sons.
2. B.L.Theraja, A.K.Theraja, **"ELECTRICAL TECHNOLOGY",** S.Chand Publications. Volume II
3. P. S. Subramanyam,**"Basic Concepts of Electrical Engineering"**, BS Publications.

REFERENCE BOOKS:

1. William Hayt and Jack E. Kemmerly, **"Engineering circuit analysis"**, Mc Graw Hill Company, 7th Edition.
2. S.N. Singh, **"Basic Electrical Engineering"**, PHI.
3. David A. Bell, **"Electrical Circuits"**, Oxford University Press.
4. K. S. Suresh Kumar, **"Electric Circuit Analysis"**, Pearson Education.

OUTCOMES:

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

1. Apply the above conceptual things to real-world electrical and electronics problems and applications with the basic transient analysis of circuits, filters, attenuators.
2. Apply their knowledge on operation of Single Phase Transformers & Basics of Induction Motors, Alternators with which, the student can able to do the conceptual things to real-world problems and applications.

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Course Code: 50406 **Credits: 2**

B. Tech. – III Semester

ELECTRONIC CIRCUIT ANALYSIS LAB

PART - A: To be performed in Simulation software

1. Common Emitter Amplifier.
2. Common Gate Amplifier.
3. Two Stage RC Coupled Amplifiers.
4. Wein Bridge Oscillator using Transistors.
5. Hartley & Colpitt's Oscillators.
6. Class A Power Amplifier (Transformer less).

PART - B: To be performed Using Discrete Electronic Components

1. Common Source Amplifier.
2. Darlington Pair.
3. RC Phase Shift Oscillator using Transistors.
4. Class A Power Amplifier (with Transformer load).
5. Class B Complementary Symmetry Amplifier.
6. Single Tuned Voltage Amplifier.

Equipment required for Laboratory:

1. Computer System - Pentium, 2.7 GHz, 2 GB RAM, 100 GB HD, Windows XP.
2. Software - Multisim
3. CRO's - 0-20MHz
4. Function Generators - 01MHz
5. Multimeters
6. Discrete Electronic Components - Resistors, Capacitors, BJTs, JFETs, Diodes - Ge or Si.

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Course Code: 50407 **Credits: 2**

B. Tech. – III Semester

BASIC SIMULATION LAB

List of Experiments:

1. Basic Operations on Matrices.
2. Generation of Various Signals and Sequences (Periodic and Aperiodic), such as Unit impulses, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.
3. Operation of 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 reliability 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. Sampling Theorem Verification.

Equipment Required:

1. Computers - Dual Core, Windows XP
2. Software - OCTAVE

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Course Code: 50H17 **Credits: 2**

B.Tech. – III Semester

GENDER SENSITIZATION
(An Activity-based Course)

OBJECTIVE:

- To develop students' sensibility with regard to issues of gender in contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

MODULE-I: UNDERSTANDING GENDER [6 Periods]

Gender: Why Should We Study It? *(Towards a World of Equals:* Unit -1) Socialization: Making Women, Making Men *(Towards a World of Equals:* Unit -2) Introduction. Preparing for Womanhood. Growing up Male. First Lessons in Caste. Different Masculinities.

Just Relationships: Being Together as Equals *(Towards* a *World of Equals:* Unit *-2)* Mary iKorn and Onler. Love and Acid just do not Mix. Love Letters. Mothers aniJ Fathers. Further Reading: Rosa Parks-The Brave Heart.

MODULE-II: GENDER AND BIOLOGY [6 Periods]

Missing Women: Sex Selection and Its Consequences *(Towards a World of Equals:* Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary *(Towards* a *World of Equals:* Unit -10)
Two or Many? Struggles with Discrimination.
Additional Reading: Our Bodies, Our Health *(Towards a World of Equals:* Unit -13)

MODULE-III: GENDER AND LABOUR [6 Periods]

Housework: the Invisible Labour *(Towards a World* of *Equals:* Unit -3)
"My Mother doesn't Work." "Share the I.oad."
Women's Work: Its Politics and Economics *(Towards a World of Equals:* Unit -7)
Fact and Fiction. Unrecognized and Unaccounted work. Further Reading: Wages and Conditions of Work.

MODULE-IV: ISSUES OF VIOLENCE [6 Periods]

Sexual Harassment: Say Nol *(Towards a World of Equals:* Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: *"Chdpulum.* Domestic Violence: Speaking Out *(Towards a World of Equals:* Unit -5)
Is Home a Safe Place? When Women Unite (Film" Rebuilding Lives. Further Reading: New Forums for Justice. Thinking about Sexual Violence *(Towards a World of Equals:* Unit -11)
Blaming the Victim-1 Fought for my Life...." - Further Reading: The Caste Face of Violence.

MODULE-V: GENDER STUDIES [6 Periods]

Knowledge: Through the Lens of Gender *(Towards a Work/ of Equals:* Unit -5)
Point of View. Gender and the Structure of Knowledge. Further Reading: Unacknowledged Women Artists of Telangana.
Whose History? Questions for Historians and Others *(Towards a World of Equals:* Unit -9)
Reclaiming a Past. Writing other Histories. Further Reading: Missing Pages from Modern Telangana History.

Essential Reading: All the Units In the Textbook, *"Towards a World of Equals: A Bilingual Textbook on Gender"* written by A.Suneetha, Uma Bhrugubanda, Duggirala Vasanta, Rama Melkote, Vasudha Nagaraj, Mina Rasheed, Gogu Shyamala, Deepa Sreenivas and Susie Thant

Note: Since it Is Interdisciplinary Course, Resource Persons can be drawn from the fields of English Literature or Sociology or Political Science or any other qualified faculty who has expertise in this field.

REFERENCE BOOKS:

1) Sen, Amartya. "More than One Million Women are Missing.' New York Review of Books 37.20 (20 December 1990). Print. We *Were Making History...' Life Stories of Women in the ToIrmgana People's Struggle.* New Delhi: Kali for Women, 1989.
2) Tripti Lahiri. "By the Numbers: Where Indian Women Work." ***Women's*** *Studios Journal* (14 November 2012) Available online at: http:// blogs.visj.com/ India real time/2012/11/14/by -the-numbers-where-Indan-womenworkP
3) K. Satyanarayana and Susie Thant (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada htto://harooreollins.co.in/BookDetailasp?Flook Cndet'3732
4) Vimata. "Vantillu (The Kitchen)". *Women Writing in India: 600 BC to the Present. Volume II:* The 20th Century. Ed. Susie Thaw and K. Lalita. Delhi: Oxford University Press 1995. 599-601.
5) Shatrughna, Veena et al. *Women's Work and its Impact on Child Health end Nutrition,* Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6) Stree Shakti Sanghatana. 'We Were *Making I listory ....' Life Stories of Women in the Telangana* People's *Struggle.* New Delhi: Kali for Women, 1989.
7) Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8) Jayaprabha, A. "Chupulu (Stares)'. *Women Writing in India: 6008C to the Present. Volume II:* The 20" Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995.596-597.

9) Javeed, Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis.' *International Journal of Humanities and Social Science Invention* 2.4(2013)
10) Gautam, l.iela and Gila Ramaswamy. 'A 'conversation' between a Daughter and a Mother.' *Broadsheet on Contemporary Politics.* Special Issue on *Sexuality and Harassment: Gender Politics on Campus Today.* Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.
11) Abdulali Sohaila. *'I Fought For My Life...and* Won."Available online at: htte://www.thealternativeinilifestylefi-fouoht-for-mv-lifeand-won-sohaila-abdulall
12) Jeganathan Pradeep, Partha Chatterjee (Ed). *`Community, Gender and Violence Subaltern Studies Xi* Permanent Black and Ravi Dayal Publishers, New Delhi, 2000
13) K. Kapadia. The *Violence of Development: The Politics of Identity, Gender and Social Inequalities in India.* London: Zed Books, 2002
14) S. Benhabib. *Situating the Salt Gender, Community, and Postmodernism in Contemporary Ethics,* London: Routledge, 1992
15) Virginia Woolf. A *Room of One's Own.* Oxford: Black Swan. 1992.
16) T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Fars,* Karachi: Oxford University Press 1997

OUTCOMES:

- Students will have developed a better understanding of important issues related to gender in contemporary India.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discrimination works in our society and how to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics and economics.
- Men and women students and professionals will be better equipped to work and live together as equals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender violence.

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Course Code: 50A03 **Audit Course**

B. Tech. – III Semester

LAW FOR ENGINEERS

OBJECTIVE:

The objective of the course is to familiarize students (Prospective engineers) with elementary knowledge of laws that would be of utility in their profession. The syllabus covers Constitution of India and new areas of law like Cyber, IPR, Human Rights, Right to Information, Corporate and Labour.

Module I **[6 Periods]**

Constitutional Law covering the Preamble; Fundamental Rights, Fundamental Duties;
Human Rights and Public International Law - Theoretical foundation, human rights and international law; UNMechanism and specialized agencies, (UNICEF, UNESCO, WHO, ILO);International NGOs – Amnesty International, Human Rights Watch, Greenpeace Foundation;Enforcement of Human Rights in India including Supreme Court, High Courts, StatutoryCommissions – NHRC, NCW, NCM, NC-SCST.

Module II **[6 Periods]**

Right to Information Act, 2005 - Evolution and concept; Practice and procedures;
Labour Laws - Industrial Employment (Standing Orders) Act, 1946; Workmen's Compensation Act, 1923;(3 Lectures)
Corporate Laws - Law relating to public, private and multinational companies, collaboration agreements for technology transfer

Module III **[6 Periods]**

Introduction to IT laws & Cyber Crimes –Cyber Crime Investigation and Cyber Security.
Intellectual property – meaning, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets;Patentable inventions, Rights and obligations of patentee, Duration of patents – law andpolicy considerations, Infringement and related remedies;

Books:

1. H.M. Seervai - Constitutional Law of India - Tripathi Publications – 4th Edition, 1991
2. S.K. Kapur - Human Rights under International Law and Indian Law - Central Law Agency – 2001
3. Cornish W. R. - Intellectual Property Rights, Patents, Trademarks, Copyrights & Allied Rights - Sweet & Maxwell– 2008
4. Avtarsingh - Company Law - Eastern Book Co.–2007
5. James Graham - Cyber Security Essentials - CRC Press - 1st Ed., 2011

OUTCOMES:

After the course, the student will able to:

1. Understand Fundamental rights, duties and different organizations for human rights protection.
2. Know Labour laws, Corporate Law and Right to Information Act.
3. Learn about Intellectual property rights, cyber crimes and laws.

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Course Code: 50B10 **Credits: 4**

B. Tech. – IV Semester

SPECIAL FUNCTIONS AND COMPLEX ANALYSIS

PREREQUISITES: Differential Calculus.

OBJECTIVE:

The main objective of this course is to introduction of the concept of series solution representation for a selected differential equation. Also we are introduced limited special functions in addition with the theory of complex analysis. For every differential equation closed form solution need not exist. In such case one can depend on series solution representation due to Frobenius. Here the idea is to get the solution in the form of infinite convergent series. Special functions are useful to evaluate improper integrals. The concept of Compex theory is introduced to test the Analyticity of a complex valued function in the Argand plane. Singularities and their classification including the notion of Residue are discussed which are useful to evaluate some typical improper integrals. Conformal mapping and its properties are discussed to learn the mapping of points from Z plane to W plane.

MODULE - I: Series Solution & Beta, Gamma functions [12 Periods]

Motivation for series solution, Ordinary point and Regular singular point of a differential equation, Series solutions to differential equations around zero , Frobenius Method about zero. Beta function, Gamma function, relationship between them, Properties.

MODULE - II: Legendre's & Bessel's Polynomials [12 Periods]

Legendre's Differential equation, General solution of Legendre's equation, Legendre's Polynomials & Properties.

Bessel's Differential equation, General solution of Bessel's equation, Bessel functions properties.

MODULE - III: Complex Functions –Differentiation and Integration [12 Periods]

Complex functions and its representation on Argand plane, Concepts of limit, Continuity, Differentiability, Analyticity, Cauchy-Riemann conditions, Harmonic functions – Milne – Thompson method.

Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.

MODULE - IV: Power series expansions of complex functions and contour Integration [12 Periods]

Radius of convergence -Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity.

Residue – Evaluation of residue by formula and by Laurent series – Residue theorem. Evaluation of integrals by indentation

(a) $\int_c^{c+2\pi} f(\cos\theta \quad ,\sin\theta)d\theta$ (b) $\int_{-\infty}^{\infty} f(x)dx$

MODULE - V: Conformal mapping [12 Periods]

Transformation of z - plane to w - plane by a function, conformal mapping. Standard transformations, Translation; Magnification and rotation; inversion and reflection,

Transformations like e^z, log z, z^2, Bilinear transformation ,Properties of Bilinear transformation, determination of bilinear transformation ,when mappings of 3 points are given.

TEXT BOOKS:

1) Ruel Churchill, **Complex Variables and Applications by James Brown**, McGraw Hill Education. 8th Edition, 1970. (Modules III, IV & V)
2) E Kreyszig, **Advanced Engineering Mathematics**, John Wiley & Sons, 10th Edition, 2010. (Modules I, II, III, IV & V)
3) B.S. Grewal, **Higher Engineering Mathematics**, Khanna Publishers. 40th Edition, 2014. (Modules I, II, III, IV & V)

REFERENCES:

1) A. K. Kapoor, **Complex Variables Principles And Problem Sessions**, World Scientific Publishers, 1st Edition, 2011.
2) K. B. Datta, **Mathematics for Engineers,** Cengage Publications, 1st Edition, 2013.

OUTCOMES:

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

1. Apply the special functions in real-life applications such as engineering; it can be used in determining the flow of fluids, such as the flow around the pipe.
2. In Fluid mechanics, the Cauchy - reimann equations are described by two complex variables. One can assess the flow nature.
3. Conformal mapping is a power aid to study the image patterns in w-plane as compared with the z - plane. One can learn the concept of fixed point notion.

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Course Code: 50408 **Credits: 3**

B. Tech. – IV Semester

DIGITAL ELECTRONICS

PREREQUISITES: Basic Mathematics.

OBJECTIVE:

This course is to introduce the basics of number systems, radix conversions, representing the numbers using various codes, code properties and studying about logic gates. This course helps the students in building the digital electronic circuits using gates, combinational logic, sequential logic, Flip Flops and the state machine analysis & applications of state machines.

MODULE – I: Number systems & Binary codes [10 Periods]

Number systems: Number Systems, Radix conversions, complement of numbers.

Binary codes: Binary codes, Weighted and non-Weighted codes, BCD code, gray code, excess 3 codes - Error detecting code, Error Correcting code, Hamming Code, Introduction to HDL Programming.

MODULE – II: Boolean Algebra & Boolean functions [13 Periods]

Boolean Algebra: Postulates and Theorems - Canonical and Standard forms: SOP and POS forms, Minterms and Maxterms – Logic gates: NOT, OR, AND, NOR, NAND, XOR, XNOR - Universal gates, HDL codes for all the gates

Simplification of Boolean functions: Simplification of functions: Karnaugh map(2,3,4,5,6 Variables) and Quine McCluskey method (Tabular Method) - Prime implicants, essential prime implicants.

MODULE - III: Combinational Logic Circuits [13 Periods]

Arithmetic circuits: Half adder, full adder, half Subtractor, full Subtractor, binary adder, Carry look ahead adder, BCD adder, Code conversion circuits, Comparator, Decoder, Encoder, Priority Encoder, Multiplexers and Design, De – Multiplexers, ROM, PLA, PAL, HDL codes for Half adder, Half Subtractor, Comparator, Decoder, Encoder and Multiplexer.

MODULE – IV: Sequential Logic Circuits - I [12 Periods]

Introduction – Latches and Flip flops: Basic Flip flop circuit, RS, D, JK and T Flip-flops – Triggering of Flip flops: Master Slave Flip flop, edge triggered flip flop – Conversion of one type of Flip flop to another, Setup time, hold time.

Counters: Registers, shift register, Ripple counter, Synchronous counter, binary up/down counter, Johnson counter, HDL code for RS,D,JK and T Flip-flops, Registers and Counters.

MODULE – V: Sequential Logic Circuits - II [12 Periods]

Analysis of Sequential Logic circuit: State Diagram, state table, reduction of state table, state Assignment –- Design procedure of sequential circuits using state diagram, state table and Flip flops. Example design Sequence detector.

Finite State Machine: Introduction, FSM capabilities and Limitations, Mealy and Moore models – minimization of completely specified and incompletely specified sequential Machines. Partition techniques and Merger charts

TEXT BOOKS:

1. Morris Mano, **"Digital Design"**, PHI, 3rd Edition, 2009.(Units V)
2. A. Anand Kumar, **"Switching Theory and Logic Design"**, PHI 2nd Edition, 2014.(Unit I, II, III, IV & V)
3. John F.Wakerly, **"Digital Design Principles & Practices"**, PHI/ Pearson Education Asia, 3rd Ed., 2005.

REFERENCE BOOKS:

1. Zvi Kohavi, **"Switching and Finite Automata Theory"**, TMH, 2nd edition, 2006.
2. Stephen Brown and Zvonka Vramesic, **"Fundamentals of Digital Logic with VHDL Design"**, McGraw Hill, 2nd Edition, 2008.
3. William I. Fletcher, **"An Engineering Approach to Digital Design"**, PHI, 1st Edition, 2009.
4. J.Bhasker , **"VHDL Primer"**, Pearson Education / PHI, 3rd Edition, 1999.

OUTCOMES:

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

1. Work on various number systems, radix and codes used to represent the numbers.
2. Understand the logic gates, truth tables, Boolean function simplifications.
3. Build the combinational and sequential circuits.
4. Understand the state machine, analyze & develop the applications using state machines.

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Course Code: 50409 **Credits: 3**

B. Tech. – IV Semester

ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

PREREQUISITES: Physics.

OBJECTIVE:

To introduce student to the fundamental theory and concepts of electromagnetic waves and transmission lines and their practical applications. This course also introduces the propagation, reflection, and transmission of plane waves in bounded and unbounded media.

MODULE – I: Electrostatics [12 Periods]

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relations Between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Illustrative Problems. Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations; Capacitance – Parallel Plate, Coaxial, Spherical Capacitors, Illustrative Problems.

MODULE – II: Magnetostatics [12 Periods]

Biot - Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Inductances and Magnetic Energy, Illustrative Problems.

Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and Word Statements, Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

MODULE – III: EM Wave Characteristics [12 Periods]

EM Wave Characteristics - I: Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definition, All Relations Between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization, Illustrative Problems.

EM Wave Characteristics – II: Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem – Applications, Power Loss in a Plane Conductor., Illustrative Problems.

MODULE – IV: Transmission Lines - I [12 Periods]

Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Expressions for Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Losslessness / Low Loss Characterization, Distortion – Condition for Distortionlessness and Minimum Attenuation, Loading - Types of Loading, Illustrative Problems.

MODULE – V: Transmission Lines – II [12 Periods]

Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; λ/4, λ2, λ/8 Lines – Impedance Transformations, Significance of Z_{min} and Z_{max}, Smith Chart – Configuration and Applications, Single and Double Stub Matching, illustrative Problems.

TEXT BOOKS:

1. Matthew N.O. Sadiku, **"Elements of Electromagnetics"**, Oxford Univ. Press, 4th Edition, 2007.(Modules I, II & III)
2. E.C. Jordan and K.G. Balmain, **"Electromagnetic Waves and Radiating Systems"**, PHI, 2nd Edition, 2000. (Modules I, II & III)
3. Umesh Sinha and Satya Prakashan, **"Transmission Lines and Networks"**, (Tech. India Publications), New Delhi, 7th Edition, 2006. (Modules IV & V)

REFERENCE BOOKS:

1. Nathan Ida, **"Engineering Electromagnetics"**, Springer (India) Pvt. Ltd, New Delhi, 2nd Edition, 2005.
2. William H. Hayt Jr. and John A. Buck, **"Engineering Electromagnetics"**, TMH, 7th Edition, 2006.
3. John D. Ryder, **"Networks, Lines and Fields"**, PHI, 2nd Edition, 1999.

OUTCOMES:

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

1. Study time varying Maxwell's equations and their applications in electromagnetic problems.
2. Determine the relationship between time varying electric and magnetic field and electromotive force.
3. Analyze basic transmission line parameters in phasor domain.
4. Use Maxwell s equations to describe the propagation of electromagnetic waves in vacuum.
5. Show how waves propagate in dielectrics and lossy media.
6. Demonstrate the reflection and refraction of waves at boundaries.
7. Explain the basic wave guide operation and parameters.

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Course Code: 50410 **Credits: 3**

B. Tech. – IV Semester
PULSE AND DIGITAL CIRCUITS

PREREQUISITES: Analog & Digital Devices and Circuits.

OBJECTIVE:
This course introduces the concepts of complete response of R-C and R-L circuits, clippers, clampers, switching characteristics of transistors and sampling gates. It also contains various multi vibrators using transistors, design of sweep circuits and sampling gates and realizes logic gates using diodes and transistors.

MODULE – I: Linear Wave Shaping [10 Periods]
High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square, ramp and exponential inputs, high pass RC circuit as differentiator and low pass RC circuit as integrator, attenuators, High pass and low pass RL circuits, Applications of High pass and low pass RC circuits.

MODULE –II: Non-Linear Wave Shaping [12 Periods]
Non-Linear Wave Shaping: Diode clippers, transistor clippers, clipping at two independent levels, emitter coupled clipper, comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, clamping circuit theorem, practical clamping circuits, Applications of Clippers and Clampers.
Steady State Switching Characteristics of Diodes & Transistors: Diode as a switch, diode switching times, temperature variation of saturation parameters, design of transistor as a switch, transistor-switching times, Applications of transistor as a switch.

MODULE –III: Multivibrators [16 Periods]
BISTABLE Multivibrators: The stable state of a Bistable multivibrator, design and analysis of fixed bias and self biased Bistable multivibrator, triggering of Bistable multivibrator, emitter coupled Bistable multivibrator, and Design and analysis of Schmitt trigger circuit using transistors.
MONOSTABLE and ASTABLE Multivibrators: Monostable multivibrator, design and analysis of collector coupled Monostable multivibrator and Monostable multi as voltage-to-time converter, Astable multivibrator, collector coupled Astable multivibrator and Astable multi as voltage-to-frequency converter, Applications of Monostable and Astable multivibrators.

MODULE –IV: Sampling Gates and Logic Families [12 Periods]
Sampling Gates: Basic operating principles of sampling gates, Unidirectional diode gate, Bi-directional sampling gates using transistors and diodes, Reduction of pedestal in gate circuit, four diode sampling gate, an alternate form of four diode gate, Applications of sampling gates
Logic Families: Realization of Logic Gates (OR, AND, NOT) Using Diodes & Transistors, DCTL, RTL, DTL, TTL, ECL, CMOS logic family and comparison of logic families, Applications of Logic families.

MODULE –V: Time Base Generators and Synchronizing Circuits [10 Periods]
General features of a time base signal, methods of generating time base waveform and errors, UJT Relaxation oscillator, miller and bootstrap time base generators – basic principles,

transistor miller time base generator, transistor bootstrap time base generator.

Synchronization and Frequency Division: Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, monostable relaxation circuits, synchronization of a sweep circuit with symmetrical signals.

TEXT BOOKS:

1. Jacob Millman, Herbert Taub, Mothiki S. Prakash Rao, **"Pulse, Digital and Switching Waveforms"**, Tata McGraw Hill, New Delhi, 3rd edition, 2008. (Modules I, II, III, IV & V)
2. Anand Kumar, **"Pulse and Digital Circuits"**, Prentice Hall of India, India, 2005. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. David A. Bell **"Solid state pulse circuits"**, Prentice Hall of India, New Delhi, India. 4th edition, 2002.
2. Mothiki S. Prakash Rao, **"Pulse and Digital Circuits"**, Tata McGraw Hill, India, 2006.

OUTCOMES:

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

1. Understand the integrator, differentiator, applications of diode as clippers, clamper circuits.
2. Learn various switching devices such as diode, transistor.
3. Design of multivibrators for various applications, synchronization techniques and sweep circuits.
4. Realizing logic gates using diodes and transistors & various logic families.

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Course Code: 50411 **Credits: 3**

B. Tech. – IV Semester

ANALOG COMMUNICATIONS

PREREQUISITES: Signals and Systems.

OBJECTIVE:

This course introduces the need for Modulation and various analog modulation and demodulation techniques. And also introduces the concepts of Noise in analog communication system and its classification, basic building blocks of radio receivers and Pulse modulation techniques.

MODULE - I: Amplitude Modulation and Demodulation [12 Periods]

Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector.

DSB-SC Modulation and Demodulation: Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop. Block diagram of AM Transmitter.

MODULE - II: SSB and VSB Modulation and Demodulation [12 Periods]

SSB: Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves.

VSB: Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

MODULE - III: Angle Modulation [12 Periods]

Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM and AM. Block diagram of FM Transmitter.

MODULE - IV: Noise in Analog communication System [12 Periods]

Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and Quadrature phase components and its Properties, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks.

Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Noise Triangle in Angle Modulation System, Pre-emphasis and de-emphasis

Module - V: Radio Receiver and Pulse Modulation [12 Periods]

Radio Receiver: Introduction, Receiver Types - Tuned radio frequency receiver,

Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Pulse Modulation: Introduction, PAM, PWM, PPM Modulation and Demodulation Techniques.

TEXTBOOKS:

1. H Taub & D. Schilling, Gautam Sahe, **"Principles of Communication Systems"**, TMH, 3rd Edition, 2007. (Modules I, II, III & IV)
2. George Kennedy and Bernard Davis, **"Electronics & Communication System"**, TMH, 3rd Edition, 2004. (Module V)

REFERENCE BOOKS:

1. Simon Haykin, **"Communication Systems"**, Wiley Publications, 2nd Edition, 2007.
2. R Singh, **"Communication Systems, Analog & Digital"**, S Sapre Publisher: Tata McGraw-Hill, New Delhi, 2nd Edition, 2008.

OUTCOMES:

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

1. Know the concepts of modulation and various analog modulation techniques i.e., AM: SSB-SC, DSB-SC, VSB.
2. Know the concepts of FM and Angle modulation.
3. Know different types of Noises and its effect in communication system.
4. Know different types of Radio receivers i.e., tuned radio receiver, super heterodyne receiver, FM Receiver.
5. Understand PAM, PPM, PWM modulation and demodulation techniques. Design typical telecommunication systems that consist of basic and essential building blocks.

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Course Code: 50584 **Credits: 3**

B. Tech. – IV Semester

COMPUTER ORGANIZATION AND OPERATING SYSTEMS

PREREQUISITES: Basic computers and Digital Electronics.

OBJECTIVE:

This course introduces the basic structure and operation of digital computer. It will discuss in detail the operation of arithmetic unit for fixed point and floating point and different ways of communicating with I/O devices. This course also discusses the functions of operating systems to implement a significant portion of operating systems.

MODULE - I: Basic Structure of Computers [12 Periods]

Computer Types, Functional UNIT, Basic OPERATIONAL Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.

Register Transfer Language and Micro Operations: Register Transfer Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers, Computer Instructions – Instruction Cycle. Memory – Reference Instructions, Input – Output and Interrupt, STACK Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

MODULE - II: Micro Programmed Control and The Memory System [12 Periods]

Micro Programmed Control: Control Memory, Address Sequencing, Microprogram Examples, Design of Control Unit, Hard Wired Control, Microprogrammed Control

The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories - Performance Considerations, Virtual Memories Secondary Storage, Introduction to RAID.

MODULE - III: Input - Output Organization [12 Periods]

Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer Modes, Priority Interrupt, Direct Memory Access, Input –Output Processor (IOP), Serial Communication; Introduction to Peripheral Components, Interconnect (PCI) Bus, Introduction to Standard Serial Communication Protocols like RS232, USB, IEEE1394.

MODULE - IV: Operating Systems [12 Periods]

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation

Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing, Case Studies - UNIX, Linux, Windows

Principles of Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

MODULE - V: File System **[12 Periods]**

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.

File System Implementation: File System Structure, File System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

TEXT BOOKS:

1. Carl Hamacher, Zvonks Vranesic, SafeaZaky, **"Computer Organization"**, McGraw Hill, 5th Edition, 2002. (Modules I, II & III)
2. M. Moris Mano, **"Computer Systems Architecture"**, Pearson, 3rd Edition, 2000. (Units I, II & III)
3. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, **"Operating System Concepts"**, John Wiley, 8th Edition, 2010. (Modules IV & V)

REFERENCE BOOKS:

1. William Stallings, **"Computer Organization and Architecture"**, Pearson, 6th Edition.
2. Andrew S. Tanenbaum, **"Structured Computer Organization"**, PHI, 4th Edition.
3. Sivaraama Dandamudi, **"Fundamentals of Computer Organization and Design"**, Springer Int. Edition.
4. Stallings, **"Operating Systems–Internals and Design Principles"**, Pearson Education, 6th Edition, 2009.
5. Andrew S Tanenbaum, **"Modern Operating Systems"**, PHI, 2nd Edition.
6. B. L. Stuart, **"Principles of Operating Systems"**, Cengage Learning, India Edition.

OUTCOMES:

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

1. Know the basic structure of a digital computer.
2. Learn Arithmetic operations of binary number system and the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
3. Know the Operating system functions, types, system calls, Memory management techniques and dead lock avoidance.
4. Know Operating systems file system implementation and its interface.

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Course Code: 50412 **Credits: 2**

B. Tech. – IV Semester

ANALOG COMMUNICATIONS LAB

LIST OF EXPERIMENTS

1. Amplitude modulation and demodulation.
2. DSB-SC Modulator & Detector
3. SSB-SC Modulator & Detector (Phase Shift Method)
4. Study of spectrum analyzer and analysis of AM and FM Signals
5. Pre-emphasis & de-emphasis.
6. Time Division Multiplexing & De multiplexing
7. Verification Of Sampling Theorem
8. Pulse Amplitude Modulation And Demodulation
9. Pulse Width Modulation & Demodulation
10. Pulse Position Modulation & Demodulation
11. AGC Characteristics
12. Radio Receiver

Equipment required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30V
2. CRO's - 0-20MHZ
3. Function Generators - 0-1MHz
4. Multimeters
5. Various Analog Communication Trainer Kits
6. Radio Receiver Trainer kits
7. Spectrum Analyzer - 0.15 MHz to 1150 MHz
8. Simulation software - MATLAB or OCTAVE

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Course Code: 50413 **Credits: 2**

B. Tech. – IV Semester

PULSE AND DIGITAL CIRCUITS LAB

LIST OF EXPERIMENTS:

PART A:

1. Linear wave shaping.
2. Non Linear wave shaping - Clippers and Clampers.
3. Transistor as a switch.
4. Study of Logic Gates & some applications.
5. Astable Multivibrator.
6. Monostable Multivibrator.
7. Schmitt Trigger.
8. Bootstrap Sweep Circuit**.**

PART B: ***HDL Simulation programs:***

1. HDL code to realize all the logic gates
2. Design of 2-to-4 decoder
3. Design of 8-to-1 multiplexer and 1x8 demultiplexer.
4. Design of flip flops: SR, D, JK, T

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
6. Xilinx Software
7. Computers - P - IV , Windows XP,1GB Ram , 500 GB HDD

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Course Code: 50H11 **Audit Course**

B. Tech. – IV Semester

HUMAN VALUES AND PROFESSIONAL ETHICS

Prerequisite: NIL

OBJECTIVE: To make students familiar with Human value with professional ethics.

Introduction:

The term 'ethics' is derived from the Greek word ***ethos*** which can mean custom, habit, character or disposition. Ethical awareness is an integral part of professional attitude and it is necessary to take time for reflection-on-action. Building professional attitude begins by understanding what it means to be a professional and how a professional should relate and react to her work environment The Course, Professional Ethics and Human Values will be a part of Value Education leading towards sensitizing the students on Values of Life and preparing them for life. The colleges are centers of excellence for the education of students. Many of these students will be the professionals of tomorrow: Engineers, Business administrators, and so forth. Their expertise, knowledge and power will exercise a crucial influence on the quality of life of millions of citizens. The question is whether they will be sufficiently prepared to recognize the ethical aspects of their professional decisions and to understand the social consequences of their work. The institutions prepare them to become experts in a very limited field, to find technical solutions to specific problems. But often they do not learn how to resolve ethical problems or to make themselves into responsible persons.

The term 'ethics' is derived from the Greek word ***ethos*** which can mean custom, habit, character or disposition. Ethical awareness is an integral part of professional attitude and it is necessary to take time for reflection-on-action. Building professional attitude begins by understanding what it means to be a professional and how a professional should relate and react to her work environment

Objectives:

- To create an awareness on Professional Ethics and Human Values.
- To understand social responsibility of any profession
- To appreciate ethical dilemma while discharging duties in professional life.
- To help the students appreciate the essential complementarily between Values and Skills to ensure sustained happiness and prosperity which are the core aspirations of all human beings
- To develop Holistic Perspectives towards life
- To enable students to lead a practical life adding value to human relations
- To generate capacity for making intelligent and independent value judgments in real life situations.

MODULE – I Human Values: **[05 Periods]**

Morals, Values and Ethics – Integrity – Work Ethic – Honesty – Courage –Empathy – Self-Confidence – Character.

MODULE –II Professional Ethics: [09 Periods]

Variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

MODULE-III Human values, Ethics, Life Skills: [09 Periods]

Goals in life – Goal setting – Differentiating Right and Wrong – Integrity – Adaptability – Sense of Humor - Valuing Time – Co-operation – Commitment

MODULE-IV Harmony in Human Beings Vs Harmony in self: [05 Periods]

Understanding self and body – Human Interactions – Human-Human relationships – Respect and Differentiation – Humanistic education, Humanistic Constitution, Humanistic Universal Order

Books for Reference:

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
4. Naagarazan. R.S "A Textbook on Professional Ethics and Human Values", New Age International Publishers, 2001
5. A N Tripathy, "Human values", New Age International Publishers, 2003
6. George Reynolds, "Ethics in Information Technology", Cengage Learning, 2002

OUTCOMES:

Upon completion of the course, the students are expected to:

1. To define various terms related to Human value with professional ethics..
2. To understand the professional responsibilities.
3. To analyse the soft ware engineering ethics and practices.

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Course Code: 50414 **Credits: 3**

B. Tech. – V Semester

MICRO PROCESSORS AND INTERFACING

PREREQUISITES: Digital Electronics.

OBJECTIVE:

This course introduces microprocessor architecture and microcomputer systems, including memory and input/output interfacing. Topics includes the architecture, assembly language programming, bus architecture, bus cycle types, I/O systems, memory systems, interrupts, and other related topics of 8085 & 8086. It also includes the architectures of advanced microprocessors like 80186, 80286, 80386 and 80486.

MODULE - I: 8085 Architecture [12 Periods]

Introduction to microprocessor, 8085 microprocessor architecture, address, data and control buses, 8085 pin functions, demultiplexing of buses, generation of control signals, instruction cycle, machine cycles, t-states, memory interfacing.

Instruction Set: classification of instructions, addressing modes, 8085 instruction set, instruction and data formats, writing, assembling & executing a program.

MODULE - II: Assembly Language Programming [14 Periods]

Assembly Language Programming of 8085: Writing 8085 assembly language programs with decision making and looping using data transfer, arithmetic, logical and branch instructions. Stack & subroutines, developing counters and time delay routines.

Interfacing with 8085: Interfacing concepts, ports, interfacing of i/o devices, interrupts in 8085, programmable interrupt controller 8259a, programmable peripheral interface 8255a.

MODULE - III: 8086 Architecture [10 Periods]

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.

Instruction set and assembly language programming of 8086: instruction formats, addressing modes, instruction set, assembler directives, macros. Simple programs.

MODULE - IV: Interfacing [14 Periods]

I/o interface: 8255 ppi, various modes of operation and interfacing to 8086, interfacing keyboard, display, d/a and a/d converter.

Communication interface: serial communication standards, serial data transfer schemes, 8251 USART architecture and interfacing.

Interfacing with advanced devices: memory interfacing to 8086, interrupt structure of 8086, vector interrupt table, interrupt service routine.

MODULE - V: Advanced Microprocessors [10 Periods]

80186, 80286, 80386 and 80486 microprocessors: 80186 architecture, enhancements of 8 0186. 80286 architecture:real and virtual addressingmodes. 80386 architecture, special regis ters, memory management, memory paging mechanism, 80486architecture , enhancements, c ache memorytechniques, exception handling,comparison ofmicroprocessors (8086 80186 – 80286 – 80386 – 80486).

TEXT BOOKS:

1. Ramesh Gaonkar, **"Microprocessor Architecture, Programing and Application with 8085"**, Penram, 5th Edition, 2002. (Modules I & II)
2. A.K.Ray, **"Advanced Microprocessors and Peripherals"**, Tata McGraw-Hill, 2nd Edition, 2006. (Modules III, IV & V)

REFERENCE BOOKS:

1. D. V. Hall, **"Microprocessors and Interfacing"**, TMH, 2nd Edition, 2006.
2. K. Uday Kumar, B.S.Umashankar, **"The 8085 Microprocessor: Architecture, programming and Interfacing"**, Pearson, 2008.

OUTCOMES:

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

1. Describe the basic architecture of 8085 & 8086 microprocessors.
2. Write assembly language programs for 8085 & 8086 microprocessors.
3. Describe a typical I/O and Memory interfacing microprocessor systems.
4. Know the architectures of advanced microprocessors.

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Course Code: 50H03 **Credits: 2**

B. Tech. – V Semester

TECHNICAL COMMUNICATION AND PRESENTATION SKILLS

PREREQUISITES: Basic English.

OBJECTIVE:
The learners need to be aware of the characteristics of technical communication. The learners are exposed different channels of technical communication**.** The learners should be an effective communicator

Introduction: Identifying the importance of communication at work and the nuances of technical communication became imperative to technical graduates. This course intends to introduce the importance, characteristics and nuances of technical communication. Technical communication is all about exchange of information that helps people interact with technology and solve complex problems. Since the communication skills cannot be taught but be developed through practice the student will be competent communicator through application and the use of the concepts and activities in different units.
Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involve in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

MODULE - I: Technical Vocabulary **[6 Periods]**
Building vocabulary – identify formal and informal vocabulary – identify technical vocabulary – tips to enhance technical vocabulary, Basics of English Pronunciation.

MODULE - II: Technical writing **[6 Periods]**
Characteristics of writing – mechanics of writing – methodology of writing – format & style-structures of writing – circular writing – memo writing – instructions writing.

MODULE - III: Technical Report writing **[6 Periods]**
Types of report, Abstract Writing, Project report writing, importance of pictorial presentation- graphs, diagrams etc
Instruction: The students are required to work on a project. Field work and collection of information, prepare a project report.

MODULE - IV: Oral Presentations **[6 Periods]**
Types of Presentations, 4Ps of Effective Presentation, Elements of effective presentations, Planning and preparing a model presentation, organizing, Barriers of making effective presentation.
Present the project in the form of Power Point Presentation and written document. This report will be given weightage during the external examination.
*This particular module is for internal evaluation purpose(s).

MODULE - V: Strategies of Reading Technical Text [6 Periods]

Note - making, SQR3, Reading and answering the technical texts, Reading for Specific Purposes.

REFERENCE BOOKS:

1. Chrissie, "**Handbook of Practical Communication Skills",** Jaico Publishing house, 1999.
2. Daniels, Aubrey, **"Bringing Out the Best in People"**, Tata McGraw-Hill: New York, 2003.Wright , Goulstone, Mark, **"Just Listen: Discover the Secret to getting through to absolutely anything"**, American Management Association, 2010.
3. Leslie. T. Giblin, **"Skill with people"**, Publication details not known.
4. Lewis, Norman, **"Word Power Made Easy",** Goyal Publications, New Delhi, 2009.
5. Murthy, A.G, Krishna, **"Ten Much",** Tata McGraw-Hill, New Delhi, 2010.
6. Pease , Barbara and Pease, Allan: **"The Definitive Book on Body Language",** Manjul Publishing House Pvt Limited, 2011
7. Rizvi M Ashraf, **"Effective Technical Communication"**, Tata McGraw-Hill, New Delhi, 2010.
8. Whitcomb, Susan Britton, **"Resume Magic: Trade Secrets of a Professional Resume"**, JIST Works, 2010.

WEBSITES:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

OUTCOMES:

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

1. The learner is ready to bring into play latest communication devices.
2. The learner is equipped with the nuances of technical communication

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Course Code: 50415 **Credits: 3**

B. Tech. – V Semester

ANTENNAS AND WAVE PROPAGATION

PREREQUISITES: Electrostatics and Magneto statics.

OBJECTIVE:
This course introduces the concepts of basic antenna terminologies, fields from various charge distributions. This course also introduces the various antennas based on their operating frequency & physical arrangement, antenna measurements and also Modes of Electromagnetic wave propagation.

MODULE - I: Antenna Basics **[12 Periods]**
Introduction, Antenna Radiation Mechanism. Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity - Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems. Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Antenna Impedance. Friis Transmission formula.

MODULE - II: Thin Linear Wire Antennas **[12 Periods]**
Radiation, Maxwell's equations, Retarded Potentials – Helmholtz Theorem. Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height.
Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small and Large Loops (Qualitative Treatment).

MODULE - III: Antenna Arrays and Non resonant Radiators **[12 Periods]**
Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources - Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.
Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles, Log Periodic Antenna and their Characteristics.
Non resonant Radiators: V-antennas, Rhombic Antennas and Design Relations, Helical Antennas - Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar.

MODULE - IV: Microwave Antennas **[12 Periods]**
Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Impact of Different Parameters on Characteristics. Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems. Lens Antennas**:** Introduction, Geometry of Non-metallic Dielectric Lenses, Zoning, Tolerances, Applications. Horn Antennas: Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

Antenna Measurements: Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Pattern Measurement Arrangement, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

MODULE - V: Wave Propagation [12 Periods]

Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation. Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS:

1. J. D. Kraus, R. J. Marhefka and Ahmad S. Khan, **"Antennas and Wave Propagation"**, TMH, New Delhi, (Special Indian Edition), 4th Edition, 2010. (Modules I, II, III, IV & V).

REFERENCE BOOKS:

1. C. A. Balanis, John Wiley & Sons, **"Antenna Theory"**, 3rd Edition, 2005.
2. John D. Kraus, **"Antennas"**, McGraw-Hill (International Edition), 2nd Edition, 1988.
3. E. C. Jordan and K.G. Balmain, **"Electromagnetic Waves and Radiating Systems"**, PHI, 2nd Edition, 2000.

OUTCOMES:

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

1. Understand Antenna terminologies like radiation intensity, beam area, directivity, efficiency etc.
2. Understand the types of antenna like monopole, dipole and Yagi Uda antenna, lens antenna, parabolic antenna etc.
3. Understand how to measure antenna parameters like gain, directivity and radiation pattern measurement.
4. Understand Modes of propagation like ground wave, sky wave, space wave and duct propagation.

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Course Code: 50416 **Credits: 3**

B. Tech. – V Semester

LINEAR AND DIGITAL IC APPLICATIONS

PREREQUISITES: Analog, Pulse and Digital Circuits.

OBJECTIVE:

This course introduces the basic building blocks of linear integrated circuits and teaches the linear and non - linear applications of operational amplifiers. This also introduces the theory and applications of 555 Timers and PLL. This course also introduces the ADC & DAC, concepts of waveform generation & Sine wave Oscillators using Operational Amplifiers.

MODULE – I: Integrated Circuits & Operational Amplifier [12 Periods]

Introduction, Classification of IC's, IC chip size and circuit complexity, basic information of Op-Amp IC741 Op-Amp and its features, the ideal Operational amplifier, Op-Amp internal circuit, Op-Amp characteristics - DC and AC.

MODULE – II: Applications of OP - AMP [12 Periods]

Linear Applications of OP-AMP: Inverting and non-inverting amplifiers, adder, subtractor, Instrumentation amplifier, AC amplifier, V to I and I to V converters, Integrator and differentiator.

Non-Linear Applications of OP-AMP: Sample and Hold circuit, Log and Antilog amplifier, multiplier and divider, Comparators, Schmitt trigger, Multivibrators, Triangular and Square waveform generators, Oscillators.

MODULE – III: Filters, Timers and PLL [12 Periods]

ACTIVE FILTERS: Introduction, Butterworth filters – 1st order, 2nd order low pass and high pass filters, band pass, band reject and allpass filters.

TIMER AND PHASE LOCKED LOOPS: Introduction to IC 555 timer, description of functional diagram, monostable and astable operations and applications, schmitt trigger, PLL - introduction, basic principle, phase detector/comparator, voltage controlled oscillator (IC 566), low pass filter, monolithic PLL and applications of PLL.

MODULE – IV: Regulators and Converters [12 Periods]

Voltage Regulator: Introduction, Series Op-Amp regulator, IC Voltage Regulators, IC 723 general purpose regulators, Switching Regulator.

D/A & A/D Converters: Introduction, basic DAC techniques - weighted resistor DAC, R-2R ladder DAC, inverted R-2R DAC, A to D converters - parallel comparator type ADC, counter type ADC, successive approximation ADC and dual slope ADC, DAC and ADC Specifications.

MODULE – V: CMOS Logic and Digital Circuits [12 Periods]

CMOS Logic: CMOS logic levels, MOS transistors, Basic CMOS Inverter, NAND and NOR gates, CMOS AND-OR-INVERT and OR-AND-INVERT gates, implementation of any function using cmos logic.

Combinational Circuits Using TTL *74XX* ICS: Study of logic gates using *74XX* ICs, Four-bit parallel adder(IC 7483), Comparator(IC 7485), Decoder(IC 74138, IC 74154), BCD-to-7-segment decoder(IC 7447), Encoder(IC 74147), Multiplexer(IC 74151), Demultiplexer (IC 74154).

Sequntial Circuits Using TTL *74XX* ICS: Flip Flops (IC 7474, IC 7473), Shift Registers, Universal Shift Register(IC 74194), 4- bit asynchronous binary counter(IC 7493).

TEXT BOOKS:

1. D. Roy Choudhury, Shail B. Jain, **"Linear Integrated Circuit"**, New Age International Pvt. Ltd., New Delhi, India, 4th edition, 2012. (Modules I, II, III, & IV)
2. Ramakant A. Gayakwad, **"OP-AMP and Linear Integrated Circuits"**, Prentice Hall / Pearson Education, New Delhi, 4th edition, 2012. (Modules I, II & III)
3. Floyd, Jain, **"Digital Fundamentals, Pearson Education"**, New Delhi, 8th edition, 2009. (Module V)

REFERENCE BOOKS:

1. Sergio Franco, **"Design with operational amplifiers and analog integrated circuits"**, McGraw Hill, New Delhi, 1997.
2. Gray, Meyer, **"Analysis and Design of Analog Integrated Circuits"**, Wiley International, New Delhi, 1995.
3. John F. Wakerly, **"Digital Design Principles and practices"**, Prentice Hall / Pearson Education, New Delhi, 4th Edition, 2007.

OUTCOMES:

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

1. Understand the operational amplifiers with linear integrated circuits.
2. Understand the different families of digital integrated circuits and their characteristics.
3. Design circuits using operational amplifiers for various applications.

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Course Code: 50417 **Credits: 3**

B. Tech. – V Semester

ELECTRONIC MEASUREMENTS AND INSTRUMENTATION
(Professional Elective - I)

PREREQUISITES: Electronic devices & circuits and Electrical Circuits.

OBJECTIVE:
This course introduces the terminologies and definitions used in measurements and instruments. It introduces about electromechanical measuring instruments and electronic measuring instruments, Signal generators, signal analyzers, bridges, general purpose and special purpose oscilloscopes, transducers.

MODULE – I: Measurement Errors and Measuring Instruments [13 Periods]
Measurements and Errors: Block Schematics of Measuring Systems, Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.
Measuring Instruments: D' Arsonval Movement, DC Voltmeters, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Electronic Voltmeters, Digital Voltmeters: Ramp type, Staircase Ramp, Dual Slope Integrating type, Integrating type, Successive Approximation type.

MODULE – II: Signal Generators and Analyzers [12 Periods]
Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications.
Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Logic Analyzer.

MODULE – III: Oscilloscopes [12 Periods]
CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.
Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.
Recorders: Strip Chart, X-Y Oscillographic recorders

MODULE – IV: Transducers [12 Periods]
Definition, Classification, Principle of Analogue transducer: Resistive (Strain Gauge, POT, Thermistor and RTD), Capacitive, Piezoelectric, Thermocouple and Inductive (LVDT) and RVDT) transducer, Working principle of Digital Transducer and Optical transducer. Photo sensitive Transducer. Applications of transducers - Velocity, Force, Pressure Measurement. Data Acquisition Systems.

MODULE – V: DC and AC Bridges [11 Periods]
Wheat stone Bridge, Kelvin Bridge, AC Bridges, Maxwell, Hay, Schering, Wien, Anderson Bridges, Resonance Bridge, The Owen Bridge, De'Sauty Bridge, Wagner's Earth (Ground) Connection, and Types of Detectors.

TEXT BOOKS:

1. H. S. Kalsi, **"Electronic Instrumentation"**, TMH, 2nd Edition 2004. (Modules I, II, III, IV & V)
2. A.K. Sawhney, **"Electrical and Electronic Measurements and Instrumentation"**. (Modules III & IV)

REFERENCE BOOKS:

1. K. Lal Kishore, **"Electronic Measurements and Instrumentation"**, Pearson Education, 2010.
2. David A. Bell, **"Electronic Instrumentation and Measurements"**, Oxford Univ. Press, 1997.

OUTCOMES:

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

1. Understand and estimate errors in a measurement system.
2. Operate signal sources and measuring instruments such as Wave Analyzer, Harmonic Distortion Analyzer and Spectrum Analyzer.
3. Estimate accurately the values of R, L and C for suitable bridges.
4. Understand the basic principles of transducers and their applications.

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Course Code: 50418 **Credits: 3**

B. Tech. – V Semester

DIGITAL DESIGN USING VERILOG HDL

(Professional Elective - I)

PREREQUISITES: Digital Electronics.

OBJECTIVE:

This course provides the knowledge to design Digital Circuits behavioral and RTL modeling using Verilog HDL. And also verifying these models and synthesizing RTL models to standard cell libraries and FPGAs. This course also provides different technologies related to HDLs, construct, compile and execute Verilog HDL programs using provided software tools.

MODULE - I: Introduction to Verilog HDL [12 Periods]

Verilog as HDL, Levels of Design Description, Concurrency, Simulation and Synthesis, Function Verification, System Tasks, Programming Language Interface, Module, Simulation and Synthesis Tools.

Language Constructs and Conventions: Introduction, Keywords, Identifiers, White space Characters, Comments, Numbers, Strings, Logic Values, Strengths, Data types, Scalars and Vectors, Parameters, Operators.

MODULE - II: Gate Level & Data Flow Modeling [12 Periods]

Gate Level Modeling: Introduction, AND Gate Primitive, Module Structure, Other Gate Primitives, Illustrative Examples, Tristate Gates, Array of Instances of Primitives, Design of Flip –Flops with Gate Primitives, Delays, Strengths and Construction Resolution, Net Types, Design of Basic Circuit.

Modeling at Dataflow Level: Introduction, Continuous Assignment Structure, Delays and Continuous Assignments, Assignment to Vectors, Operators.

MODULE - III: Behavioral Modeling [12 Periods]

Introduction, Operations and Assignments, Functional Bifurcation, 'Initial' Construct, 'Always' Construct, Assignments with Delays, 'Wait' Construct, Multiple Always Block, Designs at Behavioral Level, Blocking and Non- Blocking Assignments, The 'Case' Statement, Simulation Flow 'If' an 'If-Else' Constructs, 'Assign- De-Assign' Construct, 'Repeat' Construct, for Loop, 'The Disable' Construct, 'While Loop', Forever Loop, Parallel Blocks, 'Force- Release, Construct, Event.

MODULE - IV: Switch Level Modeling [12 Periods]

Switch Level Modeling: Basic Transistor Switches, CMOS Switches, Bi Directional Gates, Time Delays With Switch Primitives, Instantiation with 'Strengths' and 'Delays', Strength Contention with Trireg Nets.

System Tasks, Functions and Compiler Directives: Parameters, Path Delays, Module Parameters, System Tasks and Functions, File Based Tasks and Functions, Computer Directives, Hierarchical Access, User Defined Primitives.

MODULE - V: Sequential Circuit Description and Testing [12 Periods]

Sequential Circuit Description: Sequential Models - Feedback Model, Capacitive Model, Implicit Model, Basic Memory Components, Functional Register, Static Machine Coding, Sequential Synthesis

Component Test and Verification: Test Bench- Combinational Circuit Testing, Sequential Circuit Testing, Test Bench Techniques, Design Verification, Assertion Verification.

TEXT BOOKS:

1. T R. Padmanabhan, B Bala Tripura Sundari, **"Design Through Verilog HDL"**, Wiley, 2009. (Modules I, II, III, IV & V)
2. Zainalabdien Navabi, **"Verilog Digital System Design"**, TMH, 2nd Edition, 1999. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Stephen Brown, Zvonkoc Vranesic, **"Fundamentls of Digital Logic with Veilog Design"**, TMH, 2nd Edition, 2010.
2. Sunggu Lee, **"Advanced Digital Logic Design using Verilog, State Machine & Synthesis for FPGA"**, Cengage Learning, 2012.
3. Samir Palnitkar, **"Verilog HDL"**, Pearson Education, 2nd Edition, 2009.
4. Michel D. Ciletti, **"Advanced Digital Design with the Verilog HDL"**, PHI, 2009.

OUTCOMES:

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

1. Understand Verilog hardware description languages (HDL) to design Digital Circuits in different Models.
2. Write Register Transfer Level (RTL) models of digital circuits.
3. Describe standard cell libraries and FPGAs.
4. Synthesize RTL models to standard cell libraries and FPGAs.
5. Test the Digital Circuits using Test bencehes.

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Course Code: 50517 **Credits: 3**

B. Tech. – V Semester
COMPUTER NETWORKS
(Professional Elective - I)

Prerequisites: NIL

OBJECTIVES: To Build an understanding of the fundamental concepts of computer networking and Familiarize the student with the basic taxonomy and terminology of the computer networking area.

Module I: Data Communications and Physical layer

A: Data Communications **[04 Periods]**

Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as NSF NET, ARPANET, ATM, Frame Relay, ISDN

B: Physical layer **[06 Periods]**

Digital transmission, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks, Switch and Telephone Networks.

Module II: Data link layer and Medium Access sub layer

A: Data link layer **[05 Periods]**

Introduction, Framing, Error – Detection and Correction – Parity – LRC – CRC-Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols.

B: Medium Access sub layer **[05 Periods]**

ALOHA, CSMA/CD, LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11, Random access, Controlled access, Channelization, Collision Free Protocols

Module III: Network layer

A: Network layer **[09 Periods]**

Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols, Congestion Control Mechanism

Module IV: Transport Layer **[09 Periods]**

Transport Layer: Process to Process Delivery, UDP and TCP protocols, SCTP, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services,QoS in Switched Networks.

Module V: Application layer **[09 Periods]**

Application Layer: Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP, Network Security, Cryptography.

TEXT BOOKS:

1. Behrouz A. Forouzan, **"Data Communications and Networking"**, TMH, 4th Edition, 2006.
2. Andrew S Tanenbaum , **"Computer Networks"**, Pearson Education/PHI , 4th Edition.

REFERENCE BOOKS:

1. P.C .Gupta, **"Data communications and computer Networks"**, PHI.
2. S.Keshav, **"An Engineering Approach to Computer Networks"**, Pearson Education, 2nd Edition.
3. W.A. Shay, **"Understanding communications and Networks"**, Cengage Learning, 3rd Edition.
4. James Kurose & Keith W. Ross, **"Computer Networking: A Top-Down Approach Featuring the Internet"**, Pearson Education, 3rd Edition.
5. Larry L. Peterson and Peter S. Davie, **"Computer Networks"**, Harcourt Asia Pvt. Ltd., 2nd Edition.
6. William Stallings, **"Data and Computer Communication"**, Pearson Education, 6th Edition, 2000.

Outcomes:

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

1. Understand the Layered Architecture of Computer Networks.
2. Understand the operation of the main components of computer networks.
3. Learn various network protocols and algorithms.
4. Acquire the required skill to design simple computer networks.
5. Become familiar with security risks threatening computer networks.

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Course Code: **Credits: 3**

B. Tech. – V Semester

(Open Elective - I)

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Course Code: 50419 **Credits: 1**

B. Tech. – V Semester

MICRO PROCESSORS AND INTERFACING LAB

List of Experiments:

1. Arithmetic operations of 8-bit numbers using 8085.
2. Logical operations of 8-bit numbers using 8085.
3. a) Binary to BCD code conversions
   b) BCD to Binary code conversions using 8085.
4. Arithmetic operations of 16-bit numbers using 8086.
5. Program for sorting an array for 8086.
6. Program for searching for a number or character in a string for 8086.
7. Program for string manipulations for 8086.
8. Generation of waveforms using DAC interface.
9. Interfacing stepper motor control using 8086.
10. Serial communication between two microprocessor kits using 8251.
11. Parallel communication using 8255.
12. Interfacing Matrix/ Keyboard to 8086.

Equipment Required for the Laboratory:

1. Computers - Pentium 4 , Windows Xp,1GB Ram , 500 GB HDD
2. Development Boards - 8085/8086
3. Software Required - MASM/TASM, GNU sim8085

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Course Code: 50H04 **Credits: 2**

B. Tech. – V Semester

TECHNICAL COMMUNICATION AND PRESENTATION SKILLS LAB

OBJECTIVE:

To help the students understand the requisites to successfully deliver as professionals and the challenges they need to encounter. To help them make a smooth transition from the academic world into the professional world. To refine their style of individual communication and develop a personal style. To broaden and raise awareness about the dynamics of technical communication in the work environment. To integrate the learning experience with the functional areas of communication. Helping the students to become industry ready

Introduction: Effective Communication binds any progressive organization. At the B Tech third year level, the Technical Communication and Presentation skills laboratory is introduced to help students succeed in attaining a challenging and a professional career. Each unit aims to reinforce learning and helps the learners perform well before and after they enter the world of work. The course is designed to be practical, stimulating and challenging providing opportunities to the learners to go beyond the classrooms and get empowered in Technical Communication skills. The course enables the students understand the employers' expectations that are varied from company to company while giving them insight into the acceptable norms of attitude, behavior and etiquette. The course also focuses on the presentation skills of the learners

Methodology: Facilitator's role: Since classroom learning augments thinking process, helping them to develop written, spoken and non verbal communication, the facilitator / Faculty would briefly discuss the topics with the students and later on guide them while the students involved in activities, writing work and while making presentations. The facilitator is required to design a lot of practical/industry oriented project works for the students
*Students are required to participate, perform, write and submit the work in the form of written documents or Power Point Presentations to hone their spoken written and non verbal communication skills. Students are to take up field work and submit the project work.

MODULE – I: Oral Presentation

Mechanics of Presentations – Methodology of Presentation, Importance of Non-verbal communication during presentations– Nuances of Presentation.
*This particular module is for internal evaluation purpose(s).

MODULE – II: Job hunt process

SWOT analysis, correspondence and browsing the internet to search for a suitable job(s), job application-cover letter drafting, drafting a winning resume', types of resume's -electronic, video and printed resume's

- Instruction: Students are required to prepare their video resume which will be assessed by the faculty member.

MODULE – III: Group Discussion

Initiators- Contributor-Informer-Team Leader-Motivator-Creative Contributor , Importance of , Non verbal communication -eye contact, voice characters, posture, gestures, do's and don'ts, Role play and Simulation- Learners assuming the roles of characters and participating in Group discussion, analysis, or prediction with strictly defined goals.

MODULE – IV: Interview skills & Office etiquette

Preparing for the interview, types of interviews, interview session, importance of non verbal communication during the interview, do's and don'ts of interview, follow up and thanking letter. FAQ's. Formal Conversation, office attire- do's and don'ts, greetings and meetings, speaking to seniors and handshakes, offering and taking visiting cards.

MODULE – V: E - Correspondence and Email etiquette

Common web mail services, yahoo, gmail etc, fields to pay attention- To:, Cc:, Bcc:, Reply All, Subject, Salutation, Body, Signature, Font, Caps Lock , Highlight, The 'KISS' strategy (Keep It Simple and Short,)Points to remember while signing off, Introduction to Technical Vocabulary

- This unit is purely for internal assessment/evaluation

REFERENCES BOOKS:

1. Chrissie: **Handbook of Practical Communication Skills**: Jaico Publishing house, 1999.
2. Daniels, Aubrey: **Bringing Out the Best in People**: Tata McGraw-Hill: New York, 2003.Wright, Goulstone, Mark: **Just Listen: Discover the Secret to getting through to absolutely anything** : American Management Association, 2010.
3. Leslie. T. Giblin: **Skill with people** Publication details not known
4. Lewis, Norman: **Word Power Made Easy**: Goyal Publications: New Delhi, 2009.
5. Murthy, A.G, Krishna,: **Ten Much** : Tata McGraw-Hill :New Delhi, 2010.
6. Pease, Barbara and Pease, Allan: **The Definitive Book on Body Language**: Manjul Publishing House Pvt Limited, 2011
7. Rizvi M Ashraf: **Effective Technical Communication** : Tata McGraw-Hill: New Delhi, 2010.
8. Whitcomb, Susan Britton: **Resume Magic: Trade Secrets of a Professional Resume**: JIST Works, 2010.

WEBSITES:

1. http://www.mindtools.com/pages/article/newTMC_05.htm
2. http://www.kent.ac.uk/careers/intervw.htm
3. http://www.wikihow.com/Write-a-Report

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Course Code: 50420 **Credits: 2**

B. Tech. – V Semester

LINEAR AND DIGITAL IC APPLICATIONS LAB

PART - A: TO VERIFY THE FOLLOWING FUNCTIONS

1. Adder, Subtractor, Comparator Circuits using IC 741 OP AMP.
2. Integrator and Differentiator Circuits using IC 741 OP AMP.
3. Active Low pass, High pass Butterworth (Second Order).
4. RC Phase Shift and Wien Bridge Oscillators using IC 741 Op-Amp.
5. IC 555 Timers – Monostable Operation Circuits.
6. Schmitt Trigger Circuits – using IC 741 and IC 555.

PART - B: TO VERIFY THE FOLLOWING FUNCTIONALITY Of the following 74 series TTL ICS.

1. D-Flip Flop (74LS74) and JK Master Slave Flip-flop (74LS73)
2. Decade counter (74LS90) and Up-down Counter (74LS192)
3. Universal shift Register (74LS194/195)
4. 3-8 Decoder using (74LS138).
5. 4 – bit comparator (74LS85)
6. 8x1 Multiplexer - 74LS151 and 2x4 DeMultiplexer-74155.

Equipment required for Laboratories:

1. RPS - 0-30V
2. CRO - 0-20MHz
3. Function Generator - 0-1MHz
4. Multi Meters
5. Bread Boards
6. Components - IC741, IC555, IC566, IC1496, IC723, 7805, 7809, 7912 and other essential components.
7. Analog IC Tester

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Course Code: 50421 **Credits: 2**

B. Tech. – V Semester

TECHNICAL SEMINAR

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Course Code: 50H12 **Credits: 3**

B. Tech. – VI Semester

ENGINEERING ECONOMICS AND ACCOUNTANCY

PREREQUISITES: Nil

OBJECTIVE:

EEAA is a think beyond program which will make the student to examine the application of microeconomics theory as applied to the manager's responsibilities in an organization. To explain the basic principles of managerial economics, accounting and current business environment underlying business decision making. This course should emphasize the quantitative and qualitative applications of economic principle to business analysis

MODULE – I: Managerial Economics and Demand [12 Periods]

Introduction to Managerial Economics: 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 (survey methods, statistical methods, expert opinion method, test marketing, controlled experiments, judgmental approach to demand forecasting)

MODULE – II: Theory of Production and Cost Analysis [11 Periods]

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

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

MODULE – III: Market structures and Pricing Policies [11 Periods]

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

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

MODULE – IV: Business Environment and Capital Budgeting [11 Periods]

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

Capital And Capital Budgeting: Capital and its significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Nature and scope of capital budgeting, features of capital budgeting proposals, Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems)

MODULE – V: Financial Accounting and Ratios [11 Periods]

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

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

TEXT BOOKS:

1. Aryasri, **"Managerial Economics and Financial Analysis"**, TMH, 2nd Edition, 2005. (Modules I, II, III, IV & V)
2. Varshney & Maheswari, **"Managerial Economics"**, Sultan Chand, 5th Edition, 2003. (Modules I, II & III)

REFERENCE BOOKS:

1. H. Craig Peterson & W. Cris Lewis, **"Managerial Economics"**, PHI, 4th Edition.
2. Domnick Salvatore, **"Managerial Economics In a Global Economy"**, Thomson, 4th Edition.
3. Raghunatha Reddy & Narasimhachary, **"Managerial Economics& Financial Analysis"**, Scitech, 4th Edition.
4. S. N. Maheswari & S. K. Maheswari, **"Financial Accounting"**, Vikas, 6th Edition.
5. Dwivedi, **"Managerial Economics"**, Vikas, 6th Edition.

OUTCOMES:

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

1. Think in the terms of a managerial economist.
2. Appraise economic articles in newspapers such as Economic Times.
3. Solve quantitative problems in a business environment.
4. Acquire an ability to apply knowledge of economic concepts, accounting concepts.
5. Identify, formulate, and solve financial problems.
6. Gain knowledge of Financial Concepts as applied to Business Management.

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Course Code: 50422 **Credits: 3**

B. Tech. – VI Semester

DIGITAL SIGNAL PROCESSING

PREREQUISITES: Signals and Systems.

OBJECTIVE:

This course introduces the processing of discrete-time signals using various transform techniques and structures of digital IIR and FIR filters. This course also introduces the effects of finite-word length effects and Multirate digital signal processing and also the architecture and features of DSP processors.

MODULE - I: Discrete Signals and Realizations [12 Periods]

Discrete Time Signals and Systems: Discrete time signals & discrete time systems, Analysis of Discrete time Linear time invariant Systems, Discrete time systems described by difference equations. Frequency domain representation of discrete time signals and systems.

Structures for Realization of IIR and FIR Systems: Solution of difference equations of digital filters using Z-Transforms, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel forms.

MODULE - II: DFS and FFT [12 Periods]

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 and Circular Convolution.

Fast Fourier Transforms: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms and Inverse FFT.

MODULE - III: IIR Digital Filters [12 Periods]

Analog filter approximations – Butterworth and Chebyshev, IIR Digital filter Techniques- Impulse Invariant and Bilinear Transformation Methods, Design of IIR Digital filters from Analog filters and Spectral Transformations.

MODULE - IV: FIR Digital Filters [12 Periods]

Characteristics of FIR Digital Filters, Frequency Response, Design of Linear phase FIR Digital Filters using Fourier Series and Window Techniques, Comparison of IIR & FIR filters.

MODULE - V: Multirate DSP and DSP Processors [12 Periods]

Multirate Digital Signal Processing: Down-sampling, Decimation, Up-sampling, interpolation and Sampling Rate Conversion.

Finite Word Length Effects: Limit Cycles, Overflow Oscillations and Dead Band effects.

Introduction to DSP Processors: Architecture and features of TMS320CXX processor.

TEXT BOOKS:

1. John G. Proakis, Dimitris G. Manolakis, **"Digital Signal Processing, Principles, Algorithms, and Applications"**, Pearson Education / PHI, 4th Edition, 2007. (Modules I, II, III & IV)
2. A. Nagoorkani, **"Digital signal processing"**, Tata McGraw Hill, 2nd Edition, 2012. (Modules I, II, III, IV & V)

3. Avtar Singh and S. Srinivasan, **Digital Signal Processing Implementations Using DSP Microprocessors – with Examples from TMS320C54xx**, CENGAGE Learning, India, 1st Edition, 2008. (Module V)

REFERENCE BOOKS:

1. Shalivahana, Vallava Raju, Gnana Priya, **"Digital Signal Processing"**, TATA McGraw Hill, 2nd Edition, 2010.
2. Alan V. Oppenheim, Ronald W. Schafer, **"Digital Signal Processing"**, PHI Education, 2006.

OUTCOMES:

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

1. Understand the fast computation of DFT using FFT algorithms and implement in real-time applications.
2. Design IIR & FIR Digital filters for the given specifications.
3. Analyze the various errors in the implementation of finite word length effects.
4. Design Real time systems using the multirate processing techniques and the DSP processors.

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Course Code: 50423 **Credits: 3**

B. Tech. – VI Semester

MICROCONTROLLERS AND EMBEDDED SYSTEMS

PREREQUISITES: Digital Electronics and Microprocessors.

OBJECTIVE:

This course introduces the fundamental concepts of Micro Controllers and their architecture. To enable the students to write efficient programs in assembly language programs and to make the students aware of the interfacing techniques so that they can design and develop a microcontroller based system. It also includes the embedded systems building blocks.

MODULE - I: 8051 Architecture [10 Periods]

Introduction to micro controllers, comparing micro processors and micro controllers 4,8,16 and 32 bit micro controllers, Development systems for Micro controllers, Architecture; Architecture of 8051, pin configuration of 8051 micro controller, hardware input pins, output pins ports and external memory, counters and timers, serial data input and output and interrupts.

MODULE - II: Assembly Language Programming [14 Periods]

Addressing modes, External Data moves, Code Memory Read-only Data Moves, PUSH and POP OP codes, Data Exchanges, Logical Operations; Byte-Level Logical Operations, Bit Level Logical Operations, Rotate and Swap Operations. Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Jump and Call op codes; The jump and call program range, Jumps, Calls and Subroutines, call and returns, Interrupts and Returns.

MODULE - III: 8051 Interfacing [16 Periods]

8051 Interfacing and Applications: Basics of I/O concepts, I/O Port Operation, Interfacing 8051 to LCD, Keyboard, parallel and serial ADC, DAC, Stepper motor interfacing and DC motor interfacing and programming.

MODULE - IV: Introduction to Embedded Systems [08 Periods]

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

MODULE - V: Typical Embedded System [12 Periods]

Core of the Embedded System: General Purpose and Domain Specific Processors, asics, plds, Commercial Off-The-Shelf Components (COTS), Memory: ROM, RAM, Memory according to the type of Interface, Memory Shadowing, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External Communication Interfaces.

TEXT BOOKS:

1. Kenneth. J. Ayala, **"The 8051 Microcontroller"**, Cengage Learning, 3rd Edition, 2004. (Modules I, II & III)
2. Shibu K.V **"Introduction to Embedded Systems"**, Mc Graw Hill, 1st Edition, 2009. (Modules IV & V)

REFERENCE BOOKS:

1. Mazidi M.A, Mazidi JG, & Rolin D. Mckinlay, **"The 8051 Microcontroller & Embedded Systems using Assembly and C"**, Pearson Education, 2nd edition, 2007.
2. Frank Vahid, Tony Givargis, John Wiley, **"Embedded System Design",** 2nd edition, 2001.

OUTCOMES:

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

1. Express architecture of Micro Controllers
2. Program a microcontroller system in assembly code and C.
3. Build and test a microcontroller based system.
4. Understand the concepts of embedded systems.

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Course Code: 50424 **Credits: 3**

B. Tech. – VI Semester
DIGITAL COMMUNICATIONS

PREREQUISITES: Signals and Systems, Probability theory and Analog Communications.

OBJECTIVE:
This course introduces the different digital modulation techniques such as PCM, DM and various shift keying techniques, information theory and different source coding techniques. It also introduces different error detecting and error correcting codes like block codes, cyclic codes and convolution codes. It also introduces the advantages of spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc.

MODULE - I: Elements of Digital Communication Systems [12 Periods]
Model of Digital Communication System, Advantages of Digital Communication Systems.
Pulse Digital Modulation: PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

MODULE - II: Digital Carrier Modulation Schemes [12 Periods]
Introduction, ASK,ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum FSK, Non Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Coherent PSK Detection, Differential PSK , QPSK and 8-QAM.

MODULE - III: Baseband Data Transmission and Information Theory [12 Periods]
Baseband Data Transmission: Pulse Shaping for Optimum Transmissions, A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Optimal of Coherent Reception, Signal Space Representation and Probability of Error and Eye Diagrams for ASK, PSK, FSK, and Cross Talk.
Information Theory: Information and entropy, conditional entropy and redundancy, Shannon Fano coding, Mutual Information, Information loss due to noise, source codings – Huffman Code, variable length coding, Source coding to Increase average Information per bit, Lossy source coding. Line Coding Formats-Unipolar, Polar, Bipolar, Manchester, AMI, Gray coding and M-array coding. Shanon's Channel Capacity Theorem, Bandwidth-S/N Tradeoff, Hartley Shanon Law.

MODULE - IV: Error Control Codes [12 Periods]
Linear Block Codes: Matrix Description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes.
Cyclic Codes: Algebraic Structure, Encoding, Syndrome Calculation, Decoding.
Convolution Codes: Encoding, Decoding using State, Tree and Trellis Diagrams, Decoding using Viterbi Algorithm.

MODULE - V: Spread Spectrum Modulation [12 Periods]
Use of Spread Spectrum, Direct Sequence Spread Spectrum (DSSS), Code Division Multiple Access, Ranging using DSSS, Frequency Hopping Spread Spectrum, PN - Sequences: Generation and Characteristics, Synchronization in Spread Spectrum Systems and OFDM.

TEXT BOOKS:

1. Sam Shanmugam, **"Digital and Analog Communication Systems"**, John Wiley, 2005. (Modules I, II, III & IV)
2. Simon Haykin, John Wiley, **"Digital Communication"**, 1st Edition, 2005. (Modules I, III & V)

REFERENCE BOOKS:

1. John G. Proakis, Masoud Salehi, **"Digital Communications"**, Mcgraw-Hill, 5th Edition, 2008.
2. Herbert Taub, Donald L Schiling, Goutam Saha, **"Principles of Communication Systems",** Mcgraw-Hill, 2nd Edition, 2008.
3. B.P. Lathi, **"Communication Systems"**, BS Publication, 2006.

OUTCOMES:

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

1. Understand basic components of digital communication systems and Information theory.
2. Analyze the error performance & Design optimum receivers for digital modulation techniques.
3. Know about different error detecting and error correcting codes like block codes, cyclic codes and convolution codes.
4. Understand the advantages of spread spectrum techniques and performance of spread spectrum, PN codes in jamming, noise etc.

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Course Code: 50425 **Credits: 3**

B. Tech. – VI Semester

CELLULAR AND MOBILE COMMUNICATIONS

(Professional Elective - II)

PREREQUISITES: Analog and Digital Communications.

OBJECTIVE:

To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies. This course provides the student with an understanding of Co-channel and Non-Co-channel interferences and also understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas. This course also provides the student an understanding of frequency management, Channel assignment and types of handoff.

MODULE - I: Introduction to Cellular Mobile Radio Systems [12 Periods]

Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment- Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time. Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

MODULE – II: Co-Channel and Non-Co-Channel Interference [12 Periods]

Co-Channel Interference: Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.

Non – Co - Channel Interference: Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

MODULE - III: Cell Coverage, Cell Site and Mobile Antennas [12 Periods]

Cell Coverage for Signal and Traffic: Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope, General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas: Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

MODULE - IV: Frequency Management and Channel Assignment [12 Periods]

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

MODULE - V: Handoffs and Dropped Calls [12 Periods]

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS:

1. W.C.Y. Lee, **"Mobile Cellular Telecommunications"**, Mc Graw Hill, 2nd Edition, 1989. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Theodore. S. Rapport, **"Wireless Communications"**, Pearson Education, 2nd Edition, 2002.
2. Gottapu Sashibhushana Rao, **"Mobile Cellular Communication"**, Pearson, 2012.
3. Gordon L. Stuber, **"Principles of Mobile Communications"**, Springer International, 2nd Edition, 2001.

OUTCOMES:

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

1. Analyze and design wireless and mobile cellular systems.
2. Understand impairments due to multipath fading channel.
3. Understand the fundamental techniques to overcome the different fading effects.
4. Understand Co-channel and Non-Co-channel interferences
5. Familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
6. Understand the frequency management, Channel assignment and types of handoff.

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Course Code: 50426 **Credits: 3**

B. Tech. – VI Semester

INTRODUCTION TO NANO SCIENCE AND NANO TECHNOLOGY
(Professional Elective - II)

PREREQUISITES: Physics, Electronics and Electromagnetic Theory.

OBJECTIVE: This course imparts the basic knowledge on nanoscience and technology. Understand the various process techniques available for the processing of nanostructured materials. Impart knowledge on the exotic properties of nanostructured materials at their nanoscale lengths. Acquire the knowledge above the various nanoparticles process methods and their skills.

MODULE - I: Generic Methodologies for Nanotechnology [10 Periods]
Introduction and classification - What is nanotechnology? - Classification of nanostructures - Nanoscale architecture; Summary of the electronic properties of atoms and solids - The isolated atom - Bonding between atoms - Giant molecular solids - The free electron model and energy bands - Crystalline solids - Periodicity of crystal lattices - Electronic conduction; Effects of the nanometre length scale - Changes to the system total energy - Changes to the system structure - How nanoscale dimensions affect properties.

MODULE - II: Carbon Nanostructures [12 Periods]
Introduction; carbon molecules – nature of the carbon bond – new carbon structures; cabon clusters – small carbon clusters discovery of C60 – structure of C60 and its crystal – alkali doped C60 – superconductivity in C60 – large and smaller fullerenes – other buckyballs; carbon nanotubes – fabrication – structure – electrical properties – vibrational properties – mechanical properties; applications of carbon nanotubes – field emission and shielding – computers – fuel cells – chemical sensors – catalysis – mechanical reinforcement.

MODULE - III: Inorganic Nanostructures [10 Periods]
Overview of relevant semiconductor physics - Quantum confinement in semiconductor nanostructures - The electronic density of states - Fabrication techniques - Physical processes in semiconductor nanostructures - The characterisation of semiconductor nanostructures - Applications of semiconductor nanostructures.

MODULE - IV: Nanostructured Molecular Materials [14 Periods]
Introduction; Building blocks - Principles of self-assembly - Self-assembly methods to prepare and pattern nanoparticles - Templated nanostructures - Liquid crystal mesophases - Macromolecules at interfaces - The principles of interface science - The analysis of wet interfaces - Modifying interfaces - Making thin organic films - Surface effects on phase separation - Nanopatterning surfaces by self-assembly - Practical nanoscale devices exploiting macromolecules at interfaces .

MODULE - V: Evolving Interfaces of Nano [14 Periods]
Nanobiology - Introduction - Bio-inspired nanomaterials - Interaction Between Biomolecules and Nanoparticle Surfaces - Different Types of Inorganic Materials Used for the Synthesis of Hybrid Nano-bio Assemblies - Applications of Nano in Biology - Nanoprobes for Analytical Applications - Current Status of Nanobiotechnology - Future Perspectives of Nanobiology; Nanosensors - Introduction - What is a Sensor? - Nanosensors - Order from Chaos -

Characterization - Perception - Nanosensors Based on Quantum Size Effects - Electrochemical Sensors - Sensors Based on Physical Properties - Nanobiosensors - Smart Dust; Nanomedicines - Introduction - Approach to Developing Nanomedicines - Various Kinds of Nanosystems in Use - Protocols for Nanodrug Administration - Nanotechnology in Diagnostic Applications - Materials for Use in Diagnostic and Therapeutic Applications - Future Directions.

TEXT BOOKS:

1. Robert W. Kelsall, Ian W. Hamley and Mark Geoghegan, **"Nanoscale Science and Technology"**, John Wiley & Sons, Ltd, UK, 2005. (Modules I, II & III)
2. P. Poole Jr and Frank J. Owens, **"Introduction to Nanotechnology"**, Charles Wiley Interscience, 2003. (Modules IV & V)

REFERENCE BOOKS:

1. Chris Binns, **"Introduction to Nanoscience and Nanotechnology"**, Wiley, ISBN: 978-0471776475, 2010.
2. Yong Zhou, **"Bio-Inspired Nanomaterials and Nanotechnology"**, Nova Publishers.
3. T.Pradeep, **"Nano: TheEssentials: Understanding Nanoscience and Nanotecnology"**, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008.

OUTCOMES:

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

1. Understand the Generic Methodologies for Nanotechnology
2. Learn the Carbon and Inorganic Nanostructures.
3. Know Nano biology and Nano sensors.

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Course Code: 50505 **Credits: 3**

B. Tech. – VI Semester

OBJECT ORIENTED PROGRAMMING

(Using C++ and Java)

(Professional Elective - II)

Prerequisite: Any Programming Language.

OBJECTIVE: To understand the CPP and Java programming and APIs to develop an real-time applications.

MODULE - I: **[10 Periods]**

Introduction -What is object oriented programming? Why do we need object oriented Programming. characteristics of object-oriented languages such as C++ and Java. Making sense of core object concepts (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces)

Classes and Objects- Implementation of class in C++ and Java, C++ Objects as physical object, Java Objects as physical object, C++ object as data types constructor and Java object as data types constructor. Object as function arguments. The default copy constructor, returning object from function. Classes objects and memory static class data. Const and classes. assigning java object reference variables, introducing methods, constructors, usage of static with data and methods, usage of final with data, access control, this key word, garbage collection, overloading methods and constructors, parameter passing - call by value, recursion, nested classes and inner classes, exploring the String class.

MODULE - II: Inheritance **[10 Periods]**

Inheritance in CPP: Concept of inheritance. Derived class and based class. Derived class constructors, member function, inheritance in the English distance class, class hierarchies, inheritance and graphics shapes, public and private inheritance, aggregation : Classes within classes, inheritance and program development.

Inheritance in Java: member access rules, usage of super key word, forms of inheritance, method overriding, abstract classes, dynamic method dispatch, using final with inheritance, the Object class.

MODULE - III: Packages and Interfaces **[10 Periods]**

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

MODULE - IV: Exception Handling and Multithreading [10 Periods]

Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes, Concepts of Multithreading, differences between process and thread, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks, thread groups.

MODULE – V: Event Handling [10 Periods]

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

AWT : Concepts of components, container, panel, window, frame, canvas, Font class, Color class and Graphics. Buttons, Labels, Text fields, Text area, Check boxes, Check box groups, Lists, Choice, Scrollbars, Menus, Layout Managers - Flow, Border,Grid, Card and Gridbag. Swing - JApplet, JFrame and JComponent, Icons and Labels, Handling threading issues, text fields, buttons - The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables. Applets - Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets

TEXT BOOKS

1. Object Oriented Programming in C++ by Robert Lafore Techmedia Publication.
2. The Complete Reference Java J2SE 5th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.
3. Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons.

REFERENCE BOOKS:

1. OOPS C++ Big C++ Cay Horstmann Wiley Publication.
2. Object Oriented Programming in C++ R Rajaram New Age International Publishers 2nd.
3. Java How to Program, Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI
4. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
5. Core Java 2, Vol 2, Advanced Features, Cay.S.Horstmann and Gary Cornell, Seventh Edition, Pearson Education.
6. Beginning in Java 2, Iver Horton, Wrox Publications.

OUTCOMES:

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

1. Understand the Generic Methodologies for Nanotechnology
2. Learn the Carbon and Inorganic Nanostructures.
3. Know Nano biology and Nano sensors.

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Course Code: 50427 **Credits: 3**

B. Tech. – VI Semester

WIRELESS COMMUNICATIONS AND NETWORKS
(Professional Elective - III)

PREREQUISITES: Communications and Computer Networks.

OBJECTIVE:
This course introduces with various kinds of wireless communications, wireless networks and its operations. This course also provides knowledge on the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.

MODULE - I: Introduction to Wireless Communication Systems [12 Periods]
Evolution of mobile radio communications, examples of wireless communication systems - paging systems, cordless telephone systems, cellular telephone systems, comparison of common wireless communication systems, trends in cellular radio and personal communications.
Modern Wireless Communication Systems: Second generation (2G) cellular networks, third generation (3G) wireless networks, wireless local loop (WLL) and LMDS, wireless local area networks (WLANs), Bluetooth and personal area networks (PANs).

MODULE - II: Mobile Radio Propagation: Large-Scale Path Loss [12 Periods]
Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models-Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

MODULE - III: Mobile Radio Propagation: Small – Scale Fading and Multipath [12 Periods]
Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements - Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

MODULE - IV: Wireless Standards [12 Periods]

WI-FI and IEEE 802.11 Wireless Lan Standard: IEEE 802 Architecture, IEEE 802.11 Architecture and Services, 802.11 Medium Access Control, 802.11 Physical Layer, Other IEEE 802.11 Standards, Wi-Fi Protected Access.

BLUETOOTH and IEEE 802.15: Overview, radio specification, baseband specification, link manager specification, logical link control and adaptation protocol, IEEE 802.15.

MODULE - V: Mobile Data Networks [12 Periods]

Introduction, data oriented CDPD network, GPRS and higher data rates, short messaging service in GSM, mobile application protocols.

Wireless ATM & HIPERLAN: Introduction, Wireless ATM, HIPERLAN, HIPERLAN-2.

TEXT BOOKS:

1. Theodore S. Rappaport, **"Wireless Communications - Principles Practice"**, Prentice Hall of India, New Delhi, 2nd edition, 2002. (Modules I, II, III, IV & V)
2. William Stallings, **"Wireless Communications and Networks"**, Pearson Education, India, 2nd edition, 2009. (Modules I, II, III, IV & V)
3. Kaveh PahLaven, Prashanth Krishna Murthy, **"Principles of Wireless Networks - A Unified Approach"**, Pearson Education, India, 2007. (Modules IV & V)

REFERENCE BOOKS:

1. Dr. Kamilo Feher, **"Wireless Digital Communications"**, Prentice Hall of India, New Delhi, 2003.
2. Jochen Schiller, **"Mobile Communications"**, Pearson Education, India, 2nd edition, 2009.
3. Andreas F. Molisch, **"Wireless Communications"**, Wiley - India, New Delhi, 2006.

OUTCOMES:

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

1. Understand fundamentals of wireless networking and cellular system design concepts.
2. Analyze various multiple access schemes used in wireless communication.
3. Understand wireless local area and wide area networks and their performance analysis.
4. Familiar with some of the existing and emerging wireless standards.

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Course Code: 50428 **Credits: 3**

B. Tech. – VI Semester

EMBEDDED REAL TIME OPERATING SYSTEMS

(Professional Elective - III)

PREREQUISITES: Digital Electronics, Microprocessors, Microcontrollers and Embedded systems.

OBJECTIVE:

This course emphasize on the concepts of a complete system consisting of asynchronous interactions between concurrently executing hardware components and device driver software in order to illustrate the behavior of a computer system as a whole. This course introduces design RT Linux and Embedded Linux.

MODULE – I: Introduction **[12 Periods]**

Introduction to UNIX/LINUX, Overview of Commands, File I/O, (open, create, close, lseek, read, write), Process Control (fork, vfork, exit, wait, waitpid, exec).

MODULE – II: Real Time Operating Systems **[12 Periods]**

Brief History of OS, Defining RTOS, The Scheduler, Objects, Services, Characteristics of RTOS, Defining a Task, Tasks States and Scheduling, Task Operations, Structure, Synchronization, Communication and Concurrency. Defining Semaphores, Operations and Use, Defining Message Queue, States, Content, Storage, Operations and Use

MODULE – III: Objects, Services and I/O **[12 Periods]**

Pipes, Event Registers, Signals, Other Building Blocks, Component Configuration, Basic I/O Concepts, I/O Subsystem

MODULE – VI: Exceptions, Interrupts and Timers **[12 Periods]**

Exceptions, Interrupts, Applications, Processing of Exceptions and Spurious Interrupts, Real Time Clocks, Programmable Timers, Timer Interrupt Service Routines (ISR), Soft Timers, Operations.

MODULE – V: Case Studies of RTOS **[12 Periods]**

RT Linux, MicroC/OS-II, Vx Works, Embedded Linux, Tiny OS and Basic Concepts of Android OS.

TEXT BOOKS:

1. Qing Li, Elsevier, **"Real Time Concepts for Embedded Systems"**, 2011. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Rajkamal, **"Embedded Systems, Architecture, Programming and Design",** TMH, 2007.
2. Richard Stevens, **"Advanced UNIX Programming".**

OUTCOMES:

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

1. Understand the advanced concepts of computer architecture. Exposing the major differentials of RISC and CISC architectural characteristics.
2. Acquainted with recent computer architectures and I/O devices, as well as the low-level language required to drive/manage these types of advanced hardware.

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Course Code: 50429 **Credits: 3**

B. Tech. – VI Semester

DESIGN FOR TESTABILITY

(Professional Elective - III)

PREREQUISITES: Digital Electronics, Digital signal Processing and VLSI Technology**.**

OBJECTIVE:

This course introduces the concepts on testability of Digital ASIC devices and various techniques which are designed to reduce the amount of input test patterns required to ensure that an acceptable level of Fault coverage has been obtained.

MODULE - I: Introduction to Testing [12 Periods]

Testing Philosophy, Role of Testing, Digital and Analog VLSI Testing, VLSI Technology Trends affecting Testing, Types of Testing, Fault Modeling: Defects, Errors and Faults, Functional Versus Structural Testing, Levels of Fault Models, Single Stuck-at Fault.

MODULE - II: Logic And Fault Simulation [12 Periods]

Simulation for Design Verification and Test Evaluation, Modeling Circuits for Simulation, Algorithms for True-value Simulation, Algorithms for Fault Simulation, ATPG.

MODULE - III: Testability Measures [12 Periods]

SCOAP Controllability and Observability, High Level Testability Measures, Digital DFT and Scan Design: Ad-Hoc DFT Methods, Scan Design, Partial-Scan Design, Variations of Scan.

MODULE - IV: Built-In Self-Test [12 Periods]

The Economic Case for BIST, Random Logic BIST: Definitions, BIST Process, Pattern Generation, Response Compaction, Built-In Logic Block Observers, Test-Per-Clock, Test-Per-Scan BIST Systems, Circular Self Test Path System, Memory BIST, Delay Fault BIST.

MODULE - V: Boundary Scan Standard [12 Periods]

Motivation, System Configuration with Boundary Scan: TAP Controller and Port, Boundary Scan Test Instructions, Pin Constraints of the Standard, Boundary Scan Description Language: BDSL Description Components, Pin Descriptions.

TEXT BOOKS:

1. M.L. Bushnell, V. D. Agarwal, **"Essentials of Electronic Testing for Digital, Memory and Mixed Signal VLSI Circuits",** Kluwer Academic Publishers, 2004. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. M. Abramovici, M.A.Breuer and A.D Friedman, **"Digital Systems and Testable Design"**, Jaico Publishing House.
2. P.K. Lala, **"Digital Circuits Testing and Testability"**, Academic Press.

OUTCOMES:

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

1. Design complex digital systems using VLSI design methodology.
2. Assess logic and technology-septic parameters to control the functionality, system synchronization, power consumption, and Effects of circuit parasitic.

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Course Code: 50430 **Credits: 2**

B. Tech. – VI Semester

DIGITAL SIGNAL PROCESSING LAB

LIST OF EXPERIMENTS:

1. Generation of Sinusoidal waveform / signal based on recursive difference equations.
2. To find frequency response of a given system given in (Transfer Function/ Differential equation form).
3. To find DFT / IDFT of given DT signal
4. Linear and Circular convolution using DFT and IDFT method
5. Implementation of FFT of given sequence
6. Determination of Power Spectrum of a given signal(s).
7. Implementation of Decimation Process
8. Implementation of Interpolation Process
9. Implementation of LP IIR filter for a given sequence
10. Implementation of HP IIR filter for a given sequence
11. Implementation of LP FIR filter for a given sequence
12. Implementation of HP FIR filter for a given sequence

Equipment Required:

1. Computers with MATLAB software
2. PROCESSOR KITS - TMS320C6713
3. CRO'S - 20 MHZ

Note: The programs shall be implemented in software (Using MATLAB / Lab view / C programming / OCTAVE Equivalent) and hardware (Using TI / Analog devices / Motorola / Equivalent DSP processors).

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Course Code: 50431 **Credits: 2**

B. Tech. – VI Semester
MICROCONTROLLERS LAB

LAB EXPERIMENTS:

1. Introduction to Kiel IDE and Flash Magic.
2. Program to toggle all the bits of Port P1 continuously with 250 ms delay.
3. Program to toggle only the bit P1.5 continuously with some delay. Use Timer 0, mode 1 to create delay.
4. Program to interface a switch and a buzzer to two different pins of a Port such that the buzzer should sound as long as the switch is pressed.
5. Program to interface LCD data pins to port P1 and display a message on it.
6. Program to interface keypad. Whenever a key is pressed, it should be displayed on LCD.
7. Program to interface seven segment display unit.
8. Program to transmit a message from Microcontroller to PC serially using RS232.
9. Program to receive a message from PC serially using RS232.
10. Program to get analog input from Temperature sensor and display the temperature value on PC Monitor.
11. Program to interface Stepper Motor to rotate the motor in clockwise and anticlockwise directions.
12. Program for Traffic Light Controller.

Equipment Required:

1. Computers - Pentium 4, Windows XP, 1GB RAM 500GB HDD
2. Development Boards - 8051 Development Boards
3. Software - Keil µVision ,Flash Magic

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Course Code: 50H05 **Credits: 1**

B. Tech. – VI Semester

SOFT SKILLS

OBJECTIVE:

- To broaden the perspective of job seekers and help them gain awareness on the standards and the expectations of the recruiters in the industry.
- To draw a link between the academics and the industry and emphasize the importance of the right attitude, grooming, etiquette, self motivation, empathy, commitment, responsibility, self awareness and patience while dealing with a variety of people
- Refining the communication skills of the students
- Sharpen the analytical skills for appropriate decision making
- To develop the art of communication; verbal and non verbal for effective inter and intra personal skills

Introduction:

Today's dynamic business world seeks ways to help their work force learn as they progress through applicable information to help drive business. In keeping with the evolving need of firms and the recruiting process, this course aims at catering to the needs of the students fresh from the academic background ready to enter the world of work from the HR perspectives of any company. Perhaps it is noticed that an intelligent individual lacks the ability to work on team assignments, communicate with clients, or maintain professionalism. This course is a comprehensive preparation and a bridge course that would enable the students to be industry ready before they wind up their undergraduate course. The modules that are chosen are the ones that the industry experts from Infosys emphasize upon. Apart from the technical skills, the course intends to enhance the employability skills and make them employment ready.

Syllabus:

1. Spoken aspects of Communication
2. Work/Business etiquette- dressing and grooming, telephone etiquette, meeting etiquette, dining etiquette, small talk, dealing with people
3. Business communication-Fundamentals of effective communication, Barriers and filters
4. Work in teams-Team concept, advantages of working in teams, team players/leaders
5. Intra personal skills- handling negative emotions;attitude,self confidence, self esteem
6. Principles of goal setting
7. Effective Time management skills
8. Reading skills
9. Writing skills
10. Digital language

Reference books:

- The Power of Habit: Why We Do What We Do in Life and Business by Charles Duhigg
- The Zen of Steve Jobs (Paperback) by Caleb Melby
- Software Systems Architecture: Working with Stakeholders Using Viewpoints and Perspectives by Nick Rozanski
- The Art of Focused Conversation: 100 Ways to Access Group Wisdom in the Workplace (Paperback) by R. Brian Stanfield
- The Little Book of Talent: 52 Tips for Improving Your Skills by Daniel Coyle
- The 7 Habits of Highly Effective People: Powerful Lessons in Personal Change (Paperback) by Stephen R. Covey
- How to Win Friends and Influence People (Paperback) by Dale Carnegie
- Thinking, Fast and Slow by Daniel Kahneman
- Never Eat Alone: And Other Secrets to Success, One Relationship at a Time by Keith Ferrazzi
- Emotional Intelligence: Why It Can Matter More Than IQ by Daniel Goleman
- The Effective Executive: The Definitive Guide to Getting the Right Things Done (Paperback) by Peter F. Drucker
- How to Recruit and Hire Great Software Engineers: Building a Crack Development Team (Paperback) by Patrick McCuller
- Quiet: The Power of Introverts in a World That Can't Stop Talking by Susan Cain
- The $100 Startup: Reinvent the Way You Make a Living, Do What You Love, and Create a New Future by Chris Guillebeau
- The Presentation Secrets of Steve Jobsby Carmine Gallo Ackoff,Ressel Lincoln.The art of Problem solving.New York:Wiley.
- The Leader's Guide to Influence: How to Use Soft Skills to Get Hard Results (Paperback) by Mike Brent

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Course Code: 50208 **Credits: 3**

B. Tech. – VII Semester

CONTROL SYSTEMS

PREREQUISITES: Basic of Mathematics, Laplace Transforms and Matrices.

OBJECTIVE:
This course introduces the basics of control systems, types of control systems, mathematical modeling, block diagram representation, signal flow graph, Time domain and frequency domain specifications, stability and state space analysis.

MODULE - I: Introduction [12 Periods]
Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback, Mathematical models – Differential equations, Impulse Response and transfer functions.
Transfer Function Representation: Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

MODULE - II: Time Response Analysis [12 Periods]
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

MODULE - III: Stability Analysis In S-Domain [12 Periods]
The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability.
Root Locus Technique: The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.

MODULE - IV: Frequency Response Analysis [12 Periods]
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin - Stability Analysis from Bode Plots. Polar Plots - Nyquist Plots.
Compensation techniques – Lag, Lead and Lead -Lag Controllers design in frequency Domain**.**

MODULE - V: State Space Analysis of Continuous Systems [12 Periods]
Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization - Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and observability.

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "**Control Systems Engineering"**, New Age International Publishers, 5th edition, 2007. (Modules I, II, III & IV)
2. A.Nagoor kani, "**Control Systems**", RBA Publications, 2nd Edition, 2006. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Benjamin.C.Kuo, **"Automatic Control Systems"**, Prentice Hall of India, 7th Edition, 1995.
2. M .Gopal, **"Control System"** – Principles and Design", Tata McGraw Hill, 2nd Edition, 2002.
3. Schaum's Outline Series, **"Feedback and Control Systems"**Tata McGraw-Hill, 2007.
4. John J.D'azzo & Constantine H.Houpis, **"Linear control system analysis and design"**, Tata McGraw-Hill, Inc., 1995.
5. Richard C. Dorf & Robert H. Bishop, **"Modern Control Systems"**, Addidon – Wesley, 1999.
6. **http://nptel.ac.in/courses/108103007/8**

OUTCOMES:

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

1. Grasp the basics of open loop and closed loop control systems, concept of feedback in control systems, mathematical modeling and transfer function derivations of Synchros, AC and DC servo motors.
2. Apply the basics of Transfer function representation through block diagram, signal flow graphs, time response analysis of different order systems through their characteristic equation with time-domain specifications, stability analysis of control systems in S-domain through R-H criteria and root-locus techniques, frequency response analysis through bode diagrams, Nyquist, polar plots.
3. Apply the above conceptual things to real-world electrical and electronics problems and applications with the basics of state space analysis, design of PID controllers, lag, lead, lag-lead compensators.

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Course Code: 50432 **Credits: 3**

B. Tech. – VII Semester
MICROWAVE ENGINEERING

PREREQUISITES: Electro Magnetic Waves and Transmission Lines.

OBJECTIVE:
This course introduces the microwave frequency, microwave waveguide, microwave components, microwave tubes, microwave solid state devices and the various metrics / parameters used in microwave measurement and its requirement.

MODULE - I: Microwave Transmission Lines and Resonators [10 Periods]
Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguide - Solutions of wave equations in Rectangular Coordinates, TE, TM Modes, Power Transmission, Power loss, Excitations of Modes in Rectangular waveguide.
Micro strip Lines – Introduction, Zo Relations, Effective Dielectric Constant, Losses, Q factor.
Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

MODULE - II: Waveguide Components [15 Periods]
Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators. Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems.
Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.
Scattering Matrix - Significance, Formulation and properties of S-matrix. S-matrix calculation of 2 port Junctions, E, H plane, Magic Tee, Directional Coupler.

MODULE - III: Microwave Tubes [15 Periods]
Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons –Structure, Reentrant Cavities, Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram(Qualitative Analysis)
Helix TTS: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations (Qualitative Analysis)
M-Type Tubes: Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation(Qualitative Analysis).

MODULE - IV: Microwave Solid State Devices and MMIC's [12 Periods]
Solid State Devices: Introduction, Classification, Applications. TEDs –Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Basic Modes of Operation - Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

Monolithic Microwave Integrated Circuits (MMIC`s):
Introduction, Materials, MMIC-Growth, MOSFET Fabrication, Thin-Film Formation, Hybrid Integrated-circuit Fabrication.

MODULE - V: Microwave Measurements [08 Periods]
Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolo meters Measurement of Attenuation, Frequency Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS:
1. Samuel Y. Liao, **"Microwave Devices and Circuits"**, Pearson, 3rd Edition, 2003. (Modules I, II, III & IV)
2. Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, **"Microwave Principles"**, CBS Publishers and Distributors, New Delhi, 2nd Edition, 2004. (Modules III & V)

REFERENCE BOOKS:
1. R. E. Collin, **"Foundations for Microwave Engineering"**, 2nd Edition, 2005.
2. M. L. Sisodia and G.S.Raghuvanshi, **"Microwave Circuits and Passive Devices",** 2nd Edition, 1987.
3. Das and S.K. Das, **"Microwave Engineering"**, TMH, 2nd Edition, 2000.

OUTCOMES:
After completion of the course, students will be able to:
1. Understand the waveguides, strip lines used to transmit the microwave frequencies, terminologies associated with microwaves like, TE, TEM.
2. Understand Various microwave components like, E-Plane Tee, H-plane Tee, Directional Couplers, attenuators, Gyrator, circulator, isolator
3. Understand the metrics used to determine the transmission and reflection
4. Understand Microwave tubes like Klystron, O type tube, M type tube, Helix, Travelling wave tubes, Magnetrons.
5. Understand Microwave SSD's like Gunn diode, ATTD's
6. Understand Microwave measurement parameters like VSWR, Resonance, Cavity Q, impedance, attenuation etc.

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Course Code: 50433 **Credits: 3**

B. Tech. – VII Semester
VLSI DESIGN

PREREQUISITES: EDC and Digital Electronics.

OBJECTIVE: This course introduces the IC Fabrication steps and various IC technologies. This course also introduces the basics of VLSI technology, design concepts, electrical properties and modeling of Very Large Scale Integrated circuits, Gate-Level circuit Design, Data path subsystem design, Architectures of ASIC's, CPLD`s and FPGA`s.

MODULE - I: IC Fabrication and Technologies [12 Periods]
IC Fabrication: Steps in Fabrication-Oxidation, Lithography, Diffusion, Ion implantation, Encapsulation and Metallization.
IC Technologies – Review of Enhancement and Depletion MOS transistors, NMOS, PMOS & CMOS fabrications, Comparison of NMOS, CMOS & BiCMOS technologies.

MODULE - II: Basic Electrical Parameters [12 Periods]
I_{ds} - V_{ds} relationships, MOS transistor threshold Voltage (Vt), transconductance (gm), output conductance(gds) & figure of merit(wo).
Pass transistor, NMOS Inverter, Determination of pull-up to pull-down ratios, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters, Latch-up in CMOS circuits.

MODULE - III: VLSI Circuit Design Processes [12 Periods]
VLSI Design Flow, MOS Layers, Stick Diagrams, Lambda based 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- Scaling models, Scaling function for device parameters, Limitations of Scaling.

MODULE - IV: Basic Circuit Concepts and Gate Level Design [12 Periods]
Basic Circuit Concepts: Sheet Resistance R_s and Gate Capacitance C_g, Wiring Capacitances, Fan-in and fan-out, Choice of layers.
Gate Level Design: Logic Gates using CMOS and complex gates, Switch logic, Alternate gate circuits – Pseudo NMOS logic, Dynamic CMOS logic, Clocked CMOS logic(C^2MOS) and Cascaded Voltage Switch logic(CVSL).

MODULE-V: Data Path Subsystems, ASIC's and PLD's [12 Periods]
Data Path Subsystems: Subsystem Design – Barrel Shifter, Carry Select and Carry look Ahead Adder, Serial-Parallel and Braun Array Multiplier.
Application Specific Integrated Circuits – Channel gate array, Channel less gate array and structured gate array.
Programmable Logic Devices - Architectures of CPLDs and FPGAs.

TEXT BOOKS:

1. Kamran Eshraghian, Douglas A. Pucknell, **"Essentials of VLSI circuits and systems"**, PHI, 1st Edition, 2005. (Modules I, II & III)
2. K. Lal Kishore, VSV. Prabhakar, **"VLSI Design"**, I. K international Publishing House Private Ltd, 2009. (Modules IV & V)

REFERENCE BOOKS:

1. Neil H. E Weste, David Harris, Ayan Banerjee, **"CMOS VLSI Design - A circuits and systems perspective"**, Pearson Education, 3rd Edition, 2009.

OUTCOMES:

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

1. Understand the steps involved in IC fabrication and various IC technologies.
2. Draw the layout of any logic circuit using the design rules.
3. Design various adders and multipliers.
4. Understand the Architectures of FPGA and CPLD's.

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Course Code: 50H13 **Credits: 2**

B. Tech. – VII Semester
MANAGEMENT SCIENCE

PREREQUISITES: Nil

OBJECTIVE:
Through reading the text, references and discussion of cases students should be able to understand the fundamentals underlying the management of an organization.

MODULE – I: Management and Principles of Management [12 Periods]
Introduction to Management: Concepts of Management and organization-nature, importance and Functions of Management, Taylor's Scientific Management Theory, Fayols.
Principles of Management,: Mayo's Hawthorne Experiments, Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

MODULE – II: Organizational Structures and Types of Organizations [11 Periods]
Designing Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization
Types of Organizations: Line organization, Line and staff organization, functional organization ,committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure and their merits, demerits and suitability.

MODULE – III: Operations Management and Materials, Marketing Management [11 Periods]
Operations Management : Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement- Statistical Quality Control: chart, R chart, c chart, p chart, (simple Problems), Acceptance Sampling, Deming's contribution to quality.
a) Materials Management: Objectives, Need for Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records.
b) Marketing Management: Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Life Cycle, Channels of distribution

MODULE – IV: HRM and SM [11 Periods]
Human Resources Management (HRM) : Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating.
Strategic Management : Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis,

SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives

MODULE – V: Management Practices and PERT/CPM [11 Periods]

Contemporary Management Practices: Basic concepts of MIS, End User Computing, Materials Requirement Planning (MRP), Just-In-Time (JIT) System, Total Quality Management (TQM), Six sigma and Capability Maturity Model (CMM) Levels,

Project Management (PERT/CPM): Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing. (Simple problems)

TEXT BOOKS:

1. Aryasri, **Management Science**, TMH, 4th Edition, 2004. (Modules I, II, III, IV & V)
2. Stoner, Freeman, Gilbert, **Management,** Pearson Education, New Delhi, 6th Edition, 2004. (Modules I & II)

REFERENCE BOOKS*:*

1. Kotler Philip & Keller Kevin Lane, **"Marketing Management"**, PHI, 12th edition, 2005.
2. Koontz & Weihrich, **"Essentials of Management"**, TMH, 6th edition, 2005.
3. Thomas N.Duening & John M. Ivancevich **"Management - Principles and Guidelines"**, Biztantra, 2003.
4. Memoria & S. V. Gauker, **"Personnel Management"**, Himalaya, 25th edition, 2005
5. Samuel C. Certo, **"Modern Management"**, PHI, 9th edition, 2005.

OUTCOMES:

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

1. Learn the history of management and the contributions of important management techniques.
2. Understand the relevance of environmental scanning, planning and how to take decisions.
3. Learn how to delegate authority and use power to influence people to get the work done through proper communication and control.
4. Learn HR strategies of recruitment and selections and Marketing strategies.

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Course Code: 50434 **Credits: 3**

B. Tech. – VII Semester

DIGITAL IMAGE PROCESSING

(Professional Elective - IV)

PREREQUISITES: Digital Signal Processing

OBJECTIVE:

This course introduces the fundamentals concepts of digital image processing, image Transforms and its applications.

MODULE - I: Digital Image Fundamentals [12 Periods]

Fundamental Steps in Digital Image Processing, Components of an Image Processing System, A Simple Image Formation Model, Image Sampling and Quantization, Relationships Between Pixels, Imaging Geometry.

MODULE - II: Image Transforms [12 Periods]

2-D Fourier Transform, Properties, FFT, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar transform, Slant transform, Hotelling transform.

MODULE - III: Image Enhancement [12 Periods]

Spatial Domain: Introduction, Gray Level Transformations, Histogram Processing, Arithmetic and Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.

Frequency Domain: Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering.

MODULE - IV: Image Restoration and Color Image Processing [12 Periods]

Image Restoration: Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filters.

Color Image Processing: Pseudo-color Image Processing, Full-color Image Processing.

MODULE - V: Image Compression and Segmentation [12 Periods]

Image Compression: Fundamentals, Image Compression Models, Elements of information Theory, Error Free Compression, Lossy Compression.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region-Based Segmentation, Segmentation by Morphological Watersheds

TEXT BOOKS:

1. R. C. Gonzalez, R. E. Woods, **"Digital Image processing"**, Addison Wesley/ Pearson education, New Delhi, India, 3rd edition, 2002. (Modules I,II,III,IV & V)

REFERENCE BOOKS:

1. A. K. Jain, **"Fundamentals of Digital Image processing"**, Prentice Hall of India, New Delhi, 2nd Edition, 1997.
2. Rafael C. Gonzalez, **"Digital Image processing using MATLAB"**, Richard E.

Woods and Steven Low price Edition, Pearson Education Asia, India, 2nd Edition, 2004.
3. William K. Pratt, **"Digital Image Processing"**, John Wiley & Sons, New Delhi, India, 3rd edition, 2004.
4. Arthur R. Weeks, Jr, **"Fundamentals of Electronic Image Processing"**, SPIE Optical Engineering Press, New Delhi, India, 2nd Edition, 1996.

OUTCOMES:

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

1. Understand the fundamentals of Digital image processing including the topics of filtering, transforms and morphology, and image analysis and compression.
2. Implement basic image processing algorithms in MATLAB.

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Course Code: 50435 **Credits: 3**

B. Tech. – VII Semester

ADVANCED MICROCONTROLLERS

(Professional Elective - IV)

PREREQUISITES: Microprocessors and Microcontrollers.

OBJECTIVE:

This course introduces the AVR Micro Controllers and their architecture. This course helps to write efficient programs in assembly language programs. This course also introduces the MSP430 architecture.

MODULE - I: Introduction to AVR Microcontroller [12 Periods]

Overview of AVR family, AVR Microcontroller architecture, Register, AVR status register, ROM space and other hardware modules, ATmega32 pin configuration & function of each pin.

MODULE - II: AVR Programming [12 Periods]

Addressing modes of AVR, Data transfer, Arithmetic, Logic and Compare, Rotate and Shift, Branch and Call instructions. AVR data types and assembler directives, AVR assembly language programs, AVR I/O Port Programming, Time delay loop, BCD, ASCII conversion Program, Look-up table, Bit addressability, MACROs.

AVR Programming in C : Data types, I/O programming, logic operations, Intel HEX file, Timer programming , Interrupt programming , Serial Port programming.

MODULE - III: AVR Interfacing [12 Periods]

LCD and Keyboard Interfacing, ADC, DAC and sensor interfacing, SPI protocol and Display interfacing, I2C Protocol and RTC interfacing.

MODULE - IV: MSP430 architecture [12 Periods]

MSP430 architecture, functional block diagram, central processing unit, addressing modes, instruction set, examples, reflections on the CPU and instruction set, reset and clock system.

MODULE - V: Functions and Subroutines [12 Periods]

Functions, Interrupts, and Low-Power Modes: Functions and Subroutines, Storage for Local Variables, Passing Parameters to a Subroutine and Returning a Result, Mixing C and Assembly Language. Interrupts, Interrupt Service Routines., Issues Associated with Interrupts, Low-Power Modes of Operation .

TEXT BOOKS:

1. Muhammad Ali Mazidi, Sarmad Naimi and Sepehr Naimi, **"The AVR Microcontroller and Embedded Systems Using Assembly and C",** Pearson Education. (Modules I, II & III)
2. John H. Davies, **"MSP430 Microcontroller Basics".** (Modules IV & V)

REFERENCE BOOKS:

1. Mazidi M.A, Mazidi JG, & Rolin D. Mckinlay, **"The 8051 Microcontroller & Embedded Systems using Assembly and C"**, Pearson Education, 2nd edition, 2007.

OUTCOMES:

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

1. Express architecture of AVR and MSP430 Micro Controllers.
2. Program a microcontroller system in assembly code and C.
3. Interface I/O and memory to the above controllers.

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Course Code: 50436 **Credits: 3**

B. Tech. – VII Semester
TELEVISION ENGINEERING
(Professional Elective - IV)

PREREQUISITES: EDC, Analog and Digital Communications.

OBJECTIVE:
The objectives of the course are to familiarize the students with Television transmitters and receivers and TV signal transmission and also to make them understand different signal processing steps monochrome television. This course also introduce colour television transmitters and receivers.

MODULE - I: Introduction to Television [12 Periods]
TV Transmitter and Receivers, Synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera.
TV Signal Transmission a**nd Propagation**: Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW, TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

MODULE - II: Monochrome TV Receiver [12 Periods]
RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation, video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

MODULE - III: Sync Separation and Detection [12 Periods]
TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection Oscillators: Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive ICs, Receiver Antennas, Picture Tubes,

MODULE - IV: Color Television [12 Periods]
Color Television: Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes.
Color Signal Encoding and Decoding: NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U& V demodulators.

MODULE - V: Color Receiver and Digital TV [12 Periods]

Color Receiver: Introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Color, Phasors, synchronous demodulators, Sub carrier generation, raster circuits.

Digital TV: Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV.

TEXT BOOKS:

1. A. M. Dhake, **"Television and Video Engineering"**, TMH, 2nd Edition, 2003. (Modules I, II, III, IV & V)
2. R.R. Gulati, **"Monochrome and Colour TV"**, New Age International Publication, 2002. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. R. R. Gallatin, **"Modern Television Practice Principles"**, Technology and Service, New Age International Publication, 2002.
2. S. P. Bali, **"Colour Television Theory and Practice"**, TMH, 1994.
3. B. Grob and C. E. Herndon, **"Basic Television and Video Systems"**, McGraw Hill, 1999.

OUTCOMES:

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

1. Understand TV standards and picture tubes for monochrome TV.
2. Distinguish between monochrome and colour Television transmitters and receivers.
3. Analyze and Evaluate the NTSC and PAL colour systems.

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Course Code: 50437 **Credits: 3**

B. Tech. – VII Semester

OPTICAL COMMUNICATIONS

(Professional Elective - V)

PREREQUISITES: Fundamental Physics, Communication Systems.

OBJECTIVE:

This course introduces the significance of optical fiber communications and characteristics of optical fiber cable. This course develop the knowledge of optical signal sources and power launching. This course helps to understand the design of optical systems and WDM.

MODULE - I: Overview of Optical Fiber Communication [12 Periods]

Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

MODULE - II: Signal Distortion in Optical Fibers [10 Periods]

Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

MODULE - III: Fiber Splicing and Power Launching [14 Periods]

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints, Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

Source to Fiber Power Launching: Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

MODULE - IV: Optical Detectors [12 Periods]

Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

MODULE - V: Optical System Design [12 Periods]

Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.

Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

TEXT BOOKS:

1. Gerd Keiser, **"Optical Fiber Communications"**, TMH, 4th Edition, 2008. (Modules I,II,III,IV & V)
2. John M. Senior, **"Optical Fiber Communications"**, Pearson Education, 3rd Edition, 2009. (Modules I & II)

REFERENCE BOOKS:

1. D. K. Mynbaev, S.C. Gupta and Lowell L. Scheiner, Fiber **"Optic Communications"**, Pearson Education, 2005.
2. S. C. Gupta, Text Book on **"Optical Fibre Communication and its Applications"**, PHI, 2005.
3. Govind P. Agarwal, John Wiley, **"Fiber Optic Communication Systems"**, 3rd Ediition, 2004.
4. Donald J. Sterling Jr, **"Introduction to Fiber Optics"**, Cengage learning, 2004.
5. John Gowar, **"Optical Communication Systems"**, PHI, 2nd Edition, 2001.

OUTCOMES:

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

1. Understand and analyze the constructional parameters of optical fibres.
2. Estimate the losses due to attenuation, absorption, scattering and bending.
3. Compare various Optical detectors and choose suitable one for different applications.

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Course Code: 50438 **Credits: 3**

B. Tech. – VII Semester

HARDWARE SOFTWARE CO-DESIGN

(Professional Elective - V)

PREREQUISITES: Microprocessors, Microcontrollers and Embedded Systems.

OBJECTIVE:

To design mixed hardware-software systems and the design of hardware-software interfaces. This course introduces modeling concepts and the trade-offs between hardware and software components.

MODULE – I: Co - Design Issues and Co - Synthesis Algorithms [12 Periods]

Co - Design Issues: Co - Design Models, Architectures, Languages, A Generic Co - design Methodology.

Co - Synthesis Algorithms: Hardware software synthesis algorithms: hardware – software partitioning distributed system co synthesis.

MODULE – II: Prototyping, Emulation and Target architectures [12 Periods]

Prototyping And Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping architecture specialization techniques, system communication infrastructure

Target architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

MODULE – III: Compilation Techniques and Tools for Embedded Processor Architectures [12 Periods]

Modern embedded architectures, embedded software development needs, compilation technologies, practical consideration in a compiler development environment.

MODULE – IV: Design Specifications and Verification [12 Periods]

Design, co - design, the co-design computational model, concurrency coordinating concurrent computations, interfacing components, design verification, implementation verification, verification tools, interface verification.

MODULE – V: Languages for System – Level Specification and Design [12 Periods]

Languages for System – Level Specification and Design-I: System – level specification, design representation for system level synthesis, system level specification languages,

Languages for system – Level Specification and Design-II: Heterogeneous specifications and multi language co-simulation, the cosyma system and lycos system.

TEXT BOOKS:

1. Jorgen Staunstrup, Wayne Wolf, **"Hardware / Software Co - Design Principles and Practice"**, Springer, 2009. (Modules I, II, III, IV & V)

2. Giovanni De Micheli, Kluwer, Mariagiovanna Sami, **"Hardware / Software Co-Design"**, Academic Publishers, 2002. (Modules I, II & III)

REFERENCE BOOKS:

1. Patrick R. Schaumont, Springer, **"A Practical Introduction to Hardware / Software Co-design",** 2010.

OUTCOMES:

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

1. Design mixed hardware-software systems and the design of hardware-software interfaces
2. Focus on common underlying modeling concepts, , and the trade-offs between hardware and software components.
3. Learn about System –level specification, design representation for system level synthesis, system level specification languages.

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Course Code: 50439 **Credits: 3**

B. Tech. – VII Semester

ADVANCED DIGITAL SIGNAL PROCESSING

(Professional Elective - V)

PREREQUISITES: Digital Signal Processing.

OBJECTIVE:

This course introduces the Multirate Signal Processing and Parametric and Non Parametric methods of Power Spectrum Estimation.

MODULE - I: Review of DSP [10 Periods]

Review of DFT, FFT, IIR Filters, FIR Filters

MultiRate Signal Processing: Introduction, Decimation by a factor D. Interpolation by a factor I. sampling rate conversion by a rational factor I/D. Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion, Applications of Multirate Signal Processing.

MODULE - II: Non - Parametric methods of Power Spectral Estimation [10 Periods]

Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman & Tukey methods, Comparison of all Nonm-Parametric methods.

MODULE - III: Parametric Methods of Power Spectrum Estimation [10 Periods]

Autocorrelation & its Properties, Relation between auto correlation & model parameters, AR Models - Yule - Waker & Burg Methods, MA & ARMA models for power spectrum estimation.

MODULE - IV: Implementation of Digital Filters [10 Periods]

Introduction to filter structures (IIR & FIR), Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, implementation of lattice structures for IIR filters, Advantages of lattice structures.

MODULE - V: Finite Word Length Effects [10 Periods]

Analysis of finite word length effects in Fixed-Point DSP Systems – Fixed, Floating Point Arithmetic – ADC quantization noise & signal quality – Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

TEXTBOOKS:

1. J. G. Proakis & D. G. Manolokis, **"Digital Signal Processing, Principles, Algorithms & Applications"**, PHI, 4th Edition. (Modules I, II & III)
2. Alan V Oppenheim & Ronald W.Schaffer, **"Discrete Time signal processing"**, PHI. (Modules IV)
3. Emmanuel C. Ifeacher, Barrie, W.Jervis, **"DSP – A Practical Approach"**, Pearson Education, 2nd Edition. (Modules V)

REFERENCES:

1. S. M. Kay, **"Modern nspectral Estimation: Theory & Application"**, PHI, 1988.
2. P. P. Vaidyanathan, **"Multirate Systems and Filter Banks"**, Pearson Education.
3. S. Salivahanan, A. Vallavaraj, C. Gnanapriya , **"Digital Signal Processing"**, TMH, 2000.

OUTCOMES:

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

1. Estimate Power Spectrum for Parametric and Non Parametric Methods.
2. Implement Digital Filters Structures.
3. Analysis finite word length effects in Fixed-Point DSP Systems.

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Course Code: 50440 **Credits: 2**

B. Tech. – VII Semester

MICROWAVE ENGINEERING AND DIGITAL COMMUNICATIONS LAB

PART A: Microwave Engineering

List of Experiments:

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Attenuation Measurement.
4. Directional Coupler Characteristics.
5. VSWR Measurement.
6. Scattering parameters of Circulator.
7. Scattering parameters of Magic Tee.
8. Waveguide Parameters Measurement.

PART B: Digital Communication

List of Experiments:

1. PCM Generation and Detection
2. Frequency shift keying. Generation and Detection
3. Phase shift keying. Generation and Detection
4. DPSK : Generation and Detection

Equipment required for Laboratory:

Microwave Engineering Lab:

1. Microwave Bench set up with Klystron Power Supply
2. Microwave Bench set up with Gunn Power Supply
3. Micro Ammeter
4. VSWR meter
5. Microwave Components

Digital Communication Lab:

1. CRO: 0 - 20MHz
2. Experimental Kits /Modules

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Course Code: 50441 **Credits: 2**

B. Tech. – VII Semester

VLSI DESIGN LAB

List of Experiments:

1. Introduction to Verilog/VHDL.
2. HDL code to realize all the logic gates.
3. Design of 8-to-3 encoder (without and with parity).
4. Design of 4 bit binary to gray converter.
5. Design of Multiplexer / Demultiplexer, comparator.
6. Design of Full adder using 3 modeling styles.
7. Design of flip flops: SR, D, JK, T.
8. Design of 4-bit binary, BCD counters (synchronous/asynchronous reset) or any sequence counter.
9. Introduction to layout design rules.
10. Layout of CMOS Inverter.
11. Layout of CMOS NOR/ NAND Gates.
12. Layout of CMOS 1-bit Full Adder.

Equipment required for Laboratory:

1. Computers - Dual Core, Linux OS.
2. Software - CADANCE IC 614, Xilinx ISE

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Course Code: 50442 **Credits: 2**

B. Tech. – VII Semester

MINOR PROJECT

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Course Code: 50443 **Credits: 3**

B. Tech. – VIII Semester
RADAR SYSTEMS
(Professional Elective - VI)

PREREQUISITES: Communications and Microwave Engineering.

OBJECTIVE:
This course introduces the concepts of Radar fundamentals, Radar equation, Various Radar systems, elementary Radar signal processing and Radar signal detection in Noisy signal & Radar Receivers.

MODULE - I: Introduction to Radars **[12 Periods]**
Basics of Radar : Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.
Radar Equation : SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets (simple targets - sphere, cone-sphere), Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

MODULE - II: CW and Frequency Modulated Radar **[12 Periods]**
Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems
FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter, Multiple Frequency CW Radar.

MODULE - III: MTI and Pulse Doppler Radar **[12 Periods]**
Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, And Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

MODULE - IV: Tracking Radar **[12 Periods]**
Tracking with Radar, Sequential Lobing, Conical Scan, Monopulse Tracking Radar – Amplitude Comparison Monopulse (one- and two- coordinates), Phase Comparison Monopulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

MODULE - V: Radar Receivers and Noise in RADAR signals **[12 Periods]**
Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

TEXT BOOKS:

1. Merrill I. Skolnik, **"Introduction to Radar Systems"**, Special Indian Edition, TMH, 2nd Edition, 2007. (Modules I, II, III, IV & V)

REFERENCE BOOKS:

1. Byron Edde, **"Radar Principles Technology, Applications"**, Pearson Education, 2004.
2. Peebles, Jr., P.Z., Wiley, **"Radar Principles"**, New York, 1st Edition, 1998.
3. Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, **"Principles of Modern Radar Basic Principles"**, 2013.

OUTCOMES:

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

1. Understand the basic building blocks of Radar system, Radar Range equation, SNR, Envelope Detector, System Losses etc.
2. Understand different types of Radar like Doppler radar, CW Radar, FM-CW Radar, MTI and Pulse Radar etc.
3. Understand Tracking Radar by sequential Lobing, conical scan and comparison of trackers.
4. Understand detection of radar signals in noise by matched filter receiver, cross co-relation receiver etc.

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Course Code: 50444 **Credits: 3**

B. Tech. – VIII Semester

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

(Professional Elective - VI)

PREREQUISITES: Signals and Systems and Digital Signal Processing.

OBJECTIVE:

This course reviews the various transforms in Digital Signal Processing and introduces precision requirements and errors associated with DSP's. This course also introduces the Architectures of Texas Instruments and Analog Devices Digital Signal Processors. This course also introduces the Interfacing of Memory and I/O Peripherals to DSP's.

MODULE - I: Introduction **[12 Periods]**

Introduction to 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.

MODULE - II: Architectures for Programmable DSP Devices **[12 Periods]**

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.

MODULE - III: Programmable Digital Signal Processors **[12 Periods]**

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.

MODULE - IV: Analog Devices Family of DSP Devices **[12 Periods]**

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.

MODULE - V: Interfacing to DSP Devices **[12 Periods]**

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. Avtar Singh and S. Srinivasan, **"Digital Signal Processing Implementations Using DSP Microprocessors – with Examples from TMS320C54xx"**, CENGAGE Learning, India edition, 2008. (Modules I, II, III & V)
2. Amy Mar, **"Digital Signal Processing Applications"** Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, PHI. (Module IV)

REFERENCE BOOKS:

1. B. Venkataramani and M. Bhaskar, **"Digital Signal Processors, Architecture, Programming and Application"s**, Tata McGraw Hill, 2nd edition, 2002.
2. Phil Lapsley, Jeff Bier, Amit Shoham, Edward A. Lee, **"DSP Processor Fundamentals, Architectures & Features"**, Reprin, John Wiley & Sons Inc, 3rd Edition, 2010.

OUTCOMES:

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

1. Understand the various transforms of Digital Signal Processing, and also understands the precision requirements and errors in DSP's.
2. Understand the Architecture, addressing mode, Programming, interrupts and memory organization of Texas Instruments and Analog Devices DSP's.
3. Understand the Interfacing of Memory and I/O Devices to the DSP's.

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Course Code: 50445 **Credits: 3**

B. Tech. – VIII Semester

LOW POWER VLSI DESIGN

(Professional Elective - VI)

PREREQUISITES: VLSI Technology.

OBJECTIVE:

This course provide knowledge about how to design a low voltage and low power adder, Multipliers and memories which are necessary in every electronic application and to create some interest to do research that is going on in this field.

MODULE - I: Fundamentals [12 Periods]

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

MODULE - II: Low-Power Design Approaches [12 Periods]

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.

Switched Capacitance Minimization Approaches:

System Level Measures, Circuit Level Measures, Mask level Measures.

MODULE - III: Low-Voltage Low-Power Adders [12 Periods]

Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques–Trends of Technology and Power Supply Voltage, Low-Voltage Low-Power Logic Styles.

MODULE - IV: Low-Voltage Low-Power Multipliers [12 Periods]

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh - Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

MODULE - V: Low-Voltage Low-Power Memories [12 Periods]

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

TEXT BOOKS:

1. Sung-Mo Kang, Yusuf Leblebici, **"CMOS Digital Integrated Circuits – Analysis and Design"**, TMH, 2nd Edition, 2011. (Modules I, II, III, IV & V)

2. Kiat - Seng Yeo, Kaushik Roy, **"Low-Voltage, Low-Power VLSI Subsystems"**, TMH Professional Engineering, 2005. (Modules II & III)

REFERENCE BOOKS:

1. Ming-BO Lin, **"Introduction to VLSI Systems: A Logic, Circuit and System Perspective"**, CRC Press, 2011.
2. Anantha Chandrakasan, **"Low Power CMOS Design"**, IEEE Press / Wiley International, 1998.
3. Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, **"Low Power CMOS VLSI Circuit Design"**, Wiley student Edition, 2000.

OUTCOMES:

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

1. Know the difference between Low power VLSI and VLSI.
2. Know different parameters which lead to power dissipation and how to overcome that while design.
3. Design various circuits of adders, Multipliers and memory.

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Course Code: **Credits: 3**

B. Tech. – VIII Semester
(Open Elective - II)

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Course Code: **Credits: 3**

B. Tech. – VIII Semester
(Open Elective - III)

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Course Code: 50446 **Credits: 10**

B. Tech. – VIII Semester
MAJOR PROJECT

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Course Code: 50447 **Credits: 2**

B. Tech. – VIII Semester
COMPREHENSIVE VIVA VOCE

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Course Code: 50H15 **Credits: 1**

B. Tech. – VIII Semester
ENTREPRENEURSHIP SKILLS

PRE-REQUISITE: Nil

OBJECTIVE:
The aim of this course is to inspire students to become entrepreneurs so that they will emerge as job providers rather than job seekers.

MODULE -I: **[5 Periods]**
Understanding Entrepreneurial Mindset-characteristics of an entrepreneur -The evolution of entrepreneurship-Approaches to entrepreneurship- The challenges of new venture start-ups-Critical factors for new venture development.-Twenty first centaury trends in entrepreneurship-Difference between entrepreneur and entrepreneurship.

MODULE -II: **[5 Periods]**
The individual entrepreneurial mind-set and Personality-The entrepreneurial journey-Women entrepreneurship: growth problems in India-Entrepreneurial motivations. Corporate Entrepreneurial Mindset-the nature of corporate entrepreneur- -sustaining corporate entrepreneurship.

MODULE -III: **[5 Periods]**
Launching Entrepreneurial Ventures-opportunities identification-entrepreneurial Imagination and Creativity-the nature of the creativity process-Innovation and entrepreneurship. Methods to initiate Ventures-Creating new ventures-Acquiring an Established entrepreneurial venture - Intellectual property protection-Patents, Copyrights-Trademarks and Trade secrets.

Text Book:

1. D F Kuratko and T V Rao "Entrepreneurship-A South-Asian Perspective "Cengage Learning, 2012. (For PPT, Case Solutions Faculty may visit : login.cengage.com)

References:

1. Vasant Desai "Small Scale industries and entrepreneurship" Himalaya publishing 2012.
2. Rajeev Roy "Entrepreneurship" 2e, Oxford, 2012.
3. B.Janakiramand M.Rizwana" Entrepreneurship Development :Text & Cases,Excel
4. Books,2011.
5. Stuart Read, Effectual Entrepreneurship, Routledge, 2013.
6. Robert Hisrich et al "Entrepreneurship" 6the, TMH, 2012.
7. Nandan H, Fundamentals of Entrepreneurship, PHI, 2013

OUTCOME:
After completion of the course the students will be able to:

1. understand the mindset of the entrepreneurs, identify ventures for launching, develop an idea on the legal framework and also understand strategic perspectives in entrepreneurship- Legal challenges of Entrepreneurship.

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Course Code: 50A04 **Credits: 1**

B. Tech. – VIII Semester
FOREIGN LANGUAGE

OBJECTIVES:

1. To introduce a new language to the students.
2. To impart basic knowledge of foreign language to the students to be useful for everyday and Professional Purposes

Module –I:-

- Basic introduction of the language and its importance.
- Introduction to the script, words and sentences.

Module –II

- Construction of simple sentences for everyday needs like,
  - Greeting
  - Apologies
  - Enquiry
  - Bargaining
  - Seeking directions etc.

Module –III

- Language for workplace
  - Participating in meetings.
  - Party etiquette
  - Dining etiquette
  - Self-introductions
  - Introducing others etc…

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Course Code: 50102 **Credits: 3**

B. Tech.
SURVEYING

Prerequisites: Nil

OBJECTIVE:
Student will be able to learn and understand the various basic concept and principles used in surveying like Chain Surveying, Compass Surveying, Plane Table Surveying, Leveling and to calculate Horizontal Angle, Vertical Angle, Horizontal distance and Vertical distance to study the area of ground profile

MODULE - I:
A: INTRODUCTION BASIC CONCEPTS [6 Periods]
Introduction, Objectives, classifications and Principles of surveying, Scales, Shrinkage of maps, conventional symbols and code of signals, Surveying Accessories, phases of surveying.
B: MEASUREMENT OF DISTANCES AND DIRECTIONS [6 Periods]
Linear distances: Approximate methods, Direct methods-chains – tapes, ranging- tape corrections, Indirect methods- optical methods –E.D.M methods.
Prismatic Compass: Bearings, Included Angles, Local Attraction, Magnetic Declination and Dip.

MODULE - II:
A: LEVELING [6 Periods]
Basic definitions, types of levels and leveling staves, Temporary and permanent adjustments-method of leveling. Booking and determination of levels-HI method – Rise and fall method, effect of curvature if earth and refraction
B: CONTOURING [6 Periods]
Characteristics and Uses of contours, Direct and indirect methods of contour surveying, interpolation and sketching of Contours.

MODULE - III:
A: COMPUTATION OF AREAS AND VOLUMES [6 Periods]
Area from field notes, computation of areas along irregular boundaries and area consisting of regular boundaries, Planimeter. Volumes:Embankments and cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, volume of barrow pits.
B: THEODOLITE SURVEYING [6 Periods]
Types of Theodolite, description, uses and adjustments – temporary and permanent, measurement of horizontal and vertical angles. Principles of Electronic Theodolite. Trigonometrical leveling when the base is accessible and in accessible

MODULE – IV:

A: TRAVERSING **[6 Periods]**

Methods of traversing traverse computation and adjustments , gale's traverse table, omitted measurements

B: TACHEOMETRIC SURVEYING **[6 Periods]**

Principles of tacheometry, Stadia and tangential methods of Tacheometry.

MODULE - V

A: CURVES **[6 Periods]**

Types of curves, design and setting out – simple and compound curves.

B: INTRODUCTION TO MODERN SURVEYING METHODS **[6 Periods]**

Total Station, Global positioning system and Geographic information system (GIS).

TEXT BOOKS:

1. B.C.Punmia Ashok Kumar Jain and Arun Kumar Jain "**Surveying**" (Vol – 1, 2 & 3), Laxmi Publications (P) ltd., 14th Edition, 2014.
2. Duggal S K, "**Surveying**" (Vol – 1 & 2), Tata Mc.Graw Hill Publishing Co. Ltd. 4th Edition, 2004.

REFERENCES:

1. Arror K R "**Surveying Vol 1, 2 & 3"**, Standard Book House, Delhi, 4th Edition, 2004
2. Chandra A M, "**Plane Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 4th Edition 2002.
3. Chandra A M, "**Higher Surveying**", New age International Pvt. Ltd., Publishers, New Delhi, 4th Edition 2002.

WEB REFERENCES:

1. http://v5.books.elsevier.com/bookscat/samples/9780750669498/9780750669498.PDF
2. http://www.whycos.org/fck_editor/upload/File/Pacific
3. HYCOS/Surface_Waters/Levelling_and_surveying.pdf

OUTCOMES:

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

1. Pprepare Map and Plan for required site with suitable scale
2. Prepare contour Map and Estimate the Quantity of earthwork required for formation level for Road and Railway Alignment.
3. Prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects

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Course Code: 50123 **Credits: 3**

B. Tech.
AIR POLLUTION AND CONTROL

Pre-requisites: Environmental Studies

OBJECTIVE:
This course provides the knowledge and understanding of the problems associated with air pollution indoor and outdoor. It also describes the regulations pertinent to air pollution especially due to industries making the student to design proper air pollution control devices

MODULE-I: AIR POLLUTION [12 periods]
Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources. Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc., ambient air quality standards.

MODULE-II: THERMODYNAMICS AND KINETICS OF AIR-POLLUTION [12 periods]
Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio, Computation and Control of products of combustion.
.

MODULE-III: METEOROLOGICAL PARAMETERS AND WIND BEHAVIOUR
A: METEOROLOGY [**6 periods]**
Properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams Lapse Rates, Pressure Systems
B: PLUME DISPERSION [6 periods]
Winds and moisture plume behaviour and plume Rise Models; Gaussian Model for Plume Dispersion.

MODULE-IV: CONTROL OF PARTICULATES [12 periods]
Control at Sources, Process Changes, Equipment modifications, Design and operation of control equipments – Settling Chambers, Centrifugal separators, Filters, Dry and Wet scrubbers, Electrostatic precipitators.

MODULE-V: GENERAL METHODS OF CONTROL OF NO_X AND SO_X EMISSIONS [12 periods]
In-plant Control Measures, process changes, dry and wet methods of removal and recycling. Air Quality Management – Monitoring of SPM, SO; NO and CO Emission Standards.

Text Books:

1. M.N.Rao and H.V.N.Rao, **"Air pollution"**, Tata Mc.Graw Hill Company, 26th reprint 2007.
2. R.K. Trivedy and P.K. Goel, **"An introduction to Air pollution"**, B.S. Publications, 2nd revised edition, 2005.

References:

1. Wark and Warner, "**Air Pollution**" Harper & Row Publicatons, New York, 2nd edition, 1981.
2. S.C. Bhatia, "**Textbook of Air Pollution and Its Control",** Atlantic Publishers, 1st edition, 2007.
3. Karl B. Schnelle Jr.,Charles A. Brown, **" Air Pollution Control Technology Handbook"**, Published by CRC Press, 1st edition, 2002.

Web references:

1. http://www3.cec.org/islandora/en/item/2195-best-available-technology-air-pollution-control-en.pdf
2. http://www.eolss.net/sample-chapters/c09/e4-11-05.pdf
3. https://www.env.go.jp/earth/coop/coop/document/01-apctme/contents.html

OUTCOMES:

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

1. Understand in general terms, the major issues and challenges in Air pollution.
2. Design air pollution control equipment keeping in mind the stringent regulations laid by Pollution control board.

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Course Code: 50124 **Credits: 3**

B. Tech.
DISASTER MANAGEMENT

Prerequisites: Nil

OBJECTIVE:
This course provides the knowledge and understanding of the disaster phenomenon, its different contextual aspects, impacts and public health consequences along with International Strategy for Disaster Reduction. It also has the potential to make the student design and implement disaster mitigation measures.

MODULE I: CONCEPT OF HAZARDS AND DISASTERS
A: ENVIRONMENTAL HAZARDS & DISASTERS: [5 periods]
Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Different approaches & relation with human Ecology – Landscape, Ecosystem and Perception approach - Human ecology & its application in geographical researches.
B: TYPES OF ENVIRONMENTAL HAZARDS & DISASTERS: [5 periods]
Natural hazards and Disasters – Man induced hazards & Disasters - Natural Hazards- Planetary Hazards/ Disasters - Extra Planetary Hazards/ disasters - Planetary Hazards- Endogenous Hazards - Exogenous Hazards

MODULE II: CLASSIFICATION OF HAZARDS
A: ENDOGENOUS HAZARDS [8 periods]
Volcanoes- 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, Landslides- causes and impacts, Avalanches -causes and impacts.
B: EXOGENOUS HAZARDS [12 periods]
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 Planetary 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.

MODULE III: APPROACHES AND MEASURES IN DISASTER MANAGEMENT
A: EMERGING APPROACHES [4 periods]
Three Stages: 1. Pre- disaster stage [preparedness] 2. Emergency Stage 3. Post Disaster stage- Rehabilitation

B: NATURAL DISASTER REDUCTION & MANAGEMENT [4 periods]
1] Provision of Immediate relief measures to disaster affected people 2] Prediction of Hazards & Disasters 3] Measures of adjustment to natural hazards

MODULE IV: DISASTER MANAGEMENT [12 periods]
An integrated approach for disaster preparedness, mitigation & awareness.
Mitigation- Institutions- discuss the work of following Institution.
a. Meteorological observatory
b. Seismological observatory
c. Volcanological institution
d. Hydrology Laboratory
e. Industrial Safety inspectorate
f. Institution of urban & regional planners
g. Chambers of Architects
h. Engineering Council
i. National Standards Committee
Integrated Planning- Contingency management Preparedness –
a] Education on disasters
b] Community involvement
c] The adjustment of Human Population to Natural hazards & disasters Role of Media Monitoring Management- Discuss the programme of disaster research & mitigation of disaster of following organizations.
a] International Council for Scientific Unions [ICSU]- Scientific committee on problems of the Environment [SCOPE], International Geosphere- Biosphere programme [IGBP]
b] World federation of Engineering Organizations [WFED]
c] National Academy of Sciences
d] World Meteorological organizations [WMO]
e] Geographical Information System [GIS]
f] International Association of Seismology & Physics of Earth's Interior [IASPEI]
g] Various U.N agencies like UNCRD, IDNDR, WHO, UNESCO, UNICEF, UNEP.

MODULE V: DISASTER MANAGEMENT IN INDIA [10 periods]
a. A regional survey of Land Subsidence, Coastal Disaster, Cyclonic Disaster & Disaster in Hills with particular reference to India
b. Ecological planning for sustainability & sustainable development in India- Sustainable rural development: A Remedy to Disasters -Role of Panchayats in Disaster mitigations
c. Environmental policies & programmes in India- Institutions & National Centers for Natural Disaster reduction, Environmental Legislations in India, Awareness, Conservation Movement, Education & training.

Text Books:

1. Jagbir singh, **"Disaster management–Future challenges and opportunities"**, I.K. International publishing house, 1st edition, 2005.
2. Coppala P Damon, **"Introduction to International Disaster management",** ABD publishers**,** 2007**.**

References:

1. R.B.Singh [Ed], **"Environmental Geography"**, Heritage Publishers, New Delhi, 1st edition, 1990.
2. Kates,B.I & White. G.F, **"The Environment as Hazards"**, oxford publishers, 5th edition, New York, 1978.
3. R.B. Singh [Ed], **"Disaster Management"**, Rawat Publication, New Delhi, 1st edition, 2000.

Weblinks:

1. http://www.wcpt.org/disaster-management/what-is-disaster-management
2. http://study.com/academy/lesson/what-are-cyclones-types-causes-effects.html

OUTCOMES:

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

1. Analyze, evaluate and manage the environmental, social, cultural, economical, legal and organizational aspects influencing vulnerabilities and capacities to face disasters.
2. Assess the different public health aspects at local and global levels as a result of disaster, and can well plan to mitigate them.

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Course Code: 50150 **Credits: 3**

B.Tech.
GREEN BUILDINGS

Prerequisites: Nil

OBJECTIVE:
The purpose of the course is provide an overview of emerging delivery systems for high performance green buildings and the basis on which their sustainability can be evaluated.

MODULE – I **[10 periods]**
Introduction to green buildings, green materials, sources of green materials, high-performance green buildings Impacts of building construction, operation, and disposal Methods and tools for building assessment, Green Globes.

MODULE – II **[10 periods]**
The green building process, Design and construction relationships, benefits of green building , quality, healthy and safe environments , Site and landscape strategies.

MODULE – III
Building energy system strategies, Water cycle strategies, Materials selection strategies, Indoor Environmental Quality [IEQ].

MODULE – III
Analysis and strategies, Construction, team responsibilities and controls, Building commissioning strategies.

MODULE – IV **[10 periods]**
Economic issues and analysis, Use of the Green Strategies cost estimating tool, Future directions in green, high performance building technologies.

MODULE – V **[10 periods]**
Carbon accounting Green Building Specification

TEXT BOOKS:
1. Green Building, Principles and Practices in Residential Construction, In 2012, Abe Kruger and Carl Seville publication.
2. Green Building Materials: A Guide to Product Selection and Specification, 3rd Edition, Ross Spiegel, Dru Meadows. October 2010

REFERENCE BOOKS:
1. Sustainable Construction: Green Building Design and Delivery Hardcover – Import, 16 Nov 2012 by Charles J. Kibert [Author].

WEB REFERENCES:

1. http://www.ncrec.gov/Pdfs/bicar/GreenBuilding.pdf

OUTCOMES:
After completion of the course, students will be able to:
1. The benefits of green building – quality, healthy and safe environments that are cost effective – should be available to all.

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Course Code: 50203 **Credits: 3**

B.Tech.
NETWORK THEORY

Prerequisites: Basic knowledge on Electrical circuits

OBJECTIVE:
This course introduces the concepts of circuit analysis which is the foundation for all courses of the Electrical and Electronics Engineering discipline.

Module I: Network Theorems (Both AC & DC Networks) [12 periods]
Superposition, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, Millman's and Compensation and Tellegen's theorems- Statement of theorems and numerical problems.

Module II: Three Phase Circuits [10 periods]
Introduction to three phase circuits – types of connection - Star and delta– Relation between line and phase voltages and currents in balanced systems – Analysis of balanced and Unbalanced 3 phase circuits –Measurement of active and reactive power of balanced and Unbalanced 3 phase circuits .

Module III: Two Port Network Parameters [12 periods]
Open circuit impedance(Z) network parameters, Short circuit admittance(Y) network parameters –Transmission(ABCD), Inverse transmission($A^1B^1C^1D^1$) and hybrid parameters – Relationship between two port network parameters – Reciprocity and Symmetry concepts of two port network parameters.

Module IV: DC Transient Analysis [13 periods]
Introduction - Initial conditions of all elements-Transient response of Series R-L, R-C and R-L-C circuits – Solution using differential equation approach and Laplace transform approach.

Module IV: AC Transient Analysis [12 periods]
Transient response of Series R-L, R-C and R-L-C circuits – Solution using differential equation approach and Laplace transform approach.

Text Books:
1. William Hayt and Jack E. Kimmerly, "**Engineering circuit analysis**", McGrawHill Company, 6th Edition, 2005.
2. Joseph Edminister & mahmood Nahvi, "**Electric circuits**", Schaum outline Series – Tata McGraw Hill, 3rd Edition, 1999.

References:
1. Vanvalkenburg, "**Network Analysis"**, Prentice Hall of India, 3rd Edition, 1974.
2. A. Chakrabarthy, "**Circuit Theory"** by DhanipatRai & Co., 6th Edition, 2010.

3. N. N. Parker smith, "**Problems in Electrical Engineering"**, 9th Edition, 1981.

Outcomes:

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

1. Analyze electrical circuits using network theorems.
2. Apply the concepts of three phase electrical circuits to electrical machines and power systems.
3. Calculate the different parameters of a given two port electrical network.
4. Draw the transient response of a network for the given input.
5. Build the electrical circuit for the given impedance, admittance functions.

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Course Code: 50229 **Credits: 3**

B.Tech.

ENERGY AUDITING & CONSERVATION

OBJECTIVE:

To have the knowledge about the concept of energy conservation, energy management, different approaches of energy conservation in industries, economic aspects of energy conservation project and energy audit in commercial and industrial sector will be achieved by this course

MODULE I: BASIC PRINCIPLES OF ENERGY AUDIT [12 PERIODS]

Energy audit- definitions, concept , types of audit, energy index, cost index ,pie charts, Sankey diagrams, load profiles, Energy conservation schemes- Energy audit of industries- energy saving potential, energy audit of process industry, thermal power station, building energy audit

MODULE II: ENERGY MANAGEMENT [12 PERIODS]

Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management

MODULE III: ENERGY EFFICIENT MOTORS [12 PERIODS]

Energy efficient motors , factors affecting efficiency, loss distribution , constructional details , characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation- voltage unbalance- over motoring- motor energy audit

MODULE IV: POWER FACTOR IMPROVEMENT, LIGHTING & ENERGY INSTRUMENTS [14 PERIODS]

Power factor – methods of improvement, location of capacitors, Pf with non linear loads, effect of harmonics on p.f. , p.f motor controllers - Good lighting system design and practice, lighting control ,lighting energy audit,

Energy Instruments- watt meter, data loggers, thermocouples, pyrometers,lux meters, tongue testers ,application of PLC's

MODULE V: ECONOMIC ASPECTS AND ANALYSIS & ITS COMPUTATION [12 PERIODS]

Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method- Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

Text Books:

1. **"Energy management"** by W.R. Murphy & G. Mckay Butter worth, Heinemann publications.
2. **"Energy efficient electric motors"** by John .C. Andreas, Marcel Dekker Inc Ltd-2nd edition, 1995-

References:

1. **"Energy management"** by Paul o' Callaghan, Mc-graw Hill Book company-1st edition, 1998
2. **"Energy management hand book"** by W.C.Turner, John wiley and sons
3. **"Energy management and good lighting practice"** : fuel efficiency- booklet12-EEO

OUTCOME:

After completion of the course student will have the awareness of

- Different types of industries which are consisted of various energy intensive processes.
- Various energy intensive processes in different industries and to find out the energy conservation opportunities.
- Various methods of energy management and energy auditing on the site.
- Energy auditing and managing the energy demand in industry.

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Course Code: 50303 **Credits: 3**

B.Tech.
ENGINEERING MECHANICS

Prerequisites: Fundamental concepts of Physics

OBJECTIVE:
The objective of this subject is to provide the basic concepts of effect of system of forces on rigid bodies, Geometrical Properties of Planes and Solids, problem solving in kinematics and kinetics using different methods.

Module I: Introduction & Systems of Forces

A: Introduction: **[Periods 2]**

Basic Concepts, Laws of Motion, Force-types, characteristics- Principle of transmissibility.

B: Systems of Forces: **[Periods 10]**

Classification**,** Coplanar Concurrent Forces – Components of force– Resultant- Triangle law of Forces-Polygon law of Forces- Parallelogram Law of Forces-Resolution and composition of Forces– Coplanar Non-Concurrent System of Forces, Resultant of Parallel system of Forces -Moment of Force and its Application – Varignon‟s theorem, Couples.

Module II: Equilibrium of Systems of Forces: **[Periods 10]**

Free Body Diagrams, Types of Supports and their reactions, Internal and External Forces - Types of Equilibrium, Equations of Equilibrium, Conditions of Equilibrium, Equilibrium of bodies under Coplanar concurrent system of forces – Lami‟s Theorem, Converse of the Triangle law of forces, converse of the polygon law of forces.

Module III: Centroid, Centre of Gravity, Area moment of Inertia and Mass Moment of Inertia

A. Centroid: **[Periods 3]**

Centroids of Lines and Areas (from basic principles) –simple figures– Centroid of Composite Figures- Centroid of L, T, I, Z and channel Sections.

B. Centre of Gravity: **[Periods 3]**

Centre of gravity of simple solids (from basic principles), centre of gravity of composite solids, Pappu‟s-Guldinus theorems.

C.Area moment of Inertia: **[Periods 3]**

Definition –Moment of inertia of plane areas, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Moment of Inertia of L, T, I, and channel Sections.

D.Mass Moment of Inertia: **[Periods 3]**

Moment of Inertia of Simple solids, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

Module IV:- Kinematics & Kinetics

A: Kinematics: **[Periods 5]**

Rectilinear motion – Motion of Rigid Body under uniform and variable accelerations – motion under gravity-curvilinear motion -Projectiles-rotary motion, kinematics of general plane motion.

B: Kinetics: **[Periods 5]**

Analysis as a Particle and Analysis as a Rigid Body in Translation – D'Alemberts Principle – Connected bodies- Kinetics of rotating bodies- Equations of Plane Motion– Rolling Bodies.

Module V: Work, Power and Energy & Impulse-Momentum principle

A: Work, Power and Energy: **[Periods 7]**

Work-energy equation for translation-connected bodies on horizontal and inclined planes-pulleys-Work done by a spring-Work-energy equation to rotary motion and general plane motion.

B: Impulse-Momentum principle: **[Periods 3]**

Linear impulse and momentum-connected bodies-pile & hammer.

Text Books:

1. S.Timoshenko, DH Young, JV Rao, SukumarPati, "**Engineering Mechanics"**, McGraw Hill Education Publisher,5th Edition(Special Indian Edition), 2013.
2. S.S. Bhavikatti, "**A Textbook of Engineering Mechanics"**, New Age International publishers, 1st Edition,2008.
3. D.S.Kumar Patil, "**Engineering Mechanics"**, SK Kataria & Sons Publishers, 2nd Edition, 2009.

References Books:

1. Fedinand . L. Singer, **"Engineering Mechanics"**, Harper & Row Publishers, 3rd Edition, 1975.
2. K.Vijaya Kumar Reddy, J. Suresh Kumar**, "Engineering Mechanics"**, B S Publications, 3rd Edition, 2013.
3. R.S. Khurmi, "**A Text Book of Engineering Mechanics"**, S.Chand Publications, 21st Edition, 2007.
4. K L Kumar, "**Engineering Mechanics"**, TataMcGrawHillEducation,4th Edition, 2011.

OUTCOMES:

After completion of this course, students will be able to:

1. Understand the basic concepts and types of forces.
2. Analyze centroid & centre of gravity, moment of inertia of different Planes and solids.
3. Apply D'Alembert"s principle, work-energy method and Impulse Momentum principle to solve dynamics problems.

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Course Code: 50305 **Credits: 3**

B.Tech.

MECHANICS OF SOLIDS

Pre-requisite: Engineering Mechanics, Material Science

OBJECTIVE:

The objective of this subject is to provide the basic concepts of mechanical behavior of the different materials under various loads. To provide knowledge on shear force and bending moment diagrams of different beams. To provide knowledge about stress distribution across various cross sections of beams

MODULE – I: Simple Stresses & Strains [15 Periods]

Simple Stresses & Strains : Elasticity and plasticity – Types of stresses & strains–Hooke's law – stress – strain diagram for ductile and brittle material – Working stress – Factor of safety – Lateral strain, Poisson's ratio & volumetric strain – Elastic modulii & the relationship between them – Bars of varying section – composite bars – Temperature stresses . Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

MODULE – II: Shear Force and Bending Moment [12 Periods]

Shear Force And Bending Moment: Definition of beam – Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, U.D.L., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

MODULE - III: Bending Stresses & Shear Stresses [14 Periods]

A: Bending Stresses: Theory of simple bending – Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections – Design of simple beam sections.

B: Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections like rectangular, circular, triangular, I, T and angle sections.

MODULE - IV: Deflection of Beams & Torsion [17 Periods]

A: Deflection of Beams : Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, - U.D.L - uniformly varying load.

B: Torsion: Theory of pure torsion - Assumptions – Derivation of torsion equation, polar section modulus – power transmitted by shafts – combined bending and torsion.

MODULE - V: Analysis of Pin-Jointed Plane Frames & Thin Cylinders [12 Periods]

A: Analysis of Pin-Jointed Plane Frames: Determination of forces in the members of various types of cantilever & simply–supported trusses-by (i) Method of Joints (ii) Method

of Sections.

B: Thin Cylinders: Thin seamless cylindrical shells – Derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders.

TEXT BOOKS:

1. S.Timshenko **"Strength of Materials",** D. Van Nostrand Company, inc., 3rd edition, 1983.
2. Ramamrutham **"Strength of materials"** Dhanpat Rai Publishing Company, 17th edition, 2013

REFERENCE BOOKS:

1. R..K. Rajput, **"Strength of Materials"** S. Chand company Pvt, 5th edition, 2014,
2. R K Bansal **"Strength of Materials"** Lakshmi – publication, 6th edition, 2015
3. Bhavikatti **"Strength of materials"** Lakshmi publications, 4th edition, 2014.
4. Sadhu Sing, **"Strength of Materials"**, khanna bool publication, 1st edition, 2012
5. Popov **"Strength of Materials"** PRENTICE Hall Publisher.
6. D S Kumar, **"Strength of Materials,** S K Kataria & Sons, Reprint 2013, 2013.

COURSE OUTCOME:

After completion of this course, students will be able to:

1. The student shall be able to know various stress and strains.
2. Students shall know how to calculate shear force and bending moment
3. Students can utilize knowledge acquired in this subject in day –to -day life for designing of machine elements.

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Course Code: 50307 **Credits: 3**

B.Tech.

METALLURGY AND MATERIALS SCIENCE

Pre-requisite: Applied Chemistry

OBJECTIVE:

1. The objective of this subject is to provide the basic concepts of composition of different materials
2. Provides the concepts of mechanical properties and applications.
3. Provides the concepts of Heat treatment and composite materials.

MODULE – I: Crystallography & Constitution of Alloys [15 Periods]

A: Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numerical related to crystallography. Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations.

B: Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

MODULE – II: Equilibrium of Diagrams [15 Periods]

Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, Bi-Cd, Cu-An, Cus-Sn and Fe-Fe3C.

MODULE - III: Cast Irons & Steels [13 Periods]

A: Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons.

B: Steels: Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels.

MODULE - IV: Heat treatment of Alloys & Non-ferrous Metals and Alloys[13 Periods]

A: Heat treatment of Alloys: Effect of alloying elements on Fe-Fe3C system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys.

B: Non-ferrous Metals and Alloys: Structure and properties of copper and its alloys, Aluminum and its alloys, Titanium and its alloys.

MODULE - V: Ceramic materials & Composite materials [12 Periods]

A: Ceramic materials: Crystalline ceramics, glasses, cermaets, abrasive materials, nano materials –definition, properties and applications.

B: Composite materials: Classification of composites, various methods of component

manufacture of composites, particle – reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal – matrix composites and C – C composites.

TEXT BOOKS:

1. Sidney H. Avener **"Introduction to Physical Metallurgy",** Tata McGraw Hill publications, 2nd edition, 2013
2. Donald R.Askeland **"Essential of Materials science and engineering",** Thomson, 3rd edition, 2013
3. V. Rahghavan **"Elements of Material science",** PHI Publications, 6th edition, 2015.

REFERENCE BOOKS:

1. kodgire "**Material Science and Metallurgy"**, Everest Publishing House, 6th editions, 2011.
2. Agarwal "**Science of Engineering Materials"**, Tata McGrawHill, 8th edition, 2012.
3. William and collister "**Materials Science and Engineering",** 8th edition, 2010.
4. W.g.vinas & HL Mancini "**An introduction to Material science"**, 4th edition, 2011
5. C.D.Yesudian & harris Samuel "**Material science & Material"**, 3rd edition, 2014
6. R. A. Flinn and P K Trojan "**Engineering Materials and Their Applications",** Jaico Books, 7th edition, 1999
7. R.K.Rajput "**Engineering Materials and Metallurgy**" S.Chand Publisher, 3rd edition, 2012.
8. Pakirappa "**Materials Science and Engineering",** 6th edition, 2013

Outcomes:

After completion of this course, students will be able to:

1. This subject provides knowledge of Crystallography.
2. Provides knowledge of composition of various materials
3. Provides knowledge of heat treatment of different alloys

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Course Code: 50342 **Credits: 3**

B.Tech.

RENEWABLE ENERGY SOURCES

Pre-requisite: Thermal Engineering

OBJECTIVE:

The objective of this subject is to provide knowledge about different alternative energy sources.

MODULE – I: Principles of Solar Radiation [14 Periods]

Principles of Solar Radiation : Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, solar radiation data.

MODULE – II: Solar Energy Collection & Solar Energy Storage and Applications [14 Periods]

A: Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

B: Solar Energy Storage and Applications: Different methods, Sensible, latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

MODULE - III: Wind Energy & Bio-Mass [14 Periods]

A: Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria

B: Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation and economic aspects.

MODULE - IV: Geothermal Energy & Ocean Energy [14 Periods]

A: Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

B: Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

MODULE - V: Direct Energy Conversion [15 Periods]

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, seebeck, peltier and joul Thomson effects, Figure of merit,

materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions.

TEXT BOOKS:

1. Tiwari and Ghosal "**Renewable Energy Resources"**, Narosa Publishers
2. G.D. Rai "**Non-Conventional Energy Sources",** Khanna Publishers

REFERENCE BOOKS:

1. Twidell & Weir "**Renewable Energy Sources",** Taylor and Francis Group Publishers
2. Sukhatme **"Solar Energy",** TMH Publications
3. B.S Magal Frank Kreith & J.F Kreith "**Solar Power Engineering",** McGraw-Hill Publications
4. Frank Krieth & John F Kreider "**Principles of Solar Energy",** CRC Press Publications.
5. Ashok V Desai "**Non-Conventional Energy"**, Wiley Eastern Publishers
6. K Mittal "**Non-Conventional Energy Systems",**Wheeler Publishers
7. Ramesh & Kumar "**Renewable Energy Technologies",** Narosa Publications

OUTCOMES:

After completion of this course, students will be able to:

1. The students shall be able know different types of energy sources which are available naturally.

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Course Code: 50344 **Credits: 3**

B.Tech.

ROBOTICS

Pre-requisite: Kinematics and dynamics of machinery

OBJECTIVE:

1. The objective of this subject is to provide knowledge of automation of Industries
2. To provide knowledge of design of robot arm, kinematics and dynamics, Trajectory planning of robot and its applications.

MODULE – I: Introduction **[15 Periods]**

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics – present and future applications – classification by coordinate system and control system.

Components of the Industrial Robotics:-Degrees of freedom-End effectors: Mechanical gripper-magnetic-vacuum cup and other types of grippers-General consideration on gripper selection and design.

MODULE – II: Motion Analysis & Manipulator Kinematics **[13 Periods]**

A: Motion Analysis: Homogeneous transformations as applicable to rotation and translation – problems.

B: Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world coordinates Forward and inverse kinematics – problems.

MODULE - III: Dynamics **[14 Periods]**

Differential transformation and manipulators, Jacobians – problems.

Dynamics: Lagrange – Euler and Newton – Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion – straight line motion – Robot programming, languages and software packages.

MODULE - IV: Robot actuators and Feedback components **[13 Periods]**

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

MODULE - V: **[12 Periods]**

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading- Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

TEXT BOOKS:

1. Groover M P "**Industrial Robotics",** Pearson Edu.
2. Mittal R K & Nagrath I J "**Robotics and Control",** TMH.

REFERENCE BOOKS:

1. Fu K S "**Robotics",** McGraw Hill.
2. P. Coiffet and M. Chaironze "**An Introduction to Robot Technology**", Kogam Page Ltd. 1983 London.
3. Richard D. Klafter "**Robotic Engineering",** Prentice Hall Publishers
4. Asada and Slow time "**Robot Analysis and Intelligence",** Wiley Inter-Science.
5. John J Craig "**Introduction to Robotics",** Pearson Edu.
6. Mark W. Spong and M. Vidyasagar "**Robot Dynamics & Control",** John Wiley & Sons (ASIA) Pvt Ltd.

OUTCOMES:

After completion of this course, students will be able to:

1. Understand what is Robot and how it works.
2. Understand kinematics & dynamics and robot applications in manufacturing.

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Course Code: 50511 **Credits: 3**

B.Tech.
DATABASE MANAGEMENT SYSTEMS

Prerequisite: NIL

OBJECTIVE: To understand the data management and its relations, transactions, concurrency control**.**

Module I: Introduction to Databases and Database Management System

A: Basic Operations on Database System **[04 Periods]**

Database system Applications - Advantages of DBMS over File System - Data Models – Instances and schema - View of Data - Database Languages -DDL-DML - Database Users and Administrator - Database System Structure.

B: Database Design and ER diagrams **[05 Periods]**

Attributes and Entity Sets – Relationships and Relationship Sets – Constraints - Keys - Design Issues - Entity-Relationship Diagram-Weak Entity Sets - Extended E-R Features- Database Design with ER model - Database Design for Banking Enterprise

Module II: Relational Model and SQL

A: Introduction to the Relational Model **[04 Periods]**

Structure of RDBMS - Integrity Constraints over Relations – Enforcing Integrity Constraints – Querying Relational Data - Relational Algebra and Calculus.

B: Introduction to SQL **[05 Periods]**

Data Definition commands, Data Manipulation Commands, Basic Structure, Set operations Aggregate Operations - Join operations - Sub queries and correlated queries, SQL functions , views ,Triggers, Embedded SQL.

Module III: Dependencies

A: Functional Dependencies **[09 Periods]**

Introduction , Basic Definitions, Trivial and Non trivial dependencies, closure of a set of dependencies, closure of attributes, irreducible set of dependencies- Schema Refinement in Database Design- Problems Caused by Redundancy – Decompositions – Problem Related to Decomposition –- Lossless Join Decomposition – Dependency Preserving Decomposition - FIRST, SECOND, THIRD Normal Forms – BCNF — Multivalued Dependencies – Fourth Normal Form.

Module IV: Transactions and Recovery

A: Transaction concept **[06 Periods]**

Transaction state- Implementation of atomicity and Durability-Concurrent executions – Serializability, Recoverability Lock Based Protocols, Timestamp Based Protocols, Validation

Based Protocols, Multiple Granularity, Dead Lock Handling – Failure Classification – Storage Structure

B: Recovery and Atomicity **[03 Periods]**

Log Based recovery – Recovery with concurrent transactions– Checkpoints .

Module V: File Organization

A: Storage of files using Various Techniques **[09 Periods]**

Organization of records in file - Data Dictionary Storage – Indexing and Hashing – Basic Concepts , Ordered Indices, B^+ Tree Index files, B- tree index files– Static Hashing – Dynamic Hashing – Comparison of Indexing with Hashing.

Text Books:

1. Database System Concepts, Silberschatz, Korth , Fifth Edition, McGraw hill (1,2,3 & 5 Units)
2. Database Management Systems, Raghuramakrishnan, Johannes Gehrke, TATA Mc
3. Graw Hill(1,2,3 & 5 Units)
4. Introduction to Database Systems, C.J.Date, Pearson Education (4^{th} Unit)

References:

1. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
2. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.

OUTCOMES:

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

1. Understand the fundamental concepts of database management system. These concepts include aspects of database design, database languages, and database-system implementation.
2. Design and query databases, as well as understand the internals of databases.
3. Define the basic functions of DBMS & RDBMS.

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Course Code: 50518 **Credits: 3**

B.Tech.

SOFTWARE ENGINEERING

Prerequisite: NIL

OBJECTIVE:

To understand the basic concepts, issues of software and Identify Life cycle phases In the requirements for a software in real time with test cases.

Module I: Introduction to Software Engineering

A: Basics terms of Software Engineering: **[04 Periods]**

Changing nature of Software, Software Myths. A Generic View of Process:-Software engineering-A layered technology, The Capability Maturity Model Integration (CMMI)

B: Process Models: **[05 Periods]**

The water fall model, Incremental process models, evolutionary process models, and the unified process.

Module II: Requirements of Software Engineering

A: Software Requirements: **[04 Periods]**

Functional and non functional requirements, User requirements, System requirements, Interface specification, The software requirements document.

B: Requirements Engineering Process: **[05 Periods]**

Feasibility studies, requirements elicitation and analysis, requirements validation, requirements management

Module III: Phases of Software Engineering

A: System Models: **[03 Periods]**

Context models, behavior models, data models, object models, structured methods

B: Design Engineering: **[03 Periods]**

Design process and design quality, design concepts the design model

C: Creating an architectural design: **[03 Periods]**

Software architecture, data design, architectural styles and patterns, architectural design

Module IV: Test Strategies

A: Methods of Testing: **[09 Periods]**

A strategic approach to software testing, Black box and White box Testing, Validation Testing, System Testing. Product Metrics, Software Quality, Metrics for analysis model, Metrics for design model, Metrics for source code, Metrics for testing, Metrics for maintenance Metrics for process and products. Software measurement, Metrics for software quality

Module V: Risk Management

A: Management of Risk Process: [09 Periods]

Reactive vs proactive risk strategies, Software risks, Risk identification, Risk projection Risk refinement, RMMM, RMMM plan Quality Management, Quality concepts, Software quality assurance, Software reviews, Formal technical reviews, Statistical Software Quality Assurance, Software reliability, ISO 9000 Quality standards

Text Book:

1. Roger S. Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 5th edition, 2001.

References:

1. Ian Summerville, Software engineering, Pearson education Asia, 6th edition, 2000.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag,
3. 1997.
4. James F Peters and Witold Pedryez, "Software Engineering – An Engineering
5. Approach",John Wiley and Sons, New Delhi, 2000.
6. Ali Behforooz and Frederick J Hudson, "Software Engineering \ Fundamentals", Oxford University Press, New Delhi, 1996.

OUTCOMES:

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

1. Choose the appropriate Process model for the given project
2. Document the Requirements
3. Develop Different system Models
4. Create simple Test cases
5. Develop the skills for Software measurement
6. Prepare RMMI plan

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Course Code: 50571 **Credits: 3**

B.Tech.
COMPUTER GRAPHICS

Prerequisites: NIL

OBJECTIVE:
To understand and use the application programming interface for the implementation of the graphics and its pipeline and modeling.

Module I: Introduction of Graphics

A: Basics of Graphics **[04 Periods]**

Introduction, Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices.

B: Output primitives **[05 Periods]**

Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms.Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms.

Module II: Transforming and Viewing

A: 2-D geometrical transforms **[03 Periods]**

Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems.

B: 2-D viewing **[06 Periods]**

The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

Module III: 3D Objects

A: 3-D Object Representation **[09 Periods]**

Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B- Spline surfaces. Basic illumination models, polygon rendering methods.

Module IV:3D Transforming and Viewing

A: 3-D Geometric transformations **[04 Periods]**

Translation, rotation, scaling, reflection and Shear transformations, composite transformations.

B: 3-D viewing **[05 Periods]**

Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

Module V: Surface detection Methods and Animation

A: Visible surface detection methods [05 Periods]

Classification, back-face detection, depth- buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods.

B: Computer Animation [04 Periods]

Design of animation sequence, generalcomputer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

TEXT BOOKS:

1. 1"Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, PearsonEducatio.
2. "Computer Graphics Principles & practice", second edition in C, Foley,VanDam,Feiner andHughes, PearsonEducation.

REFERENCES:

1. "Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker,
2. PHI/Pearson Education.
3. "Computer Graphics Second edition", Zhigand xiang, Roy Plastock, Schaum's outlines, Tata Mc- Graw hill edition.

OUTCOMES:

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

1. Upon successful completion of the course, students will- gain a proficiency with OpenGL, a standard specification defining a cross-language, cross-platform API for writing applications that produce 2D and 3D computer graphics.
2. Learn the principles and commonly used paradigms and techniques of computer graphics.
3. Develop a facility with the relevant mathematics of computer graphics
4. Be able to write basic graphics application programs including animation
5. Understand the basic aspects of 2D image representations and transformation

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Course Code: 50553 **Credits: 3**

B.Tech.
BIG DATA

Prerequisite: Mathematics and Analytics.

OBJECTIVE:
To understand the Big data refers to a collection of large and complex data sets those are difficult to process using traditional data processing applications.

Module I: Introduction

A: Introduction **[09 Periods]**

Small and big data, statistics and machine learning, statistical data mining; Providing structure to unstructured data – machine translation, auto coding, indexing, term extraction; Identification, de identification and re identification; ontologies and semantics; introspection;

Module II: Data Integration

A: Data Integration **[09 Periods]**

Data integration and software interoperability; immutability and immortality; measurement; big data and healthcare. Big data techniques – data range, denominator, frequency distributions, mean and standard deviation, estimation-only analysis; big data analysis – clustering, classifying, recommending and modeling, data reduction, normalizing and adjusting data; special considerations – theory in search of data, data in search of a theory.

Module III: Data Analysis

A: Data Analysis **[09 Periods]**

Over fitting, bigness bias, too much data, fixing data; stepwise approach to big data analysis – formulate a question, resource evaluation, reformulate a question, query output adequacy, data description and reduction, algorithm selection, results review; failure, legalities and societal issues.

Module IV: Data Stream

A: Data Stream **[09 Periods]**

Variable assessment - correlation coefficient, scatterplots; paired-variable assessment – CHAID based data mining; symmetrizing ranked data – scales of measurement, steam and leaf display, Box and Whiskers plot; many-variable assessment – principle component analysis; logistic regression; ordinary regression; regression coefficient; predictive contribution coefficient

Module V: Data Modeling

A: Data Modeling **[09 Periods]**

R language – data modeling in R, importing data into R, Hadoop – different Hadoop modes,

Hadoop Distributed File System (HDFS) – fundamentals and architecture, MapReduce – fundamentals and architecture, Hadoop security, Hadoop programming in Java, Integrating R and Hadoop – RHIPE, RHadoop, data analytics with R and Hadoop, importing and exporting data from various databases, Hive, RBase, Apache Pig- large data analysis platform, automating data processing with Oozie.

Text Books:

1. Jules J Berman, Principles of Big Data: Preparing, Sharing, and Analyzing Complex Information, Morgan Kaufman-Elsevier, 2013.
2. Bruce Ratner , Statistical and Machine-Learning Data Mining: Techniques for Better Predictive Modeling and Analysis of Big Data, 2nd Edition, CRC Press, 2011.

References:

1. Michael Milton, Head First Data Analysis: A learner's guide to big numbers, statistics, and good decisions, O'Reilly Media Inc., 2009.
2. Big Data Now: 2012 Edition, O'reilly Media Inc., 2012.
3. Vignesh Prajapati , Big Data Analytics with R and Hadoop, Packt Publishing, 2013.

OUTCOMES:

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

1. Understand the concepts of big data
2. The student able to know the machine learning techniques
3. The student can formulate the solutions on big data for queries
4. Apply data mining concepts on big data
5. The student to know the concepts like Hadoop security and data modeling on R

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Course Code: 50578 **Credits: 3**

B.Tech.

Cloud and Distributed Computing

Prerequisite: NIL

OBJECTIVE: To understand the Cloud infrastructure and its applications.

Module I:

A: Understanding Cloud Computing: **[09 Periods]**

Cloud Computing – History of Cloud Computing – Cloud Architecture – Cloud Storage – Why Cloud Computing Matters – Advantages of Cloud Computing – Disadvantages of Cloud Computing – Companies in the Cloud Today – Cloud Services.

Module II: A **Developing cloud services:** **[09 Periods]**

Web-Based Application – Pros and Cons of Cloud Service Development – Types of Cloud Service Development – Software as a Service – Platform as a Service – Web Services – On-Demand Computing, Discovering Cloud Services Development Services and Tools – Amazon Ec2 – Google App Engine – IBM Clouds

Module III: A: Cloud computing for everyone: **[10 Periods]**

Centralizing Email Communications – Collaborating on Schedules – Collaborating on To-Do Lists - Collaborating Contact Lists – Cloud Computing for the Community – Collaborating on Group Projects and Events – Cloud Computing for the Corporation.

Module IV: A: **Distributed Systems Computer architecture:** **[09 Periods]**

CICS, RISC, Multi-core Computer Networking: ISO/OSI Model Evolution of operating systems Introduction to distributed computing systems. DCS design goals, Transparencies, Fundamental issues. Distributed Coordination Temporal ordering of events, Lamport's logical clocks, Vector clocks; Ordering of messages, Physical clocks, Global state detection.

Module V: A: Process synchronization: **[09 Periods]**

Distributed mutual exclusion algorithms, Performance matrix. Inter-process communication Message passing communication, Remote procedure call, Transaction communication, Group communication; Broadcast atomic protocols.,Distributed file systems Deadlocks in distributed systems and Load scheduling and balancing techniques

References:

1. Michael Miller, Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online, Que Publishing, August 2008.
2. Haley Beard, Cloud Computing Best Practices for Managing and Measuring Processes for On-demand Computing, Applications and Data Centers in the Cloud with SLAs, Emereo Pty Limited, July 2008.

3. Distributed Systems Concepts and Design, G. Coulouris, J. Dollimore, Addison Wesley
4. Advanced Operating Systems, M. Singhal, N.G. Shivarathri, McGraw Hill

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Course Code: 50579 **Credits: 3**

B.Tech.

INTERNET OF THINGS

Prerequisite: Internet Basics and its operations.

OBJECTIVE:

To learn the basic issues, policy and challenges in the Internet and understand the components and the protocols in Internet with manage the resources in the Internet. Deploy the resources into business and the cloud and internet environment.

Module I: INTRODUCTION

A: Basics of Internet and its terms **[09 Periods]**

Definition – phases – Foundations – Policy– Challenges and Issues - identification - security – privacy. Components in internet of things**:** Control Units – Sensors – Communication modules – Power Sources – Communication Technologies – RFID – Bluetooth – Zigbee – Wifi – Rflinks – Mobile Internet – Wired Communication

Module II: PROGRAMMING THE MICROCONTROLLER FOR IOT

A: IOT on sensor and cloud **[06 Periods]**

Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IOT – Arduino/Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors

B: Communication **[03 Periods]**

Connecting microcontroller with mobile devices – communication through blue tooth and USB – connection with the internet using wifi / Ethernet.

Module III: RESOURCE MANAGEMENT IN THE INTERNET OF THINGS

A: IOT Resources and its objects **[09 Periods]**

Clustering - Software Agents - Data Synchronization - Clustering Principles in an Internet of Things Architecture - The Role of Context - Design Guidelines -Software Agents for Object – Data Synchronization- Types of Network Architectures - Fundamental Concepts of Agility and Autonomy-Enabling Autonomy and Agility by the Internet of Things-Technical Requirements for Satisfying the New Demands in Production - The Evolution from the RFID-based EPC Network to an Agent based Internet of Things- Agents for the Behaviour of Objects.

Module IV: BUSINESS MODELS FOR THE INTERNET OF THINGS

A: IOT with Business models **[09 Periods]**

The Meaning of DiY in the Network Society- Sensor-actuator Technologies and Middleware

as a Basis for a DiY Service Creation Framework - Device Integration - Middleware Technologies Needed for a DiY Internet of Things Semantic Interoperability as a Requirement for DiY Creation -Ontology- Value Creation in the Internet of Things-Application of Ontology Engineering in the Internet of Things-Semantic Web-Ontology - The Internet of Things in Context of EURIDICE - Business Impact.

Module V: FROM THE INTERNET OF THINGS TO THE WEB OF THINGS

A: Transition of IOT to WEB **[09 Periods]**

Resource-oriented Architecture and Best Practices- Designing REST ful Smart Things – Webenabling Constrained Devices - The Future Web of Things - Set up cloud environment – send data from microcontroller to cloud – Case studies – Open Source e-Health sensor platform – Be Close Elderly monitoring – Other recent projects.

Reference Books:

1. Charalampos Doukas , Building Internet of Things with the Arduino, Create space, April 2002
2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011
3. Luigi Atzor et.al, "The Internet of Things: A survey, ", Journal on Networks, Elsevier Publications, October, 2010
4. http://postscapes.com/
5. http://www.theinternetofthings.eu/what-is-the-internet-of-things

OUTCOMES:

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

1. Identify the components of IOT.
2. Design a portable IOT using appropriate boards.
3. Program the sensors and controller as part of IOT.
4. Develop schemes for the applications of IOT in real time scenarios.
5. Establish the communication to the cloud through wifi/ Bluetooth.
6. Manage the internet resources.
7. Model the Internet of things to business.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50564 **Credits: 3**

B.Tech.
ARTIFICIAL INTELLIGENCE

Perquisite: NIL

OBJECTIVE:
This course contributes to the development of the following capabilities Enabling Knowledge, Problem Solving: and Critical Analysis.

Module I: Introduction [09 Periods]
AI problems, AI Technique, defining problem as a static space search production systems, problem characteristics, production system characteristics. Heuristic **Search B:Techniques:** Generate –and –test, hill climbing, Best –First Search, problem reduction, constraint satisfaction, means-ends analysis.

Module II: Knowledge Representation [09 Periods]
Issues, predicate logic, resolution, representing, knowledge using rules, forward versus Backward reasoning, Matching, control knowledge, weak slot –and –filler structures, semantic nets, frames, strong slot –and –filler structures, conceptual dependency, scripts

Module III: Reasoning Techniques [09 Periods]
Nonmonotonic reasoning, Augmenting a problem solver, implementation of depth first search and Breadth first search, statistical reasoning, probability and Bayes theorem, certainty factors and rule - based systems, Bayesian Networks.

Module IV: Game Playing [09 Periods]
Mini max search, alpha – beta cutoffs, planning system, Goal stack planning, hierarchical planning, understanding, understanding as constraint satisfaction, Waltz algorithm, natural language processing, syntactic processing, Augmented transition Networks, semantic analysis, case grammars.

Module V: Learning [09 Periods]
Role learning, learning by taking advice, learning in problem solving, learning from examples, Winston's learning program, Decision trees, perception, vision, speech recognition, Navigation, manipulation, Robot architectures, Expert systems, shell, explanation, knowledge acquisition.

Text Books:

1. "Artificial Intelligence", 2nd Edition., E. Rich and K. Knight (TMH).
2. Neural Computing: Theory and practice – Waserman

References:

1. Artificial Intelligence Structures and Strategies complex problem Solving – George F. Lugar Pearson Education

OUTCOMES:

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

1. Describe the key components of the artificial intelligence (AI) field
2. Describe search strategies and solve problems by applying a suitable search method
3. Describe minimax search and alpha-beta pruning in game playing.
4. Describe and apply knowledge representation
5. Describe and list the key aspects of planning
6. Describe and apply probability theorem and Bayesian networks.
7. Describe the key aspects of intelligent agents

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Course Code: 52501 **Credits: 3**

B.Tech.
FUNDAMENTALS OF GEOLOGY

PRE-REQUISITE: Under graduate Physics and Chemistry

OBJECTIVES:
To introduce fundamentals of geology to the student emphasizing the importance of mineralogy, structural geology, stratigraphy of earth, course is also aimed at explanation of seismic zones, geology and mineral resources of India.

MODULE-I: General Geology **[12 Periods]**
Origin, age, internal structure and composition of Earth.
Landforms: Origin or mode of development, characteristic features and engineering considerations of landforms developed by Rivers, Wind, Glaciers, Oceans and Volcanoes.

MODULE-II: **[12 Periods]**
Mineralogy :Minerals: Physical and chemical properties; Classification of minerals and properties of common silicate minerals (Quartz, Feldspar, Pyroxene, Amphibole, Garnet, Olivine, Mica), sulphides (Pyrite, Chalcopyrite, Galena, Sphalerite) and oxides (Haematite, Magnetite, Chromite, Pyrolusite, Psilomelane).
Petrology Igneous rocks: Magma and lava, extrusive and intrusive forms, textures; Classification and description of some common igneous rocks (Granite, Dolerite, gabbro, Basalt, Rhyolite, Pegmatite). Sedimentary rocks: Sedimentation processes; Classification and description of some common sedimentary rocks (Conglomerate, Sandstone, Shale, Limestone).
Metamorphic rocks: Processes of metamorphism, textures and structures of metamorphic rocks; Classification and description of some common metamorphic rocks (Slate, Phyllite, Schist, Gneiss, Quartzite, Marble).

MODULE-III:
A: Structural Geology **[6 Periods]**
Strike and Dip, Fundamental types, characteristic features and mechanics of folds.
B: **[6 Periods]**
Faults, joints (fractures) and unconformities. Foliation and Lineation.

MODULE-IV: Stratigraphy **[12 Periods]**
Principles of stratigraphy , geological time scale, stratigraphic succession, description and mineral wealth of archeans, proterozoic basins, Gondwanas, Deccan traps and Himalayas.

MODULE-V: Groundwater **[12 Periods]**
Hydrological cycle, vertical distribution of groundwater. Types of aquifers, geological formations as aquifers, springs, engineering considerations of groundwater and groundwater exploration.
Earthquakes: Mode of propagation of seismic energy, causes, effects and distribution of earthquakes, seismic Zoning Map of India.

TEXT BOOKS:
1. A Text Book of Geology by P.K. Mukherjee/ The world press Pvt Ltd.(2005)

2. Engineering Geology by D.V Reddy,vikas publishing house pvt Ltd.,(2010),

REFERENCE BOOKS:

1. Fundamentals of Engineering Geology by F.G. Bell ; Butterworth Heinemann.(1983)
2. Principles of Physical Geology by Arthur Holmes/ Van Nostrand Reinhold (UK). (1978)
3. Engineering and General Geology, Singh, Parbin ; 6th ed.,Katson Publishing House, Ludhiana(1994)
4. Read, H.H. (1984), "Rutley's Elements of Mineralogy", 26th ed.,CBS, New Delhi
5. Text Book of Applied Engineering Geology, Maruthesh Reddy, New Age International Pvt. Ltd. Publishers, New Delhi(2008)
6. Principles of Petrology,-Tyrell GW, Chapman and Hall Publications, New edition
7. Billings, M.P. Structural Geology, Prentice Hall Ino., N. Jersey, USA, 1972.
8. Krishnan M.S. Geology of India and Burma, 3rd Edition, IBH Publishers, N. Delhi, 1984.

OUTCOMES:

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

1. Know about the geology of the ground in which mining activity is proposed or in vogue.
2. Get acquainted with the geological conditions of the ground and helps students to plan better and safer mining activity.

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Course Code: 52511 **Credits: 3**

B.Tech.

MINE CONSTRUCTION ENGINEERING

PRE-REQUISITE: Nil

OBJECTIVES :

This course introduces site selection procedure, Shaft sinking methods, Mechanization, Loose ground shaft lining, Design of lining, Surface layouts, Open pit mines opening out trenches, Scheduling for mine constructions PERT/CPM.

MODULE-I **[12 Periods]**

Size of mine Environment and ecology, selection criteria for site of the openings geological investigation.

MODULE-II **[12 Periods]**

Underground mine shaft sinking methods through alluvium, soft and hard rock, Mechanization, consolidation of loose ground shaft lining , ground pressure, thickness of lining.

MODULE-III

PART-A: **[6 Periods]**

Design and procedure of laying the lining, construction of shaft collar heap stead.

PART-B: **[6 Periods]**

Design and construction of insets, shaft bottom, excavation for mechanized decking of cages, skip loading, pit bottom lay outs, installation of main haulages.

Main sump size, construction under ground substation, first aid room and office.

MODULE-IV **[12 Periods]**

Surface inclines, drivage through soft and hard rock, construction and lining of inclines, lateral and vertical and vertical pressures. Underground development, drivage of roads in stone and coal, mechanization support systems opening of faces.

Surface layouts pit top circuits and coal handling and coal preparation plant, railway sifting and weigh bridges, surface and underground coal bunkers winding house substation, lamp room. Pit head bath, crèche dispensary: office, work-shop, material handling stowing installations, bunker, water tanks, mixing chamber.

MODULE-V **[12 Periods]**

Open pit mines opening out trenches, haul roads, construction of benches. Assembling and transporting of draglines, shovels etc. Scheduling for mine constructions PERT/CPM.

TEXT BOOKS:

1. Design of Underground hard coal mine, J. Pazdziora, Elsevier.
2. Opencast Mining: MODULE Operations, V. V. Rzhevsky- Mir Publications.

REFERENCE BOOKS:

1. Working of Mineral Deposits—G. Popov, International Law & Taxation Publishers

OUTCOMES:

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

1. Gain knowledge on selection of suitable site for mines, different sinking methods, procedure of laying lining, Scheduling for mine construction.

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Course Code: 52528 **Credits: 3**

B.Tech.
INTRODUCTION TO MINERAL PROCESSING

PRE-REQUISITE: Development of Mineral Deposits

OBJECTIVES:
This course introduces Objectives of mineral processing, characteristics of minerals and coal, crushing methods, separation methods, methods of concentration, fields of application and limitations.

MODULE-I: Introduction **[12 Periods]**
Scope, objectives and limitations of mineral processing, liberation and beneficiation characteristics of minerals and coal.
Comminution:
Theory and practies of crushing and grinding; different types of crushing an grinding equipments – their applications and limitations.

MODULE-II: Size Separation **[12 Periods]**
Laboratory size analysis and interpretation; settling of solids in fluids; industrial screens,
Gravity Concentration Methods:
Jigging, Heavy media separation, flowing film concentrators – theory, applications and limitations.

MODULE-III:
PART-A: **[6 Periods]**
Mechanical classifiers and hydro cyclones.
PART-B: Froth Floatation **[6 Periods]**
Physico-chemical principles, reagents, machines, floatation of sulphides, oxides and coal.

MODULE-IV: Electrical Methods of Concentration **[12 Periods]**
Principles, fields of applications and limitations.

MODULE-V: Flow Sheets **[12 Periods]**
Simplified flow sheets for coal, zinc, iron, and manganese ores.
Magnetic methods of concentration Principles, Fields of Application and Limitation.

TEXT BOOKS:
1. Introduction to Mineral Processing – V. Malleswar Rao, Indian Academy of Geoscience
2. Mineral Processing – Barry AWills, Elsevier.

REFERENCE BOOKS:
1. Mineral Processing – S.K. Jain, CBS Publishers & Distributors

OUTCOMES:
After completion of the course, students will be able to:
1. Understand characteristics and processing of minerals and size separation after crushing, different methods of separation, flow charts for coal, zinc, iron and

manganese.

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Malla Reddy Engineering College (Autonomous)

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Course Code: 50H08 **Credits: 3**

B.Tech

INTERPRETATION OF LITERATURE AND ANALYTICAL WRITING

OBJECTIVES:

- To determine how well the students can develop a compelling argument in writing for an academic audience.
- To involve them in critical thinking and persuasive writing exercises .
- To develop effective writing skills -to analyze , to evaluate the data and ideas for making sense
- Encourage students to learn strategies for becoming accurate readers and critical analysts.
- To help learners understand their abilities and strengths while laying a road map towards their career goals.

Introduction :

Developing Analytical writing skills through interpretation of literature and enabling the students to think critically. It assesses the ability to articulate and support complex ideas , construct and evaluate arguments and sustain a focused and coherent discussion. Interpreting the text triggers the students' analytical and critical thinking skills while expanding their outlook.

Methodology :

- Giving them exercises pertaining to translation of their thoughts into words.
- Giving them vocabulary exercises in different contexts.
- Find supporting evidence.
- Make an outline

MODULE – I:

Introduction to interpretation skills

- Interpretation in different settings
- Interpretation of Literature
- Understanding the main ideas in the text
- Vocabulary by Theme

From the short novel: Animal Farm: George Orwell

MODULE – II:

Critical Reading

- Introduction
- The Theme
- Figurative language and characterization
- Interpreter's role and ethics

- Interpretation of story.
- Interpretation of characters
- Animal characters
- Human characters
- Key events
- Things
- Places

MODULE- III:

Critical Writing

- Introduction
- The Theme
- Figurative language and characterization
- Interpreter's role and ethics
- Interpretation of story.
- Interpretation of characters
- Animal characters
- Human characters
- Key events
- Things
- Places

From the short novel : Animal Farm : George Orwell

MODULE – IV :

Analytical writing:

- Responding to various situations
- Entering into the role and responding
- Analyze an issue
- Analyze an Argument
- Verbal Reasoning
- Interpretive Reports.

From the short novel : Animal Farm : George Orwell

MODULE –V:

Approaches to literary Criticism

Formalist Criticism
Biographical Criticism
Historical Criticism
Gender Criticism
Psychological Criticism
Sociological Criticism
Reader-Response Criticism
Mythological Criticism
Deconstructionist Criticism

Reference books

1. GRE by CliffsTestPrep-7th edition
2. GRE Exam- A Comprehensive Program
3. MacMilan edition- Glossary of English Literary terms by – M H Abraham
4. Interpreting Literature- A Myth and a Reality- GD Barche

OUTCOMES:

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

1. Students are capable of critical thinking and analytical writing.
2. Learners would get real life experiences through interpretation of literature.
3. Students learn strategies for becoming accurate readers and critical analysts
4. Students are capable of logical thinking towards social, political, economical, legal and technological issues.
5. They are capable of drawing their career vision and mission independently.

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Course Code: 50H09 **Credits: 3**

B.Tech

BUSINESS COMMUNICATION

OBJECTIVES

- To upgrade the learner's communication and presentation skills and to make the student's competent in communication at an advanced level.
- To groom the learners' personality
- To make the students self-confident individuals by mastering inter-personal skills, team management skills, and leadership skills

Introduction

Effective communication and interpersonal skills are crucial to increase employment opportunities and to compete successfully in the Global market. The real key to the effectiveness of professionals is their ability to put their domain knowledge into effective practice. Every employer today, looks for an extra edge in their employees. The rapid change in the corporate world asks for proper communication skills in almost all kinds of fields. This course is designed to enhance overall communication skills and soft skills amongst the learners including "How to win interviews". The course content for Business Communication and Soft Skills has been developed keeping in mind the standard of Indian students and the industry requirements.

MODULE – I: Communication skills

Types of communication-Oral, aural and written, reading-Word Power-Vocabulary-technical vocabulary, Rate of speech- pitch, tone-clarity of voice.

MODULE – II: Conversation skills

Informal and Formal conversation, Verbal and Non-verbal communication. Barriers to effective communication- Kinesics

MODULE – III: Reading skills

Types of reading–reading for facts, guessing meaning from context, strategies of reading-scanning, skimming, inferring meaning, critical reading,.

MODULE – IV: Writing and composition II

Letter-writing-business letters-pro forma culture-format-style-effectiveness, promptness-Analysis of sample letters collected from industry-email, fax, Essay writing-nuances of essay writing, types of essays.

MODULE – V: E- Correspondence

e mail, etiquette, characteristics and types of social correspondence -advantages and disadvantage.

REFERENCE BOOKS:

1. Essentials of Business Communication, Rajendra Pal S KorlahaHi: Sultan Chand & Sons, New Delhi.
2. Basic Communication Skills for Technology, Andrew J.Rutherford: Pearson Education Asia, Patparganj, New Delhi-92.
3. Advanced Communication skills, V.Prasad, Atma Ram Publications, and New Delhi.
4. Raymond V.Lesikav; John D.Pettit Jr.; Business Communication: Theory & application, All India Traveler Bookseller, New Delhi-51
5. Business Cimmunication, RK Madhukar, Vikas Publishing House Pvt Ltd
6. K.R. Laxminarayana: English for Technical Communication-Vols.1 and 2.SCITECH Publications (India) Pvt.Ltd. T.Nagar, Chennai-6000 017
7. Edmond H. Weiss: Writing Remedies: Practical Exercises for Technical Writing, Universities Press, and Hyderabad.
8. Cliffs test Prep for GRE and TOFFEL: Computer Based, IDG Books. India (P) Ltd.New Delhi-002.
9. How to build a better vocabulary – Nurnberg Maxwell & Morris Rosenblum: Grand Central Publishing.
10. How to read better and faster: Norman Lewis, W.R. Goyal Publishers, New Delhi.

OUTCOMES:

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

1. Understand the importance of non-verbal signals in communication.
2. The learner will be confident to participate in business meetings
3. The learner will be encouraged in all- round development by focusing on soft skills
4. The learner will be aware of importance of soft skills in the real time situations.

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Course Code: 50H10 **Credits: 3**

B.Tech

WORLD LITERATURES

OBJECTIVES:

- The undergraduates need to know about the societies across the globe to understand their society better, and this course aims at bringing awareness about the societies across the globe.
- The students need to understand the cultures of different nations as they are going to enter into global careers and understanding these cultures of different nations will help them to cope with the culture shock.

Module I

African literature:

- **Wole Soyinka**
  Dedication (poem)
- **Chinua Achebe**
  A Mother in a Refugee Camp.(poem)
- **OyetSisto Ocean**
  In the Plantation (short story)
- **David Oyuke**
  Of days and nights of old (short story)

Module-II

Australian Literature:

- **Christopher Kelen**
  Dark between Empires (poem)
- **Henry Lawson**
  Sons of the South (poem)
- **Ryan O'Neill**
  It's a Tuesday Morning(short story)
- **Linda Heuring**
  Roommates (Short Story)

Module III

American Literature:

- **Robert Frost**
  A Late Walk (poem)
- **Maya Angelou**
  Caged Bird (poem)
- **Stephen Crane**

A Dark Brown Dog(Short Story)

- **Mark Twain**

  A True Story –word to word as I heard It (Short Story)

Module IV

European Literature:

- **Herta Muller**

  "Gri" (fragment) (poem)

- **William Wordsworth**

  I Wandered Lonely As A Cloud (Poem)

- **Grazia Deledda**

  The Portrait of a Country woman (Short Story)

- **Guy de Maupassant**

  Miss Harriet(Short Story)

Module V

Asian Literature:

- **Gieve Patel**
  How Do You Withstand, Body(poem)
- **Amrita Pritam**
  Empty Space(poem)
- **Mahasweta Devi**
  Our Non-veg Cow (short story)
- **Basil Fernando**
  Albert the Murderer (short story)

References:

Africa's Best Stories: An Anthology of Africa's Best Short Stories :ChimamandaNgoziAdichie, Wole Soyinka, E. C. OsonduStoryAfrica.inc, America, 2010

Our Non-veg Cow and Other Stories MahāśvetāDebī, Seagull Books, 1998

Original Short Stories of Maupassant by Guy de Maupassant The Floating Press, 2014

Unspeakable Women: Selected Short Stories Written by Italian Women during Fascism by Robin Pickering-Iazzi :The Feminist Press, New York, 1993

www.naosite.lb.nagasaki-u.ac.jp/dspace/bitstream/.../keieikeizai70_03_08.pdf

www.poetryfoundation.org

www.bigbridge.org/BB17/**poetry**/indian**poetry**anthology/**Gieve_Patel**.html

www.romanianstudies.org/.../**poetry**-in-translation

www.poemhunter.com

www.americanliterature.com

www.fishpublishing.com/**short-stories**-to-read-online.php

www.theliftedbrow.com/post/.../an-australian-**short-story**-by-**ryan-oneill**

www.universeof**poetry**.org/australia.shtml

www.famouspoetsandpoems.com › Poets › Wole Soyinka

www.goodreads.com

www.africanwriterstrust.org

OUTCOMES:

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

1. Learnt about the literatures of different nations and continents.
2. Aware of the cultures of different societies of the world and are ready to cope with the culture shock they might experience when set to work in global environment.

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Course Code: 50B23 **Credits: 3**

B.Tech

ADVANCED OPTIMIZATION TECHNIQUES

PRE-REQUISITE: Nil

OBJECTIVES:

- To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems
- To develop and promote research interest in applying optimization techniques in problems of Engineering and Technology
- To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

MODULE- I: Single Variable Non-Linear Unconstrained Optimition: **[8 Periods]**
One dimensional Optimization Methods:- Uni-modal function, elimination method, Fibonacci method, golden section method, interpolation methods- quadratic method.

MODULE – II: Multi Variable Non-Linear Unconstrained Optimization [8 Periods]
Direct search method – Univariant Method – pattern search methods – Powell's – Hook – Jeeves search

MODULE – III:
Geometric Programming:
Polynomials – arithmetic – geometric inequality – unconstrained G.P
Dynamic Programming: [8 Periods]
Multistage decision process, principles of optimality, examples, conversion of final problem to an initial value problem, application of dynamic programming, production inventory.

MODULE IV: Linear Programming: **[8 Periods]**
Formulation – Sensivity analysis. Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints. Simulation – Introduction

MODULE V: Stochastic Programming [8 Periods]
Basic concepts of probability theory, random variables – distributions – mean, variance, Correlation, co variance, joint probability distribution – stochastic linear, dynamic programming.

Text Books:

1. S.S Rao, **Optimization theory & Applications,** New Age International, 4th Edition, 2009.
2. Kasan & Kumar, **Introductory to operation research**, Springar, 2004.

3. M.C Joshi, **Optimization Techniques theory and practice**, K.M Moudgalya Narosa Publications, 2004.

Reference Books:

1. H.A. Taha, **Operation Research**, TMH, 8th Edition, 2011
2. R.L Rardin, **Optimization in operations research**, 3rd Edition, 1998.
3. Benugundu & Chandraputla, **Optimization Techniques** , Person Asia, 2nd Edition, 2014.

OUTCOMES:

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

1. Develop models of optimization
2. Developed the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework.
3. Solve the models for their optimal solutions; interpret the models' solutions and infer solutions to the real-world problems

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Course Code: 50B24 **Credits: 3**

B.Tech

MATHEMATICAL MODELLING

PRE-REQUISITE: Nil

OBJECTIVES:

- The objective of the course is to introduce mathematical modeling of engineering problems.
- The construction and analysis of mathematical models inspired by real life problems.
- The course will present several modelling techniques and the means to analyze the resulting systems.

MODULE-I: Mathematical Modeling& Types of models using Ordinary Differential Equations of First Order: [12 Periods]

Mathematical Model, types of Mathematical models, Procedure of modeling, Linear Growth and Decay Models, Non-Linear Growth and Decay Models, Mathematical Modeling in Dynamics Through Ordinary Differential Equations of First Order,

MODULE-II: Mathematical Modeling through Systems of Ordinary Differential Equations of the First Order [12 Periods]

Mathematical Modeling in Population Dynamics, Mathematical Modelling in Economics Through Systems of Ordinary Differential Equations of First Order, Mathematical Models in Medicine, Mathematical Modelling in Dynamics Through Systems of OrdinaryDifferential Equations of First Order.

MODUELE-III: Mathematical Modelling Through Ordinary Differential Equations of Second Order [12 Periods]

Mathematical Modeling of Planetary Motions, Mathematical Modeling of Circular Motion and Motion of Statellites, Mathematical Modeling Through Linear Differential Equations of Second Order, Miscellaneous Mathematical Models Through Ordinary Differential Equations of the Second Order.

MODULE-IV: Mathematical Modeling Through Difference Equations [12 Periods]

The Need for Mathematical Modelling Through Difference Equations: Some Simple Models, Basic Theory of Linear Difference Equations with Constant Coefficients, Mathematical Modelling Through Difference Equations in Economics and Finance, Mathematical Modelling Through Difference Equations in Population Dynamics and Genetics, Mathematical Modelling Through Difference Equations in Probability Theory, Related problems.

MODULE-V: Mathematical Modeling through Partial Differential Equations [12 Periods]

Motivation of Partial Differential Equations Models,: First Method of Getting PDE Models, Momentum Balance Equations: The Second Method of Obtaining Partial Differential Equation Models, Variational Principles: Third Method of Obtaining Partial Differential

Equation Models, Probability Generating Function, Fourth Method of Obtaining Partial Differential Equation Models, Model for Traffic Flow on a Highway, Nature of Partial Differential Equations, Initial and Boundary Conditions.

TEXT BOOKS:

1. Edward A. Bender.. An Introduction to Mathematical Modeling.
2. A. C. Fowler.. Mathematical Models in Applied Sciences, Cambridge University Press.
3. J. N. Kapoor. Mathematical Modeling, Wiley eastern limited. S.M. Ross .Simulation, India Elsevier Publication. A.M.Law and W.D.Kelton.. Simulation Modeling and Analysis, T.M.H. Edition.
4. Numerical Solutions of Differential Equations by M.K.Jain, Wiley Eastern Ltd.

Outcomes:

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

1. Know different types of models (static, discrete time, continuous time, stochastic) with case studies chosen from population dynamics and other fields can to be determined.
2. Identify the most important processes governing the problem (theoretical assumptions)
3. Identify the state variables (quantities studied)
4. Identify the basic principles that govern the state variables (physical laws, interactions)
5. Express mathematically these principles in terms of state variables (choice of formalism)

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Course Code: 50B25 **Credits: 3**

B.Tech

DIFFERENTIAL EQUATIONS AND DYNAMICAL SYSTEMS

PRE-REQUISITE: Nil

OBJECTIVES:

- The aim is to give a self contained introduction to the field of or- dinary differential equations with emphasis on the dynamical systems point.
- The objective of this course is to provide the student with an understanding of the ... Apply techniques of Nonlinear ODE and Dynamical Systems

MODULE-I: Linear Systems, Uncoupled Linear Systems, Diagonalization, Exponentials of Operators, Linear Systems.

MODULE-II: Complex Eigen values, Multiple Eigen values, Jordan Forms , Stability Theory Non homogeneous Linear Systems.

MODULE-III: The Stable Manifold Stability and Liapunov Functions, Saddles, Nodes, Foci and Centers Global Theory, Dynamical Systems and Global Existence Theorems .

MODULE-IV: Limit Sets and Attractors, The Stable Manifold Theorem for Periodic, Global Phase Portraits and Separatrix Configurations Structural Stability, Higher Codimension Bifurcations at Non hyperbolic Equilibrium Points.

MODULE-V: Hopf Bifurcations and Bifurcations of Limit Cycles from a Multiple Focus Bifurcation, Finite Co -dimension Bifurcations in the Class of Bounded Quadratic Systems.

Text Books:

1. Lawrence Perko, Springer Publications , Third edition ,Texts in Applied Mathematics.
2. Advanced engineering Mathematics by Kreyszig, John Wiley & Sons Publishers, 10th Edition, Reprint 2010.

Reference Books:

1. Mathematics for Engineers and Scientists, Alan Jeffrey, 6ht Edi, 2013, Chapman & Hall/ CRC
2. Advanced Engineering Mathematics, Michael Greenberg, Second Edition. Pearson Education.

OUTCOMES:

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

1. Develops the theory of dynamical systems systematically.
2. Learn to analyze non-linear systems described for diagonalization.
3. Know the basic concepts and methods from the theory of differential equations and dynamical systems.

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Course Code: 50B20 **Credits: 3**

B.Tech

ADVANCED PHYSICS FOR ENGINEERS

Prerequisites: Applied Physics – I & II

OBJECTIVES:
The objective of this course is to make the students familiar with the recent advanced concepts in physics.

Module-I: Special Theory of Relativity **[9 Periods]**
Introduction, Concept of theory of relativity, Frames of reference-Inertial, non-inertial; Galilean transformation equations, Michelson-Morley experiment, Einstein theory of relativity, Lorentz transformation of space and time, Length contraction, Time dilation, Variation of mass with velocity, Relativistic relation between energy and momentum.

Module-II: Holography **[9 Periods]**
Introduction, Basic principle, Construction and Reconstruction of Hologram, Properties of Hologram, Types of Holograms, Applications- Holographic Interferometry, Acoustic Holography, Holographic Microscopy.

Module –III: Thin films Synthesis and Characterization

A - Synthesis **[7 Periods]**
Introduction, Deposition techniques-Pulsed Laser Deposition (PLD), Spray Pyrolysis; Nucleation and growth of the thin films, properties (Mechanical, Electrical, Magnetic and Optical).

B – Characterization **[7 Periods]**
X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis (EDAX), Principles and applications of X-Ray Diffraction, Electron Diffraction, Atomic Force Microscopy.

Module-IV: Photonic Crystals **[9 Periods]**
Important features of photonic crystals, Presence of photonic band gap, anomalous group velocity dispersion, Micro cavity, effects in Photonic Crystals, fabrication of photonic Crystals, Dielectric mirrors and interference filters, PBC based LEDs, Photonic crystal fibers (PCFs), Photonic crystal sensing.

Module-V: Solar cell Physics **[9 Periods]**
Single, poly and amorphous silicon, GaAs, CdS, Cu_2S, CdTe; Origin of photovoltaic effect, Homo and hetero junction, working principle of solar cell, Evaluation of Solar cell parameters, I-V, C-V and C-f characteristics.

Text / Reference Books:

1. R K Gaur and SL Gupta, "**Engineering Physics**" Dhanpat Rai Publications, 8th revised Edition, 2006.
2. B K Pandey and S Chaturvedi, "**Engineering Physics**" Cengage Learning India, Revised Edition, 2014.
3. R F Bun shah, "**Hand Book of Technologies for Films and coating"**, Noyes publishers, 1st Edition, 1996
4. B E A Saleh and A C Tech*, "***Fundamentals of Photonics***"*, John Wiley and Sons, New York, 1st Edition, 1993.
5. K L Chopra and S R Das, "**Thin film Solar Cells"**, Plenum press, 1st Edition 1983.
6. K Vijaya Kumar, T Sreekanth and S Chandralingam, "**Engineering Physics**" S Chand and Co 1st Edition, 2008.

OUTCOMES:

After completion of the course, student will be able to:

1. Understand the concepts of special theory of relativity.
2. Analyze the basic concepts of Holography and applications.
3. How to synthesize and different methods of characterization of thin films.
4. Develop basic knowledge on the photonic crystals and solar physics and their applications

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Course Code: 50B21 **Credits: 3**

B.Tech

NANO MATERIALS: SYNTHESIS AND CHARACTERIZATION

Prerequisites: Applied Physics – I & II

OBJECTIVES: The objective is to provide different methods of synthesis and characterization of nano material.

Module-I: Physical Methods **[9 periods]**
Bottom-up approachand Top-down approach, Inert gas condensation, Arc Discharge, lasers ablation, laser pyrolysis, ball milling, molecular beam epitaxial, and electro deposition.

Module-II: Chemical methods **[8 periods]**
Nanocrystals by chemical reduction, photochemical synthesis, electrochemical synthesis,Nano crystals of semiconductors.

Module-III: Thermal Methods
A-Thermal Methods: **[8 periods]**
Thermolysisroute – spray pyrolysis and solved metal atom dispersion, sol-gel method solvothermal and hydrothermal routes, solution combustion synthesis, CVD method.

B: Surface Characterization **[8 periods]**
Scanning electron microscopy (SEM), Transmission electron microscopy (TEM). Photo luminescence Spectroscopy.

Module-IV: Compositional and structural Characterization techniques **[9 periods]**
X-Ray Photoelectron Spectroscopy (XPS), Energy Dispersive X-Ray Analysis(EDAX),Principles and applications of X-Ray Diffraction, Electron Diffraction, and Electron probe microanalysis(EPMA).

Module – V: Properties and Applications of Nanomaterials **[8 periods]**
Carbon Nano Tube (CNT) – Single-Wall Carbon Nano Tube (SWCNT), Multi-wall carbon Nano tube (MWCNT), Activated carbon, Fullerene, Graphene, Quantum wire and Quantum dots

Text Books:

1. C N R Rao, A Muller and A K Cheetham "**The chemistry of Nanomaterials: Synthesis, Properties and Appliocations**" John Wiley, First Edition, 2004
2. Hari Singh Nalwa, "**Nanostructured Materials and Nanotechnology**", Academic Press, First Edition, 2002.

Reference Books:

1. Charles P Poole Jr "**Introduction to Nanotechnology**", John Willey & Sons, 1st Edition, 2003
2. C Dupas, P Houdy, M Lahmani, Nanoscience: "**Nanotechnologies andNanophysics**", Springer-Verlag Berlin Heidelberg, 1st Edition, 2007

3. Guozhong Cao, "**Nanostructures and Nanomaterials, synthesis, properties and applications***",* Imperial College Press, 1st Edition, 2004.
4. T Pradeep, "**NANO: The Essentials: Understanding Nanoscience andNanotechnology***".* Tata McGraw-HillPublishing Company Limited, Revised Edition, 2007
5. Z L Wang, "**Characterization of Nanophase Materials***"* Wiley-VCH, 1st Edition, 2000.
6. K Vijaya Kumar, T Sreekanth and S Chandralingam, "**Engineering Physics**" S Chand and Co 1st Edition, 2008.

OUTCOMES:

After completion of the course, student will be able to:

1. Understand different methods of synthesis of nano materials
2. Analyze the differences in the different methods of synthesis
3. Learn different characterization techniques of nano materials.
4. Develop basic knowledge on the properties and the applications few nano materials.

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Course Code: 50B22 **Credits: 3**

B.Tech

NDT AND VACUUM TECHNOLOGY

Prerequisites: Applied Physics – I & II

OBJECTIVES: The objective is to provide a basic level of understanding on Non destructive testing and Vacuum technology.

Module – I: Introduction to Non destructive testing [6 periods]
Introduction, Objectives of Non destructive testing, Types of defects – Cracking, Spalling, Staining, Construction and Design defects, Honey combing, Dusting, Blistering, Rain damage.

Module – II: Methods of Non destructive Testing [10 Periods]
Liquid penetration method, Dye penetration method, Radiographic testing, Ultrasonic Inspection method, Pulse Echo method, Magnetic particle testing, Eddy current Testing.

Module – III: Introduction to Vacuum Technology and Flow meters
A: Introduction to Vacuum Technology [9 Periods]
Definition of vacuum, Degrees of vacuum and their ranges; Review of Kinetic theory of gases; Definitions of particle flux, mono layer formation time, pressure; Elementary gas transport phenomena; Knudsen's and Reynolds' numbers; Throughput, mass flow and conductance;
B: Flow meters [8 Periods]
Molar flow, Mass flow and throughput; Rota meters and chokes; differential pressure techniques;

Module – IV: Pressure gauges [8 Periods]
Classification, Direct and indirect gauges, Indirect gauges – Pirani gauge, Thermocouple gauge, Ionization gauge, hot cathode gauge, Penning gauge

Module – V: Vacuum Pumps [9 Periods]
Introduction, Pumping speed, Rotary vane pump, Turbo molecular pump, Diffusion pumps

Text Books:

1. B K Pandey, S Chaturvedi, **"Engineering Physics"**, Cengage learning, 1st Edition, 2014
2. John. F. O'Hanlon, **"A User's guide to Vacuum technology",** Wiley, 3rd Edition, 2003

Reference Books:

1. M R Srinivasan, **"Physics for Engineers"**, New Age international, 1st reprint, 2007
2. R K Gaur and S L Gupta, "**Engineering Physics**", Dhanpat rai, Reprint, 2006
3. Krishna Seshan, "**Hand Book of Thin film deposition**", Noyes, 2nd Edition, 2002

OUTCOMES:

After completion of the course, student will be able to:

1. Understand the concepts of NDT and Vacuum technology.
2. Learn different methods of NDT.
3. Develop basic knowledge of flow meters, pressure gauges and vacuum pumps working and their applications.

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Course Code: 50B17 **Credits: 3**

B.Tech

CHEMISTRY OF ENGINEERING MATERIALS

OBJECTIVE:

The objective is to make the students know about the Concept of phase rule and alloys, phase diagrams of different systems. To give knowledge to the students regarding lubricants, abrasives, glass, ceramics, re-fractories and adhesives. To make the students to understand the basic concepts of chemistry to develop futuristic materials for high-tech applications in the area of engineering.

Module-I: Phase Rule and alloys [10 period]

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.
Alloys-fabrication of alloys-Ferrous alloys-Non ferrous alloys-industrial applications.

Module-II: Lubricants, Abrasives and Adhesives [9 periods]

Introduction to Lubricants-Mechanism of Lubrication-classification of Lubricants-properties of lubricants-viscosity, flash and fire points, cloud and pour points,decomposition stability,saponification number. Abrasives-natural and artificial abrasives-grinding wheels-abrasive paper and cloth. Adhesives-classification -action of adhesives- factors influencing adhesive action development of adhesive strength.

Module-III: Cement and Concrete [8 periods]

Introduction-Classification of cement-natural –chemical composition of cement-portland cement-chemical reactions involved in setting and hardening of cement-additives for cement--mortars and concretes-pre stressed concrete-post tensioning-curing-overall scenario of cement industry-Reinforced concrete constructions-testing and decaying of cement-prevention of cement decay

Module-IV: Glass, Ceramics and Refractories [9 periods]

Structure of glass-properties-Manufacturing of glass-Types of glasses-uses Ceramics-clays-methods for fabrication of ceramic ware plasticity of clays. Ceramic products-glazes. Porcelain and vitreous enamels. Requisites of a good refractory-classification, properties and applications of refractories.

Module-V: Polymers and Composite materials [9 periods]

Structure and properties of polymers-rubber –classification-vulcanization of rubber – preparation properties and application of Buna-S and Buna-N and Thiokol rubber. Biogradable polymers- poly vinyl acetate and poly lactic acid. Liquid crystals-Introduction-structure of liquid crystal forming compounds-classification-chemical properties-importance and applications.

Reference 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).
3. Engineering Chemistry by B. Siva Shankar Mc.Graw Hill Publishing Company Limited, New Delhi (2006).
4. Engineering Chemistry J.C. Kuriacase & J. Rajaram, Tata McGraw Hills Publishing Company Limited, New Delhi (2004).
5. Text Book of Engineering Chemistry by S.S. Dara & Mukkati S. Chand & Co Publishers, New Delhi(2006) Chemistry of Engineering Materials by CV Agarwal,C.P Murthy, A.Naidu, BS Publications.

OUTCOMES:

After completion of the course, student will be able to:

1. Practice professional chemical - polymer engineering knowledge for sustainable development.
2. Apply core concepts in Materials Science to solve engineering problems.

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Course Code: 50B18 **Credits: 3**

B.Tech

NANO CHEMISTRY

OBJECTIVES:

The objective is to make the learners know about the scope of nanoscale materials and their versatile properties. To give knowledge of various instrumental techniques to the analysis the nonmaterials. To make aware of the learners of different applications of nano materials.

MODULE-I: NANO CHEMISTRY-I [8Periods]

Introduction -synthesis of nanostructure materials, Bottom-up approach and Top-down approach With examples-sol-gel method,-solvothermal and hydrothermal routes, Chemical Vapor Deposition and precipitation methods.

MODULE-II: NANO CHEMISTRY-II [9Periods]

Properties of nano materials - Electronic properties, Energy bands and gaps in semiconductors, Fermi surfaces - Optical properties- Fluorescence / luminescence, photoluminescence / fluorescence, electroluminescence, quantum dot. Magnetic properties - mechanical properties - thermal properties.

MODULE-III: INSTRUMENTAL ANALYSIS [9Periods]

Characterization techniques: Principles involved in Scanning Electron Microscopy(SEM), Electron Dispersion Spectroscopy(EDS), Transmission Electron Microscopy (TEM), Dynamic Light Scattering (DLS) and Atomic Force Microscopy(AFM) -Illustrative examples.

MODULE-IV: CARBON NANO TUBES AND APPLICATION [10Periods]

Carbon Nano structures ,types and preparation of Carbon Nano tubes.Nano structured crystals. Graphene, Carbon nano-fibers- Carbon clusters and Fullerenes- optical and telecommunication applications. Organic Nano Solar cells and its applications.

MODULE-V: ENVIRONMENTAL NANOTECHNOLOGY [9 Periods]

Implications of Nanotechnology & Research needs- Nano structured Catalysts TiO2 Nano particles for Water purification- Nano membranes in Drinking water treatment and desalination, Nano membranes in Sea desalination- Nano particles for treatment of Chlorinated Organic Contaminants.

Reference Books:

1. Nano Technology and Nano Electronics – Materials, devices and measurement Techniques by WR Fahrner – Springer
2. Nano Technology – science, innovation and opportunity by Lynn E Foster;Prentice Hall - Pearson education.
3. Hand book of Nano structured materials; Vol I to V Bio Ethics Readings and cases by Branch.
4. Nano: The Essentials – Understanding Nano Scinece and Nanotechnology – by T.Pradeep; Tata Mc.Graw Hill.
5. Nanotechnology: Principles and Practices – Sulabha K. Kulkarni – Capital Publishing Company

6. Specimen preparation for Transmission Electron microscopy by John & Bravmno et al, published by MRS.

OUTCOMES:

After completion of the course, student will be able to:

1. The students become aware about the synthesis of nanostructure materials.
2. The learners get knowledge about the properties of nano materials and instrumental analysis. The students can come to know about the Carbon nano tubes, Carbon nano-fibers, nano structured Catalysts and Organic nano solar cells.

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Course Code: 50B19 **Credits: 3**

B.Tech

PHOTOCHEMISTRY AND SPECTROSCOPY

OBJECTIVES:

The objective is to make the students know about the impact of light on matter and the implications of it also to bring awareness to explore the consequences of light matter interaction. To give knowledge to the learners regarding the structural identification /determination utilizing the different regions of electromagnetic spect

Module -I: **Photochemistry I** [9 **Periods]**

Introduction to photochemistry, atomic orbitals,molecular orbitals,thermal and photochemical reactions. Fundamental principles of photochemistry-Interaction of light with chemical substances.absortion spectra, electronic transition. spin multiplicity, singlet and triplet of excited state.

Module –II: **Photochemistry II** [8 **Periods]**

Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law. Quantum efficiency – determination.Jablonski Diagram-Fluorescence and Phosphorescence. Chemiluminescence and Thermoluminescence with examples. Photosensitization.

Module –III: Absorption Spectroscopy [10 Periods]

Introduction and importance; Principles and instrumentation; Interferences - Chemical & Spectral methods; Applications of Atomic Absorption Spectroscopy for qualitative and quantitative analysis. UV-Visible spectroscopy: principles, applications for qualitative and quantitative analysis.

Module –IV: IR Spectroscopy [9 Periods]

Introduction- basic principles, Instrumentation. Identification of some functional groups applications for qualitative and quantitative analysis.

Module –V: Nuclear magnetic resonance spectroscopy [9 Periods]

Introduction-basic principles, Instrumentation – chemical shift- Spin-Spin splitting- coupling constant, Spin decoupling, shift reagents. Structure determination, applications of proton NMR spectroscopy.

REFERENCES BOOKS:

1. **"Vogel's Text Book of Quantitative Chemical Analysis",** by J. Mendham, R.C. Denney, J.D. Barnes and M.J.K. Thomas, Pearson Education Pvt. Ltd., New Delhi, (**6thedition**).
2. **Organic Spectroscopy by R.C.Banwell**
3. **Organic Spectroscopy by William kemp.**
4. **R.O. Kan .Organic Photochemistry.New York :Mc Graw-Hill.**
5. **N.J Turro ,modern molecular photochemistry,**The Benjamin/comings publishing

6. **Applications of Absorption Spectroscopy of Organic Compounds"** by John R.Dyer, Prentice-Hall of India Pvt. Ltd., New Delhi (**1969**).
7. **Instrumental Methods of Analysis by** Hobart H.Willard and D.U.Merritt & J.R.J.A.Dean, C.E.S Pu8blishers and distributors.
8. **Instrumental methods of chemical analysis** – By Scoog and West .

Outcomes:

After completion of the course, student will be able to:

1. Aware about the light matter interaction. The learners get knowledge about the usage of UV-Visible, IR & NMR radiations for structural identification of matter.