

Important

Academic Rules

Scheme of

Studies & Syllabus



**B.Tech. Degree Programme
Electronics & Communication Engg.**
(Effective from 2009-2010)



**LINGAYA'S
UNIVERSITY**
choose to know

(u/s 3 of UGC Act 1956)

CONTENTS

Sr. No.	Description	Page No.
1	Abbreviations/Definitions	1
2	Code of Conduct and Ethics for Students	2
3	Important Academic Rules	3
4	Degree Objective	10
5	Category-wise List of Courses	11
6	Suggested Plan of Studies	13
7	Scheme of Studies	14
8	List of Dept. Electives	21
9	Important Notes	22
10	Detailed Syllabus :	
	– Gen., BSM, ESTA, Dept. Core & Elective	23
	– Additional/Bridge Courses	59
	– Professional Development Courses	61
	– Open Elective Courses	66

ABBREVIATIONS/DEFINITIONS

- "AC" means, Academic Council of the University.
- "BOM" means, the Board of Management of the University.
- "BOS" means, the Board of Studies of the Department.
- "CAU/AUC-option" CAU/AUC means change from Credit to Audit option / change from Audit to Credit option
- "Class/Course Committee" means, the Class/Course Committee of a class/course.
- "Course" means, a specific subject usually identified by its course-number and course-title, with a specified syllabus / course-description, a set of references, taught by some teacher(s) / course- instructor(s) to a specific class (group of students) during a specific academic-semester / term.
- "Course Instructor" means, the teacher or the Course Instructor of a Course.
- "Curriculum" means the set of Course-Structure and Course-Contents.
- "DAA" means, the Dean of Academic Affairs.
- "DAAB" means Departmental Academic Appeals Board.
- "DEC/PEC" means Dissertation Evaluation Committee / Project Evaluation committee.
- "Department" means a group in the University devoted to a specific discipline also called a School. Department and School are used interchangeably.
- "DSA" means, Dean Student Affairs.
- "ETE" means End Term Examination.
- "Faculty Advisor/Class Counsellor" means, the Faculty Advisor or the Panel of Faculty Advisors, in a Parent Department, for a group (admission-batch) of students. Also known as Class Counsellor.
- "Grade Card" means the detailed performance record in a term/ programme.
- "He" means both genders "he" and "she"; similarly "his" and/or "him" includes "her" as well, in all the cases.
- "HOD" means, the Head of the Department.
- "MET" means Make-up End Term.
- "MLC" means Mandatory Learning Course.
- "MTE" means Mid Term Examination.
- "Parent Department" or "Degree Awarding Department" means, the department that offers the degree programme that a student undergoes.
- "Project Guide" means, the faculty who guides the Major Project of the student.
- "Regulations" means, set of Academic Regulations.
- "University" or "LU" means, Lingaya's University, Faridabad
- "VC" means, the Vice Chancellor, Lingaya's University, Faridabad.

CODE OF CONDUCT AND ETHICS FOR STUDENTS

1. Wear decent dress respecting his/her modesty as well as that of others.
2. Expected to respect and show regard for teachers, staff and fellow students.
3. Inculcate civic sense and sensitivity for environment protection.
4. Not to resort to collection of funds for any use without written permission of VC.
5. To exhibit exemplary behaviour, discipline, diligences, and good conduct and are a role model to other students.
6. Not to indulge in offences of cognizable nature.
7. Not to practice casteism, communalism.
8. Not to indulge in any other conduct unbecoming of a professional student of the University.
9. Not to outrage the status, dignity and honour of any person.
10. Not to get involved in physical assault or threat, and use of physical force against any body.
11. Not to expose fellow students to ridicule and contempt that may affect their self esteem.
12. Not to form any kind of student's Union, etc.
13. Not to take active or passive part in any form of strikes/protests.
14. To observe all safety precautions while working.
15. Not to disfigure/damage the University property, building, furniture, machinery, library books, fixtures, fittings, etc. (Damage / loss caused shall have to be made good by the students).
16. Use of mobile/video camera phones is strictly prohibited inside the examination halls, class rooms, laboratories and other working places. The University has the right to confiscate the mobile phones in case of any violation.
17. Not to indulge in ragging/teasing, smoking, gambling, use of drugs or intoxicants, drinking alcohol, rude behavior, and use of abusive language.
18. Not to resort to violence, unruly travel in buses, bullying, threatening and coercing others for undesirable act, such as preventing from attending classes, writing exam. / tests, etc etc.
19. All the students of the University shall be under the disciplinary control of the VC.
20. Students are deemed to be under the care and guidance of parents. It is obligatory for the former to appraise their progress (given by the CC) to the parents.
21. Fine, if ever imposed, is only to improve discipline and shall be paid promptly.
22. While on campus, students have to take care of their belongings and no responsibility for any loss or damage can be held by the University.
23. Every student shall produce the I-Card on demand, and if lost, get a duplicate issued.
24. The students must attend all lectures, tutorials and practical classes in a course punctually (The attendance will be counted course-wise).
25. To abide by the rules and regulations of the University stipulated from time to time.

IMPORTANT ACADEMIC RULES

B.Tech. Degree Programme (Regular)

GENERAL

- The Regulations may evolve and get revised/refined or updated or amended or modified or changed through approvals from the Academic Council from time to time, and shall be binding on all parties concerned, including the Students, Faculty, Staff, Departments, University Authorities and officers. Further, any legal disputes shall be limited to the legal jurisdiction determined by the location of the University and not that of any other parties.
- If, at any time after admission, it is found that a candidate had not in fact fulfilled all the requirements stipulated in the offer of admission, in any form whatsoever, including possible misinformation etc., the matter will be reported to the AC, recommending revoking the admission of the candidate.
- The University reserves the right to cancel the admission of any student at any stage of his study programme in the University on the grounds of unsatisfactory academic performance or indiscipline or any misconduct.
- Medium of Instruction shall be English.

PROGRAMME

- The normal duration of the programme leading to B.Tech degree will be four years comprising twelve trimesters (or terms).
- The B.Tech. Degree programme consists of two modes i.e. (a) Project Mode and (b) with Internship.
- The total course package for a Regular B.Tech Degree Programme with Project Mode will typically consist of the following components.
 - (i) General courses
 - (ii) Basic Science and Mathematics
 - (iii) Engineering Science and Technical Arts
 - (iv) Core Courses
 - (v) Elective Courses
An Elective Course can be any of the following:
 - a) Departmental Elective
 - b) Open Elective
 - (vi) Project/Internship (Supervised)
 - (vii) Major Project/Internship (Supervised)
 - (viii) Industrial Training
 - (ix) Mandatory Learning Courses
- The Regular B. Tech. Degree Programme with internship will typically consist of all the components of the Regular Project Mode as above, however with different weightage to industrial training and core courses.
- The student has to opt for the Internship Scheme in the ninth term which will not be revoked in any circumstances. In the absence of exercising the option, it will be presumed that option is for Project Mode.
- A student having registered for internship scheme of a programme cannot opt out of that scheme.
- The minimum credit requirement for the B.Tech.

Degree programme is 190. However, considering a case for award of honours the minimum credits will be 195.

- The project will be assigned in tenth term. It may be extended to Major Project. The Major Project shall comprise of Phase-I and Phase-II, spread over eleventh and twelfth terms respectively. Appropriate double-letter grade is awarded as per the evaluation scheme which will be considered for TGPA and CGPA calculations. It is recommended that an external expert from industry/academia may be a member of the evaluation team of four persons (two professors, external expert and respective project guide).
- MLC must be completed by a student at appropriate time or at his convenience. The 'S' grade is awarded for satisfactory completion of the course and 'N' grade is awarded for non-satisfactory completion of the course. In case 'N' grade is awarded, the student has to re-register for the same course if no alternative options are available. However, one can opt for other courses if provided with multiple options. The 'S' and 'N' grades do not carry grade-points and, hence, are not included in the TGPA and CGPA computations. Courses that come under this category are the following:
 - (a) Environment Science and Ecology
 - (b) Community Service Oriented Project
 - (c) Professional Development Courses
- Students admitted to the University will be required to take suitable additional Courses in Mathematics (5-0-0) and or Communication Skills (3-0-0), if found deficient.

ASSOCIATION

- Every under graduate student of the University shall be associated with Parent Department (degree awarding department) offering the degree programme that the student undergoes throughout his study period, right from the very first day of admission into the programme. However, in the first year class he may report to the Dept. of Applied Science and Humanities for administrative/academic purpose.
- A student will be placed in GROUP-A/B/C for all the three terms in an academic year.
- The schedule of academic activities for a term, including the dates of registration, mid-term examinations (MTE), end-term examination (ETE), inter-term vacation, etc. shall be referred to as the Academic Calendar of the term, and announced at least two weeks before the closing date of the previous term.

PRE-REGISTRATION

- In order to facilitate proper planning of the academic activities of a term, it is essential for the students to declare their intent to register for a course well in advance, before the actual start of

the academic session, through the process of Pre-Registration, which is mandatory for all those students of second or subsequent term who propose to deviate from recommended scheme of studies.

- Pre-registration is an expression of intention of a student to pursue particular course(s) in the next term. It is information for planning for next term. Every effort will be made to arrange for a course opted by the student. However, it is not obligatory on the part of the University to offer the course(s) and no course may be offered if the number of students opting for the course is less than 15 or 25 percent of the admission strength whichever is less.
- If a student fails to pre-register, it will be presumed that he will follow suggested normal scheme of studies provided that he is progressing at a normal pace. For remaining students the HOD of the parent department will plan for courses as per the convenience of the department.

REGISTRATION TO COURSES

- Every student after consulting his Faculty-Advisor is required to register for the approved courses with the HOD of parent department at the commencement of each term on the days fixed for such registration as notified in the academic calendar.
- A student shall register for courses from amongst the courses being offered in the term keeping in mind the minimum and maximum credits allowed for a degree and other requirements i.e. pre-requisite if any, TGPA and CGPA after consulting the Faculty Advisor. No registration will be valid without the consent of HOD of the parent department.
- A student will be permitted to register in the next term as per the suggested normal scheme only if he fulfills the following conditions:
 - (a) Satisfied all the Academic Requirements to continue with the programme of studies without termination.
 - (b) Cleared all University, library and hostel dues and fines (if any) of the previous term.
 - (c) Paid all required advance payments of the University and hostel for the current term.
 - (d) Not been debarred from registering on any specific ground by the University.
- The students will be permitted to register for course(s) being offered in a term other than his normal suggested scheme provided that the time table permits.
- The registration in the critical cases will be done as per the priority given below:
 - (a) Fulfillment of minimum credit requirement for continuation,
 - (b) The completion of programme in minimum period needed for degree, (Those who need to improve TGPA/CGPA)
 - (c) The fulfillment of pre-requisite requirement of courses.
- Students who do not register on the day announced for the purpose may be permitted LATE REGISTRATION up to the notified day in academic calendar on payment of late fee.

- REGISTRATION IN ABSENTIA will be allowed only in exceptional cases with the approval of the DAA after the recommendation of HOD through the guardian of the student.
- Credits will be awarded in registered courses only.

CREDIT LIMITS

- A student of the B.Tech. degree programme must register for a minimum of 10 credits, and up to a maximum of 21 credits in a term. However, the minimum / maximum credit limit can be relaxed by the DAA on the recommendation of the HOD, only under exceptional circumstances. The maximum credits that a student can register in a Summer Term are 8.
- Professional Development courses are one credit courses each, with multiple options, to be completed at student's convenience in each term. Some of them may be mandatory and others two-letter grade category. However, registration has to be done for all courses.

CHANGE IN REGISTRATION

- A student has the option to ADD courses for registration till the date specified for late registration in the Academic Calendar.
- On recommendation of the Teaching Department as well as the Parent Department, a student has the option to DROP courses from registration until two weeks after the commencement of the classes in the term, as indicated in the Academic Calendar.
- A student can register for auditing a course, or a course can be converted from credit to audit or from audit to credit, with the consent of the Faculty Advisor and Course Instructor within two weeks after the commencement of the classes in the term as indicated in the Academic Calendar. However, CORE Courses shall not be available for audit.

ATTENDANCE REQUIREMENTS

- LU academic programmes are based primarily on the formal teaching-learning process. Attendance in classes, participating in classroom discussions and participating in the continuous evaluation process are the most essential requirements of any academic programme.
- Attendance will be counted for each course, i.e., scheduled teaching days as per the academic calendar.
- The attendance requirement for appearing in end term examination shall be a minimum of 75% of the classes scheduled in each course.

LEAVE OF ABSENCE

- The leave of absence must be authorized as per regulations.
- A student short of attendance in a course (less than needed after leave of absence and condonation by VC) will be awarded 'FF' grade in the course.
- All students must attend all lecture, tutorial and practical classes in a course. The attendance will be counted course wise.
- To account for approved leave of absence e.g. representing the University in sports, games or athletics; professional society activities, placement

activities, NCC/NSS activities, etc. and/or any other such contingencies like medical emergencies, etc., the attendance requirement shall be a minimum of 75% of the classes scheduled in each course to appear in the examination.

- A student with less attendance in a course during a term, in lectures, tutorials and practicals taken together as applicable, shall be awarded 'FF' grade in that course, irrespective of his academic performance, and irrespective of the nature of absence.
- If the period of leave is more than three days and less than two weeks, prior application for leave shall have to be submitted to the HOD concerned, with the recommendation of the Faculty-Advisor, stating fully the reasons for the leave requested, along with supporting documents.
- If the period of leave is two weeks or more, prior application for leave shall have to be made to the DAA with the recommendations of the Faculty-Advisor and HOD concerned stating fully the reasons for the leave requested, along with the supporting documents. The DAA may, on receipt of such application, grant leave or decide whether the student be asked to withdraw from the course for that particular term because of long absence.
- If a student fails to apply and get sanction for absence as in the above two cases, his parent/guardian may apply to the VC with reasons duly recommended by the Faculty Advisor, HOD and DAA and explain in person to the VC the reasons for not applying in time. The VC will consider on merit and decide to grant the leave or withdrawal from the course for that particular term subject to any condition that he may like to impose. The decision of the VC shall be final and binding.

ABSENCE DURING EXAMINATIONS

- A student who has been absent during MTE due to illness and/or any exigencies may give a request for make-up examination within one week after the MTE to the HOD with necessary supporting documents in person. The HOD may consider such requests depending on the merits of the case, and after consultation with the Course Instructor, may permit the Make-up examination for the student concerned. However, no makeup examination will be permitted if the attendance in the course is less than 60% till the date of examination.
- In case of absence from ETE of a course(s) on medical ground and/or other special circumstances, the student can apply for award of 'I' grade in the course(s) with necessary supporting documents and certifications by an authorized person to the HOD within one week after the ETE. The HOD may consider the request, depending on the merit of the case, and after consultation with the Course(s) Instructor(s)/ Faculty Advisor permit the MET Examination for the student concerned. The student may subsequently complete all course requirements within the date stipulated by BOS (which may possibly be extended till first week of term under special circumstances) and 'I' grade will then

converted to an appropriate double-letter grade, as per Clause No: G5.9. All the details of such a decision with date of finalizing the grade shall be communicated to DAA. If such an application for the 'I' grade is not made by the student then a double-letter grade will be awarded based on his term performance.

COURSE CREDIT ASSIGNMENT

- Every course comprises of specific Lecture-Tutorial-Practical (L-T-P) schedule. The credits for various courses are shown in the Scheme of Studies & Syllabus.
- The Academic Performance Evaluation of a student shall be according to a Letter Grading System, based on the Class Performance Distribution.
- The double-letter grade (AA, AB, BB, BC, CC, CD, DD, FF) indicates the level of academic achievement, assessed on a decimal (0-10) scale.

Letter-Grades and Grade-Points:

LETTER- GRADE	GRADE- POINTS	REMARKS
AA	10	
AB	9	
BB	8	
BC	7	
CC	6	
CD	5	
DD	4	
FF	0	Fail
I	-	Incomplete
U	-	Audited
W	-	Withdrawal
S	-	Satisfactory
N	-	Unsatisfactory

DESCRIPTION OF GRADES

- An 'AA' grade stands for outstanding performance, relative to the class which may include performance with previous batches. The Course Instructor is supposed to take utmost care in awarding of this highest double-letter grade.
- The 'DD' grade stands for marginal performance and is the minimum passing double-letter grade.
- The 'FF' grade denotes very poor performance, i.e. failure in a course, and the Course Instructor is supposed to take utmost care while awarding this lowest double-letter grade.
- A student, who obtains 'FF' grade in a core course, has to repeat (re-register) that core course, in subsequent terms/sessions whenever the course is offered, until a passing grade is obtained. However, for an elective course in which 'FF' grade has been obtained, the student may either repeat the same course, or register for any other elective course.
- An 'I' grade denotes incomplete performance in any course due to absence at the ETE (see also Clause No: G7.4). When the 'I' grade is converted to a regular double letter grade, a penalty of ONE Grade-Point is imposed, by

awarding the double-letter grade that is immediately below the one that the student would have otherwise received except when the student has 95% attendance record in the subject concerned. For example, if on the basis of the performance including MET Examination, a student gets AB grade, he will be awarded BB grade if not under exception rule.

- 'U' grade is awarded in a course that the student opts to register for audit. It is not mandatory for the student to go through the entire regular process of evaluation in an audit course. However, the student has to go through some process of minimal level of evaluation and also the minimum attendance requirement, as stipulated by the Course Instructor and approved by the corresponding BOS, for getting the 'U' grade awarded in a course, failing which that course will not be listed in the Grade Card.
- A 'W' grade is awarded when the student withdraws from the course. Withdrawal from a course is permitted only under extremely exceptional circumstances (like medical emergencies, family tragedies and/or other unavoidable contingencies) and has to be recommended by the HOD and approved by the DAA. However, no withdrawal is permitted after the finalization of the grades in the term.
- 'S'/'N' grades are awarded for the Mandatory Learning Courses. The 'S' grade denotes satisfactory performance and completion of a course. The 'N' grade is awarded for non-completion of course requirements and the student will have to register for the course until he obtains the 'S' grade.

FEEDBACK TO STUDENTS

- A student requires feedback on the progress of his learning. For this purpose, the Instructor will conduct at least two quizzes for a theory course in a term-one before MTE and the other thereafter. The quizzes will form a component of class work, the other components being tutorials, home assignments or any other mode.
- For a laboratory course, the continuous assessment's feed back will be given through the laboratory records which are required to be submitted after performing the experiment in the next laboratory class.
- The continuous feedback on project/major project will be through project diary and interim report.
- For Internship stream, the continuous assessment and feedback is to be through seminars, professional diary and interim reports at the place of work.

EVALUATION

Theory Course:

- The double-letter grade awarded to a student in a course other than a practical course, i.e. it shall be denoted by L-T-0 course for which he has registered, shall be based on his performance in quizzes, tutorials, assignments etc., as applicable, in addition to one MTE and ETE. The weightage of these components of continuous evaluation may be as follows:

End-term Examination	:	50%
Mid-term Examinations	:	30%
Quizzes, Tutorials, Assignments, etc. (Several over the term)	:	20%
Total	:	100%

Laboratory Course:

- The double letter grade awarded to the student in a practical course i.e. 0-0-P course will be based on his performance in regular conduct of experiments, viva voce, laboratory report, quizzes etc., in addition to end term practical examination. The weightage of the components of continuous evaluation may be as follows:

Conduct of Experiments (as per syllabus)	:	40%
Lab Record	:	10%
Quizzes/Viva Voice	:	20%
End-term Examination	:	30%
Total	:	100%

Project (Including Seminar):

- The double letter grade awarded to the student in Project (Includes Seminar) i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a small size problem, project report, and presentation of work and defending it in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Seminar, Presentation & Viva-voce	:	25%
Total	:	100%

Major Project:

- The double letter grade awarded to the student in Major Project Phase-I and Phase-II i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a problem, project report, presentation and defending in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Presentation & Viva-voce	:	25%
Total	:	100%

Internship:

- The Internship-II will be treated as Major Project for evaluation purpose. The double letter grade awarded to the student in Internship-II i.e. 0-0-P course will be based on his performance in technical work pertaining to the solution of a real-life problem, project report, presentation and defending in a viva-voce. The weightage of the components of continuous evaluation may be as follows:

Technical Work	:	50%
Report	:	25%
Presentation & Viva-voce	:	25%
Total	:	100%

The continuous assessment and feedback is to be through seminars, professional diary and entering report at the place of work.

Seminar:

- The double letter grade awarded to the student in Seminar i.e. 0-0-P course will be based on his performance in oral presentation with emphasis on technical contents, presentation and ability to answer questions. The weightage of the components of continuous evaluation may be as follows:

Technical Contents	:	40%
Presentation	:	30%
Questions and answers	:	30%
Total	:	100%

Industrial/Field Training/Internship-I:

- The double letter grade awarded to the student in Industrial/Field Training/Internship-I i.e. 0-0-P course will be based on Practical Training/Internship-I in an industry, professional organization/ research laboratory. The components of continuous evaluation with weightage may be as follows:

Training report	:	40%
Presentation	:	30%
Questions and answers	:	30%
Total	:	100%

Professional Development:

- There are 14 credits divided into 14 courses of one credit each. The evaluation process of these courses will be as per the nature, contents and delivery of these courses. Some of the common components of evaluation could be quizzes, viva-voce, practical test, group discussion, etc. Participation by students is to be given more weightage in Co-curricular courses.

SCHEME OF EXAMINATION

- The duration of examinations for a theory course will be 3 hours for ETE and 1½ hours for MTE.
- The pattern of question paper/examination will be as under:
- Theory Courses:**
The University shall conduct the ETE for all theory courses being taught in the term.
 - There will be eight questions in all distributed over all the units in a course syllabus. The question paper will be in three parts with weightage 20 percent, 40 percent and 40 percent respectively.
 - Part-A will be short answer type with multiple parts covering all the units in the syllabus, which will be compulsory.
 - Part-B will have three questions from any three units, which will have long answers of derivation/descriptive type. Two questions are to be answered from this part.
 - Part-C will consist of four questions from the remaining four units and they will be of problem solving type in order to measure ability on comprehension/ analysis/ synthesis/ application. The relevant data will be made available. The student is required to solve two questions. However, for Part-C, the external examiner may select the questions from the

question bank supplied by the University.

- Students are allowed in the examination the use of single memory, non-programmable calculator. However, sharing of calculator is not permitted.
- Laboratory Courses:**
 - The ETE in laboratory course will be conducted jointly by an external examiner (other than the instructor) and an internal examiner (the coordinator / instructor) jointly.
 - The student will be given randomly an experiment to perform from within the list of experiments in the course.
 - No change in the experiment will be permitted after the draw, if the student had performed the same in the class.
- Mid-Term Examination:**
Question 1 is compulsory covering all topics taught till then. Question 2 and 3 will be essay type, out of which student will answer any one. Question 4 and 5 will be to measure to ability of analysis / comprehension / synthesis / application, out of which the student will answer any one.

TRANSPARENCY

- The answer books of all MTE and ETE will be shown to the students within three days of the last paper. It is the responsibility of the student to check this evaluation and affix his signature in confirmation.
- If the student finds some discrepancy, he should bring it to the notice of the Course Coordinator. The Course Coordinator will look into the complaint and remove the doubts of the student and proceed with the work of grading.
- The entire process of evaluation shall be transparent, and the Course Instructor shall explain to a student the marks he is awarded in various components of evaluation.

RESULT

- The final marks shall be displayed on the notice board for ONE day, (the date of which will be indicated in the Academic Calendar). A student can approach the Course Instructor(s) concerned for any clarification within TWO days of display. The process of evaluation shall be transparent and the students shall be made aware of all the factors included in the evaluation. In case of any correction, the Course Instructor shall have to incorporate the same before finalization of the grades.
- The Student's Grade Card shall contain the Letter-Grade for each registered course; along with the TGPA at the end of the term, and the CGPA at the completion of the programme.

APPEAL FOR REVIEW OF GRADE

- If a student is not satisfied with the award of the grade after the announcement of the grades, he may appeal on a Grievance Form duly filled in along with the fee receipt for this purpose to the HOD of the parent department within one week of the following term. The HOD will forward the form along with his recommendation based on the

records of the case to DAAB within the date specified in the Academic Calendar.

- The fee for such an appeal will be decided from time to time. If the appeal is upheld by DAAB, then the fee amount will be refunded to the student without interest.
- VC shall have power to quash the result of a candidate after it has been declared, if
 - (a) He is disqualified for malpractice in the examination;
 - (b) A mistake is found in his result;
 - (c) He is found ineligible to appear in the examination

AWARD OF DIVISIONS

- The overall performance of a student will be indicated by two indices:
 - (i) **TGPA** which is the Term Grade Point Average
 - (ii) **CGPA** which is the Cumulative Grade Point Average

TGPA for a term is computed as follows:

$$TGPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where,

C_i denotes credits assigned to i^{th} course with double-letter grade, and G_i denotes the grade point equivalent to the letter grade obtained by the student in i^{th} course with double-letter grade, including all 'FF' grades in that term.

CGPA is computed as follows:

$$CGPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where,

C_i denotes credits assigned to i^{th} course with double-letter grade, and G_i denotes the grade point equivalent to the letter grade obtained by the student in i^{th} course for all courses with double-letter grades, including all 'FF' grades in all terms at the end of the programme.

For CGPA calculation, the following grades are to be counted:

- (i) Grades in all core courses,
 - (ii) The best grades in the remaining eligible courses to fulfill the minimum credits requirement for a programme.
- The degree will be awarded only upon compliance of all the laid down requirements for programme as under:
 - (i) There shall be University requirement of earning a minimum credits for a degree, satisfactory completion of MLCs and other activities as per the course structure.
 - (ii) There shall be a minimum earned credit requirement on all Departmental Core courses, Elective courses and Major Project as specified by BOS.
 - (iii) There shall be a maximum duration for complying with the degree requirement.
 - (iv) The candidate will be placed in First Division with Honours/First Division with Distinction/First Division/Second Division which will be mentioned on the degree certificate as under:

DIVISION	CONDITIONS TO BE FULFILLED
First Division with Honours	CGPA ≥ 8.5 No 'FF', N or W grade in any course during the programme and total 195 credits
First Division with Distinction	CGPA ≥ 8.5
First Division	CGPA ≥ 6.75
Second Division	CGPA ≥ 5.0 but < 6.75

Note:

Although, there is no direct conversion from grades to marks, however, for comparison purposes percentage of marks may be assumed to be CGPA multiplied by nine.

B. TECH. DEGREE REQUIREMENTS

- The requirements of the award of B.Tech. Degree programme are as follows:
 - (a) **University Requirements:**
 - (i) Minimum Earned Credit Requirement for Degree is 190 for regular programme. However, the credits required for consideration for honours degree will be 195.
 - (ii) Satisfactory completion of all MLCs.
 - (b) **Programme Requirements:** Minimum Earned Credit Requirements on all Core Courses, Elective Courses and Major Project/Internship as specified by the BOS.
 - (c) The CGPA at the end of programme is atleast 5.0.
 - (d) The Maximum duration for a student for complying with the Degree Requirement is SEVEN years from date of first registration for first Term.

GRADE IMPROVEMENT

- A student may be allowed to improve the TGPA in an appropriate term, if his TGPA falls below 5.0. Similarly, any student may be allowed to improve performance in any course provided the course is being floated and available.

TERMINATION FROM THE PROGRAMME

- A student shall be required to leave the University without the award of the Degree, under one or more of the following circumstances:
 - (1) If a student fails to earn the minimum credits specified below:

CHECK POINT	CREDIT THRESHOLD**
End of FIRST year	20*
End of SECOND year	50*
End of THIRD year	85
End of FOURTH year	125

* A student may be given one more chance to cover the shortfall in the threshold during the following summer term as follows:

- (i) if a student earns 12 credits or more but less than 20 at the end of first year.
- (ii) if a student earns 42 or more credits but less than 50 at the end of second year.

In case he fails to clear the threshold even after the summer term he has to leave the course.

- ** If at any stage, a student fails to cross the threshold with a TGPA of minimum 5.0 in any term, he will be treated as critical case and will be advised to improve the grades.

— The period of temporary withdrawal is not to be counted for the above credit threshold.

- (2) If a student is absent for more than 4 (four) weeks at a stretch in a term without sanctioned leave.
- (3) Based on disciplinary action by the AC, on the recommendation of the appropriate Committee.

Note:

Under any circumstances of termination, the conditions specified in permanent withdrawal shall also apply.

WITHDRAWAL FROM PROGRAMME

Temporarily:

- A student who has been admitted to a degree programme of the University may be permitted to withdraw temporarily, for a period of one term or more, on the grounds of prolonged illness or grave calamity in the family, etc., provided:
 - (i) He applies to the University stating fully the reasons for withdrawal together with supporting documents and endorsement from his parent/guardian

- (ii) There are no outstanding dues or demands, from the Departments/ University / Hostels / Library and any other centers;
- (iii) Scholarship holders are bound by the appropriate Rules applicable to them.
- (iv) The decision of the VC of the University regarding withdrawal of a student is final and binding.

- Normally, a student will be permitted only one such temporary withdrawal during his tenure as a student and this withdrawal will not be counted for computing the duration of study.

Permanently:

- Any student who withdraws permanently admission before the closing date of admission for the academic session is eligible for the refund of fee as per the University rules. Once the admission for the year is closed, the following conditions govern withdrawal of admission:
 - A student who wants to leave the University for good, will be permitted to do so (and take Transfer Certificate from the University, if needed), only after clearing all the dues for the remaining duration of the course.
 - A student who has received any scholarship, stipend or other form of assistance from the University shall repay all such amounts, in addition, to clearing all the dues for the remaining duration of the course.
 - The decision of the VC regarding all aspects of withdrawal of a student shall be final and binding.

* * * * *

Department of Electronics & Communication Engineering

DEGREE OBJECTIVE

The B. Tech. degree programme aims at providing a strong foundation in theoretical, practical and design aspects of Electronics and Communication Engineering (EC). The curriculum covers all areas of electronics and communication engineering under the broad categories of electronic circuits, electronic devices, signal processing and communication. The syllabus comprises of theory and laboratory courses under these categories. The theory course can be either a core or an elective course. Each theory course has a laboratory component, which provides a balanced mix of quality teaching of theoretical concepts and experimental verification of the learnt concepts.

CATEGORY-WISE LIST OF COURSES

General (Humanities, Soc Sc. Man) (GEN.)				
1	BA-225	Economics	5-0-0	3
2	BA-226	Principles of Management	5-1-0	4
3	CE-101	Environmental Science & Ecology	5-0-0	3
4	EN-101	Communication Skills	5-0-0	3
5	EN-151	Language Lab	0-0-2	1
6	EN-291	Essentials of Communication Objective (Bridge Course)	5-0-0	3
7	MA-191	Mathematics (Makeup Course)	5-0-0	3
8	MA-291	Mathematics (Bridge Course)	5-0-0	3

Basic Science & Mathematics including Computer (BSM)				
1	CH-101	Applied Chemistry	5-0-0	3
2	CH-151	Applied Chemistry Lab	0-0-2	1
3	CS-101	Computer Programming	5-1-0	4
4	CS-151	Computer Programming Lab	0-0-2	1
5	MA-101	Applied Mathematics-I	5-1-0	4
6	MA-102	Applied Mathematics-II	5-1-0	4
7	MA-201	Applied Mathematics – III	5-1-0	4
8	MA-202	Applied Numerical Methods	5-1-0	4
9	MA-252	Applied Numerical Methods Lab	0-0-2	1
10	PH-101	Physics	5-1-0	4
11	PH-102	Applied Physics	5-1-0	4
12	PH-151	Physics Lab	0-0-2	1
13	PH-152	Applied Physics Lab	0-0-2	1
14	PH-152	Applied Physics Lab	0-0-2	1
15	CS-201	Data Structures & Algorithm	5-0-0	3

Engineering Science & Technical Arts (ESTA)				
1	EC-204	Electronics Engineering	5-1-0	4
2	EC-254	Electronics Engineering Lab	0-0-2	1
3	EL-101	Electrical Engineering	5-1-0	4
4	EL-151	Electrical Engineering Lab	0-0-2	1
5	ME-101	Engineering Mechanics	5-1-0	4
6	ME-151	Engineering Mechanics Lab	0-0-2	1
7	ME-152	Workshop Practice	0-0-4	2
8	ME-153	Engineering Graphics	0-0-6**	3

Department Core (DC)				
1	EC-202	Electrical Engineering Materials and Semi-Conductor Devices	5-1-0	4
2	EC-203	Electromagnetic Theory	5-0-0	3
3	EC-252	Electrical Engineering Materials and Semi-Conductor Devices Lab	0-0-2	1
4	EC-204	Electronic Measurement and Instrumentation	5-0-0	3
5	EC-254	Electronic Measurement and Instrumentation Lab	0-0-2	1
6	EC-205	Analog Electronics	5-1-0	4
7	EC-206	Network Theory	5-1-0	4
8	EE-306	Communication Systems	5-0-0	3

9	EC-207	Digital Electronics	5-1-0	4
10	EC-256	Network Theory Lab	0-0-2	1
11	EE-356	Communication Systems Lab	0-0-2	1
12	EC-257	Digital Electronics Lab	0-0-2	1
13	EL-301	Control Systems	5-1-0	4
14	EC-301	Analog Electronic Circuits	5-0-0	3
15	EC-302	Microprocessors and Interfacing	5-0-0	3
16	EC-351	Analog Electronic Circuits Lab	0-0-2	1
17	EL-351	Control System Lab	0-0-2	1
18	EC-352	Microprocessors and Interfacing Lab	0-0-2	1
19	EC-303	Antenna and Wave Propagation	5-0-0	3
20	EC-304	Digital System Design	5-1-0	4
21	EC-305	Embedded System Design	5-1-0	4
22	EC-306	Communication Engineering	5-1-0	4
23	EC-354	Digital System Design Lab	0-0-2	1
24	EC-355	Embedded System Design Lab	0-0-2	1
25	EC-307	Wireless Communication	5-1-0	4
26	EC-308	MOS IC's and Technology	5-1-0	4
27	EC-309	Digital Signal Processing	5-0-0	3
28	EC-310	TV Engineering	5-1-0	4
29	EC-358	MOS IC's and Technology Lab	0-0-2	1
30	EC-359	Digital Signal Processing Lab	0-0-2	1
31	EC-401	Mobile Communication	5-0-0	3
32	EC-402	Microwave and Radar Engineering	5-0-0	3
33	EC-451	Mobile Communication Lab	0-0-2	1
34	EC-452	Microwave & Radar Engineering Lab	0-0-2	1
35	EC-453	Satellite & Optical Communication Lab	0-0-2	1
36	EC-404	Data Communication	5-1-0	4
37	EC-454	Data Communication Lab	0-0-2	1

Department Elective (DE)				
1	EC-403	Optical Communication	5-0-0	3
2	EC-421	Advanced Digital Signal Processing	5-0-0	3
3	IT-202	Computer Networks	5-0-0	3
4	EC-431	Industrial Electronics	5-0-0	3
5	EC-432	Advance Audio & Video Tech.	5-0-0	3
6	EC-433	Satellite Communication	5-0-0	3
7	EC-441	Nano Technology	5-0-0	3
8	EC-442	RF Devices & Circuits	5-0-0	3
9	EL-303	Advanced Control System	5-0-0	3
10	EC-461	Biomedical Instrumentation	5-0-0	3
11	EC-462	Neural Networks & Fuzzy Logic	5-0-0	3
12	CS-402	Artificial Intelligence	5-0-0	3

B.Tech. Electronics & Communication Engineering (Regular)

Open Elective (OE)				
1	AE-411	Transport Management	5-0-0	3
2	BA-271	Human Resource Management	5-0-0	3
3	BA-272	Entrepreneurship Development	5-0-0	3
4	CE-471	Advanced Traffic Engineering	5-0-0	3
5	CE-472	Elements of Town Planning and Architecture	5-0-0	3
6	CH-471	Advanced Applied Chemistry	5-0-0	3
7	CS-303	Computer Graphics	5-0-0	3
8	CS-422	Cryptography and Data Compression	5-0-0	3
9	EC-305	Embedded System Design	5-0-0	3
10	EC-401	Mobile Communication	5-0-0	3
11	EE-401	Programmable Logic Controllers & SCADA	5-0-0	3
12	EE-431	Industrial Electronics and Application	5-0-0	3
13	EL-421	Renewable Energy Source and Energy Conservation	5-0-0	3
14	EL-422	High Voltage Direct Current Transmission	5-0-0	3
15	EL-423	High Voltage Engineering	5-0-0	3
16	EN-471	Professional Communication	5-0-0	3
17	EN-472	Business Communication	5-0-0	3
18	IT-423	Introduction to E-commerce & ERP	5-0-0	3
19	IT-443	Information Storage & Management	5-0-0	3
20	MA-471	Discrete Mathematics	5-0-0	3
21	MA-472	Advanced Higher Engineering Mathematics	5-0-0	3
22	MA-473	Advanced Numerical Techniques	5-0-0	3
23	MA-474	Operation Research	5-0-0	3
24	ME-442	Ergonomics	5-0-0	3
25	ME-443	Finite Element Analysis	5-0-0	3
26	ME-461	Renewable Sources of Energy	5-0-0	3
27	PH-471	Non Destructive Testing Techniques	5-0-0	3
28	PH-472	Nano Technology	5-0-0	3
29	PH-473	Laser Technology	5-0-0	3

Project/Internship, Seminar Training, CSOP				
1	EC-481	Project (Phase-I)	0-0-10	5
2	EC-482	Project (Phase II)	0-0-6	3
3	EC-483	Internship - I	0-0-2	1
4	EC-484	Internship - II (in industry)	0-0-24	12
5	EC-485	Internship Documentation	0-0-6	3
6	EC-491	Community Service Oriented Project (CSOP)	0-0-2	1
7	EC-492	Project (includes Seminar)	0-0-4	2
8	EC-493	Industrial Training/Field Training	0-0-2	1
9	EC-494	Seminar – I	0-0-2	1
10	EC-495	Seminar – II	0-0-2	1

Professional Development (PD) – Gen.				
1	PD-151	Basics of Computer Fundamentals	0-0-2	1
2	PD-191	Co-curricular Activities		1
3	PD-192	Personality Skills	0-0-2	1
4	PD-193	Entrepreneurial & Professional Skills	0-0-2	1
5	PD-251	MATLAB	0-0-2	1
6	PD-291	Co-curricular Activities		1
7	PD-292	Effective Communication	0-0-2	1
8	PD-293	Intra & Inter-personal Skills	0-0-2	1
9	PD-354	Embedded System Design (8051 Microcontroller)	0-0-2	1
10	PD-391	Co-curricular Activities		1
11	PD-392	Problem Solving Skills	0-0-2	1
12	PD-393	Advanced Professional Development	0-0-2	1
13	PD-454	Microprocessor and DSP Based Systems	0-0-2	1
14	PD-491	Co-curricular Activities		1

Mandatory Learning Course (MLC)				
1	CE-101	Environmental Science & Ecology	5-0-0	3
2	EC-491	Community Service Oriented Project (CSOP)	0-0-2	1
3	PD-292	Effective Communication	0-0-2	1
4	PD-393	Advanced Professional Development	0-0-2	1

SUGGESTED PLAN OF STUDIES

Course→	1	2	3	4	5	6	7	8	9	10
Term-I	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-II	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-III	PH-101/ EL-101/ PH-102	MA-101/ ME-101/ MA-102	CH-101/ CS-101/ CE-101	EN-101/ ME-102/ ME-103	ME-151	PH-151/ PH-152/ EL-151	CH-151/ CS-151	EN-151/ ME-152/ ME-153	PD-192/ PD-193/ PD-151	PD-191
Term-IV	MA-201	EC-201	EC-202	EC-203	EC-251	EC-252	-	-	PD-292/ PD-293/ PD-251	PD-291
Term-V	EC-204	CS-201	MA-202	BA-225	EC-254	MA-252	-	-	PD-292/ PD-293/ PD-251	PD-291
Term-VI	EC-205	EC-206	EE-306	EC-207	EC-256	EE-356	EC-257	-	PD-292/ PD-293/ PD-251	PD-291
Term-VII	BA-226	EL-301	EC-301	EC-302	EC-351	EL-351	EC-352	-	PD-392/ PD-393/ PD-354	PD-391
Term-VIII	EC-303	EC-304	EC-305	EC-306	EC-354	EC-355	-	-	PD-392/ PD-393/ PD-354	PD-391
Term-IX	EC-307	EC-308	EC-309	EC-310	EC-358	EC-359	-	-	PD-392/ PD-393/ PD-354	PD-391
Term-X (Project)	EC-401	EC-402	Dept. Elect.-I	EC-491	EC-492	EC-451	EC-452	EC-493	PD-454	PD-491
Term-X (Internship)	EC-401	EC-402	Dept. Elect.-I	EC-491	EC-492	EC-451	EC-452	EC-483	PD-454	PD-491
Term-XI (Project)	Dept. Elect.-II	Open Elect.	EC-453	EC-481	EC-494	-	-	-	-	PD-491
Term-XI (Internship)	EC-494	EC-484	-	-	-	-	-	-	-	PD-491
Term-XII (Project)	EC-404	Dept. Elect.-III	Dept. Elect.-IV	EC-454	EC-482	EC-495	-	-	-	PD-491
Term-XII (Internship)	EC-404	Dept. Elect.-III	Dept. Elect.-IV	EC-454	EC-485	EC-495	-	-	-	PD-491

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year

TERM – I

THEORY										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
					L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)		Total
1	A	MA-101	Applied Mathematics-I	5-1-0	20	30	50	100	4	
	B	MA-101	Applied Mathematics-I	5-1-0	20	30	50	100	4	
	C	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
2	A	PH-101	Physics	5-1-0	20	30	50	100	4	
	B	PH-101	Physics	5-1-0	20	30	50	100	4	
	C	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
3	A	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
	B	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
	C	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
4	A	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation With Weightage (%)					
					L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce		ETE (2 Hrs)
1	C	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
	B	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
	C	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
3	A	CH-151	Applied Chemistry Lab	0-0-2	40	10	20	30	100	1
	B	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
4	A	EN-151	Language Lab	0-0-2	40	10	20	30	100	1
	B	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
	C	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
5	A	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
	B	PD-193	Enterpreneural & Professional Skills	0-0-2	40	10	20	30	100	1
	C	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	20-2-8 (30)	18
B	15-3-10 (28)	17
C	15-2-12 (29)	17

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

MTE – Mid-Term Exam

CW - Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year										
TERM – II										
THEORY										
Sl. No.	Group	Course No.	SUBJECT	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
				L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)	Total		
1	A	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
	B	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
	C	MA-101	Mathematics-I	5-1-0	20	30	50	100	4	
2	A	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
	B	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
	C	PH-101	Physics	5-1-0	20	30	50	100	4	
3	A	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
	B	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
	C	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
4	C	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation With Weightage (%)					
				L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce	ETE (2 Hrs)		Total
1	B	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
	B	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
	C	PH-151	Physics Lab	0-0-2	40	10	20	30	100	1
3	A	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
	C	CH-151	Applied Chemistry Lab	0-0-2	40	10	20	30	100	1
4	A	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
	B	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
	C	EN-151	Language Lab	0-0-2	40	10	20	30	100	1
5	A	PD-193	Enterpreneurial & Professional Skills	0-0-2	40	10	20	30	100	1
	B	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
	C	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	15-3-10 (28)	17
B	15-2-12 (29)	17
C	20-2-8 (30)	18

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

MTE-Mid-Term Exam

CW - Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Scheme of Studies
B. Tech. Degree Programme (Regular)
(Common to all Branches)

1st Year**TERM – III**

THEORY										
Sl. No.	Group	Course No.	SUBJECT	Periods	Evaluation Scheme				Cr	
					Components of Evaluation with Weightage (%)					
				L-T-P	Class Work	MTE (1½ Hrs)	ETE (3 Hrs)	Total		
1	A	ME-101	Engineering Mechanics	5-1-0	20	30	50	100	4	
	B	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
	C	MA-102	Applied Mathematics-II	5-1-0	20	30	50	100	4	
2	A	EL-101	Electrical Engineering	5-1-0	20	30	50	100	4	
	B	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
	C	PH-102	Applied Physics	5-1-0	20	30	50	100	4	
3	A	CE-101	Environmental Science & Ecology***	5-0-0	20	30	50	100	3	
	B	CH-101	Applied Chemistry	5-0-0	20	30	50	100	3	
	C	CS-101	Computer Programming	5-1-0	20	30	50	100	4	
4	B	EN-101	Communication Skills	5-0-0	20	30	50	100	3	
PRACTICAL/DRAWING/DESIGN										
Sl. No.	Group	Course No.	Course Name	Periods	Evaluation Scheme				Cr	
					Components of Evaluation With Weightage (%)					
				L-T-P	EXPT.	Lab Record	MTE Quizzes/ Viva-voce	ETE (2 Hrs)		Total
1	A	ME-151	Engineering Mechanics Lab	0-0-2	40	10	20	30	100	1
2	A	EL-151	Electrical Engineering Lab	0-0-2	40	10	20	30	100	1
	B	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
	C	PH-152	Applied Physics Lab	0-0-2	40	10	20	30	100	1
3	B	CH-101	Applied Chemistry	0-0-2	40	10	20	30	100	1
	C	CS-151	Computer Programming Lab	0-0-2	40	10	20	30	100	1
4	A	ME-153	Engineering Graphics	0-0-6**	40	10	20	30	100	3
	B	EN-101	Language Lab	0-0-2	40	10	20	30	100	1
	C	ME-152	Workshop Practice	0-0-4	40	10	20	30	100	2
5	A	PD-151	Basics of Computer Fundamentals	0-0-2	40	10	20	30	100	1
	B	PD-192	Personality Skills	0-0-2	40	10	20	30	100	1
	C	PD-193	Entrepreneurial & Professional Skills	0-0-2	40	10	20	30	100	1
6	A/B/C	PD-191	Co-curricular Activities							1*

Note: A student will be placed in GROUP A/B/C for all the three terms in an academic year.

GROUP	TOTAL CONTACT HOURS	TOTAL CREDITS
A	15-2-12 (29)	17+1*
B	20-2-8 (30)	18+1*
C	15-3-10 (28)	17+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

MTE – Mid-Term Exam

CW – Class Work

ETE – End-Term Exam

* One credit to be earned in Term-III through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of first year.

** One hour for explanation/demonstration.

*** CE-101 is a Mandatory Learning Course.

Department of Electronics & Communication Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

2nd Year

TERM – IV				
SN	Course No.	Course Name	L-T-P	Cr.
1	MA-201	Applied Mathematics-III	5-1-0	4
2	EC-201	Electronics Engineering	5-1-0	4
3	EC-202	Electrical Engineering Materials and Semi-Conductor Devices	5-1-0	4
4	EC-203	Electromagnetic Theory	5-0-0	3
5	EC-251	Electronics Engineering Lab	0-0-2	1
6	EC-252	Electrical Engineering Materials and Semi-Conductor Devices Lab	0-0-2	1
7	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
8	PD-291	Co-curricular Activities		1*
20-3-6 (29)				18

TERM – V				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-204	Electronic Measurement and Instrumentation	5-0-0	3
2	CS-201	Data Structures & Algorithm	5-0-0	3
3	MA-202	Applied Numerical Methods	5-1-0	4
4	BA-225	Economics	5-0-0	3
5	EC-254	Electronic Measurement and Instrumentation Lab	0-0-2	1
6	MA-252	Applied Numerical Methods Lab	0-0-2	1
7	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
8	PD-291	Co-curricular Activities		1*
20-1-6 (27)				16

TERM – VI				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-205	Analog Electronics	5-1-0	4
2	EC-206	Network Theory	5-1-0	4
3	EE-306	Communication Systems	5-0-0	3
4	EC-207	Digital Electronics	5-1-0	4
5	EC-256	Network Theory Lab	0-0-2	1
6	EE-356	Communication Systems Lab	0-0-2	1
7	EC-257	Digital Electronics Lab	0-0-2	1
8	PD-292/ PD-293/ PD-251	Effective Communication**/ Intra & Inter-personal Skills/ MATLAB	0-0-2	1
9	PD-291	Co-curricular Activities		1*
20-3-8 (31)				19+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

* One credit to be earned in Term-VI through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of second year.

** PD-292 is a Mandatory Learning Course.

Department of Electronics & Communication Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

3rd Year

TERM – VII				
SN	Course No.	Course Name	L-T-P	Cr.
1	BA-226	Principles of Management	5-0-0	3
2	EL-301	Control Systems	5-1-0	4
3	EC-301	Analog Electronic Circuits	5-0-0	3
4	EC-302	Microprocessors and Interfacing	5-0-0	3
5	EC-351	Analog Electronic Circuits Lab	0-0-2	1
5	EL-351	Control System Lab	0-0-2	1
6	EC-352	Microprocessors and Interfacing Lab	0-0-2	1
7	PD-392 PD-393 PD-354	Problem Solving Skills Advanced Professional Development** Embedded System Design (8051 Microcontroller)	0-0-2	1
8	PD-391	Co-curricular Activities		1*
20-1-8 (30)				17

TERM – VIII				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-303	Antenna and Wave Propagation	5-0-0	3
2	EC-304	Digital System Design	5-1-0	4
3	EC-305	Embedded System Design	5-1-0	4
4	EC-306	Communication Engineering	5-1-0	4
5	EC-354	Digital System Design Lab	0-0-2	1
6	EC-355	Embedded System Design Lab	0-0-2	1
7	PD-392 PD-393 PD-354	Problem Solving Skills Advanced Professional Development** Embedded System Design (8051 Microcontroller)	0-0-2	1
8	PD-391	Co-curricular Activities		1*
20-3-6 (29)				18

TERM – IX				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-307	Wireless Communication	5-1-0	4
2	EC-308	MOS IC's and Technology	5-1-0	4
3	EC-309	Digital Signal Processing	5-0-0	3
4	EC-310	TV Engineering	5-1-0	4
5	EC-358	MOS IC's and Technology Lab	0-0-2	1
6	EC-359	Digital Signal Processing Lab	0-0-2	1
7	PD-392 PD-393 PD-354	Problem Solving Skills Advanced Professional Development** Embedded System Design (8051 Microcontroller)	0-0-2	1
8	PD-391	Co-curricular Activities		1*
20-3-6 (29)				18+1*

SUMMER TERM – INDUSTRY TRAINING/FIELD TRAINING/INTERNSHIP

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

* One credit to be earned in Term-IX through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 3rd year.

** PD-393 is a Mandatory Learning Course.

Department of Electronics & Communication Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

(PROJECT MODE)

4th Year

TERM – X				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-401	Mobile Communication	5-0-0	3
2	EC-402	Microwave and Radar Engineering	5-0-0	3
3		Dept. Elective-I	5-0-0	3
4	EC-491	Community Service Oriented Project (CSOP) [#]	0-0-2	1
5	EC-492	Project (including Seminar)	0-0-4	2
6	EC-451	Mobile Communication Lab	0-0-2	1
7	EC-452	Microwave & Radar Engineering Lab	0-0-2	1
8	EC-493	Industrial Training/Field Training**	0-0-2	1
9	PD-454	Microprocessor and DSP Based Systems	0-0-2	1
10	PD-491	Co-curricular Activities		1*
15-0-14 (29)				16

TERM – XI				
SN	Course No.	Course Name	L-T-P	Cr.
1		Dept. Elective-II	5-0-0	3
2		Open Elective	5-0-0	3
3	EC-453	Satellite & Optical Communication Lab	0-0-2	1
4	EC-481	Major Project Phase-I***	0-0-10	5
5	EC-494	Seminar – I****	0-0-2	1
6	PD-491	Co-curricular Activities		1*
10-0-14 (24)				13

TERM – XII				
SN	Course No.	Course Name	L-T-P	Cr.
1	EC-404	Data Communication	5-1-0	4
2		Dept. Elective-III	5-0-0	3
3		Dept. Elective-IV	5-0-0	3
4	EC-454	Data Communication Lab	0-0-2	1
5	EC-482	Major Project Phase-II	0-0-6	3
6	EC-495	Seminar – II*****	0-0-2	1
7	PD-491	Co-curricular Activities		1*
15-1-10 (26)				15+1*

FINAL EVALUATION IN GRADES

(L-T-P-Cr) – Lectures-Tutorials-Practicals-Credits

CSOP is a mandatory learning course.

* One credit to be earned in Term-XII through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 4th year.

** To be evaluated based on the work done during Summer Term after Term-IX.

*** Marks of Major Project Phase-I to be added to marks of Major Project Phase-II for award of final grade.

**** To be based on Major Project Phase-I.

***** To be based on Major Project Phase-II.

Department of Electronics & Communication Engineering
Scheme of Studies
B. Tech. Degree Programme (Regular)

(INTERNSHIP MODE)

4th Year

TERM-X				
Sr. No.	Course No.	Course Name	L-T-P	Cr
1	EC-401	Mobile Communication	5-0-0	3
2	EC-402	Microwave & Radar Engineering	5-0-0	3
3		Dept. Elective-I	5-0-0	3
4	EC-491	Community Service Oriented Project (CSOP) [#]	0-0-2	1
5	EC-492	Project (includes Seminar)	0-0-4	2
6	EC-451	Mobile Communication Lab	0-0-2	1
7	EC-452	Microwave & Radar Engineering Lab	0-0-2	1
8	EC-483	Internship – I**	0-0-2	1
9	PD-454	Microprocessor and DSP Based Systems	0-0-2	1
10	PD-491	Co-curricular Activities		1*
15-0-14 (29)				16

TERM-XI				
Sr. No.	Course No.	Course Name	L-T-P	Cr
1	EC-494	Seminar – I***	0-0-2	1
2	EC-484	Internship – II (in industry)	0-0-24	12
3	PD-491	Co-curricular Activities		1*
0-0-26 (26)				13

TERM – XII				
Sr. No.	Course No.	Course Name	L-T-P	Cr
1	EC-404	Data Communication	5-1-0	4
2		Dept. Elective-III	5-0-0	3
3		Dept. Elective-IV	5-0-0	3
4	EC-454	Data Communication Lab	0-0-2	1
5	EC-485	Internship Documentation	0-0-6	3
6	EC-495	Seminar – II****	0-0-2	1
7	PD-491	Co-curricular Activities		1*
15-1-10 (26)				15+1

FINAL EVALUATION IN GRADES

(L-T-P-Cr) - Lectures-Tutorials-Practicals-Credits

CSOP is a mandatory learning course.

* One credit to be earned in Term-XII through Co-Curricular Activities outside contact hours. However, a student is to register for this course in all the three terms of 4th year.

** To be evaluated based on the work done during Summer Term after Term-IX.

*** To be based on Internship-II and to be given in the beginning of Term-XII.

**** To be based on Internship Documentation.

LIST OF DEPT. ELECTIVES

Dept. Elective - I				
1	EC-403	Optical Communication	5-0-0	3
2	EC-421	Advanced Digital Signal Processing	5-0-0	3
3	IT-202	Computer Networks	5-0-0	3

Dept. Elective - II				
1	EC-431	Industrial Electronics and Application	5-0-0	3
2	EC-432	Advance Audio & Video Tech.	5-0-0	3
3	EC-433	Satellite Communication	5-0-0	3

Dept. Elective - III				
1	EC-441	Nano Technology	5-0-0	3
2	EC-442	RF Devices & Circuits	5-0-0	3
3	EL-303	Advanced Control System	5-0-0	3

Dept. Elective - IV				
1	EC-461	Biomedical Instrumentation	5-0-0	3
2	EC-462	Neural Networks & Fuzzy Logic	5-0-0	3
3	CS-402	Artificial Intelligence	5-0-0	3

IMPORTANT NOTES

1. Laboratory Courses are being offered as distinct courses (0-0-2) without being mixed with lecture components.
2. Conduct of Lab Courses:
 - a. At least ten experiments/programs/exercises are to be performed in a term.
 - b. It is expected that more experiments/programs/exercises are designed and set as per the scope of the syllabus, which may be added to the above list.
 - c. One or more than one experiments/programs/exercises may be performed in one lab period in order to utilize the time properly.
 - d. The scheme of operation is to be approved by HOD.
3. Students admitted through Lateral Entry Scheme will be required to take a Bridge Course on Mathematics (5-0-0) as an Audit Course.
4. Assessment of Industrial/Field Training and Internship-I will be based upon certificate of Industry/Field training obtained by the student, report, seminar and viva-voce examination. A student who is awarded 'FF' Grade is required to repeat Industry/Field training.
5. The choice of the students for any elective shall not be a binding for the department to offer, if the department does not have expertise.
6. For open elective, all students will be permitted to opt for any one elective run by another department. However, the departments will offer only those elective for which they have expertise. Further, the students will not be allowed to opt for any course under this category, which has already been done. An open elective opted during the end of tenth term, allotted list of which will be displayed on notice board and taught in the eleventh term.
7. The choice of students for the Internship stream shall not be a binding for the department to offer.
8. Elective-II is not required to be done by the students pursuing the degree through Internship Mode.
9. Students are allowed in the examination the use of single memory, non-programmable calculator. However, sharing of calculator is not permitted.
10. The B. Tech. degree programmes in Electrical Engineering, Electronics & Communication Engineering and Electrical & Electronics Engineering constitute one group for the purpose of deciding core courses as these all are based on electrical sciences.
11. For the students admitted in 2009-10 the sequence of PD Courses is given in the table below:

Professional Development (PD) – Gen.				
1st Year	PD-251	MATLAB	0-0-2	1
	PD-191	Co-curricular Activities		1
	PD-292	Effective Communication	0-0-2	1
	PD-393	Advanced Professional Development	0-0-2	1
2nd Year	PD-151N*	Basics of Computer Fundamentals	0-0-2	1
	PD-291	Co-curricular Activities		1
	PD-192	Personality Skills	0-0-2	1
	PD-193	Entrepreneurial & Professional Skills	0-0-2	1
3rd Year	PD-354	Embedded System Design (8051 Microcontroller)	0-0-2	1
	PD-391	Co-curricular Activities		1
	PD-392	Problem Solving Skills	0-0-2	1
	PD-293	Intra & Inter-personal Skills	0-0-2	1
4th Year	PD-454	Microprocessor and DSP Based Systems	0-0-2	1
	PD-491	Co-curricular Activities		1

* The contents for PD-151N are the same as for PD-151.

DETAILED SYLLABUS

GEN., BSM, ESTA, DEPT. CORE & ELECTIVE

BA-225	ECONOMICS	L T P	Cr
		5 0 0	3

OBJECTIVE

The purpose of this course is to

- Acquaint the students in the basic economic concepts and their operational significance and
- Stimulate him to think systematically and objectively about contemporary economic problems.

1. **INTRODUCTION:** Definition of economics; difference between micro and macro economics; central problems of economy including PP curve; factors of production
2. **UTILITY:** concept and measurement of utility; Law of Diminishing Marginal Utility (DMU); derivation of Law of Demand from Law of DMU; Law of Equimarginal Utility (EMU) – its practical applications
3. **DEMAND:** What is demand and supply; shift in demand and extension of demand; law of demand and law of supply; demand function; demand schedule; elasticity of demand; measurement of elasticity of demand; factors affecting elasticity of demand; role of demand and supply in price determination and effect of changes in demand and supply on prices
4. **PRODUCTION FUNCTIONS:** Meaning of production and production functions; Law of Variable Proportion; returns to scale, internal and external economies and diseconomies of scale.
5. **COSTS:** Various concepts of costs: fixed cost, variable cost, average cost, marginal cost, opportunity cost; shape of average cost, marginal cost, total cost etc. in short run and long run.
6. **MARKET STRUCTURES:** What is market; main features of perfect competition; monopoly; oligopoly; monopolistic competition.
7. **MACRO ECONOMICS:** Macro economics: brief concepts of GDP, GNP, NI, per capita income; inflation; privatization; globalization (merits & demerits); elementary concepts of VAT, WTO, GATT and TRIPS

TEXT BOOK

Hirshey M., "Managerial Economics", Thomson Learning, 2007

REFERENCE BOOKS

1. Monroe Kent B., "Pricing Making Profitable Decisions", McGraw Hill, New York, 2006
2. Keat Paul B., and Young Philip K. Y., "Managerial Economics - Economic Tools for Today's Decision Makers", Pearson Education, 2003

BA-226	PRINCIPLES OF MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with various concepts of management which will be very basic to appreciate the subject.

1. **INTRODUCTION:** Meaning of management, definitions of management, characteristics of management, management vs. administration; management: art, science and profession; importance of management; Fayol's principles of management; the management functions; interrelationship of managerial functions.
2. **FORMS:** Forms of organizational structure (line, line & staff, functional); delegation of authority; centralization & decentralization.
3. **GROUPS:** Formal & informal groups; stages in team development, empowerment concept, significance; changing nature of managerial work; outsourcing.
4. **CORPORATE SOCIAL RESPONSIBILITY:** Corporate social responsibility – meaning; responsibility towards different stakeholders; ethics in management – meaning; factors effecting ethical choices.
5. **STAFFING:** Nature and significance of staffing; human resource management - functions of human resource management; human resource planning; process of human resource planning; recruitment, selection; promotion-seniority vs. merit.
6. **MARKETING MANAGEMENT:** Marketing management – definition of marketing, marketing concept, objectives and functions of marketing; marketing mix (basics of 4Ps of marketing); difference between goods and services; steps of personal selling.
7. **FINANCIAL MANAGEMENT:** Introduction of financial management; objectives of financial management; functions and importance of financial management; brief introduction to the concept of capital structure and various sources of finance.

TEXT BOOK

Chhabra T. N., "Principles and Practice of Management", Dhanpat Rai Publishers, 2008

REFERENCE BOOKS

1. Aggarwal R. D., "Organization and Management", Tata McGraw Hill, 1995
2. Prasad L. M., "Principles and Practice of Management", Sultan Chand & Sons, 2005
3. Harold, Koontz and O'Doneell Cyril, "Management", McGraw Hill, 1968
4. Sherlekar S. A., "Marketing Management", Himalaya Publishing House, 2009
5. Pandey I. M., "Financial Management", Vikas Publishing House, New Delhi, 2005
6. Stoner James A. F. and Freemann R. Edward, "Management", 6th Edition, Prentice Hall of India, 2000
7. Prasad L. M., "Organizational Behavior", Sultan Chand & Sons, 2008
8. Singh & Chhabra, "Business Organization & Management", Dhanpat Rai Publishers

CE-101	ENVIRONMENTAL SCIENCE AND ECOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

Environmental Studies is a multidisciplinary area, the issues of which every one should know. The aim of the course is to make everyone aware of environmental issues like continuing problems of pollution, loss of forest, solid waste disposal, and degradation of environment. Issues like economic productivity and national security, global warming, the depletion of ozone layer and loss of biodiversity are other serious concerns before the mankind.

- 1. THE MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:** Basic definitions related to environment; Scope, vis-à-vis environmental science and environmental engineering; Causes of environmental degradation, atmospheric composition and associated spheres, habitat and climate; objective, goals and principles involved in environmental education, environmental awareness, environmental ethics, environmental organization and their involvement.
- 2. NATURAL RESOURCES:** Renewable and non-renewable resources; forest resources, over-exploitation, and deforestation / afforestation; water resources, impact of over-utilization of surface and ground water, floods, drought, conflicts over water, dams; mineral resources: dereliction of mines, environmental effects of extracting and using mineral resources; Food resources, modern agriculture and its impact, problem associated with fertilizer and pesticide, water logging, salinity ; energy resources, renewable, non-renewable energy sources, solar energy, wind energy, hydro energy, biomass energy, geothermal energy, nuclear energy and its associated hazards; land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- 3. ECOSYSTEMS:** Concept of an ecosystem, structure and function of an ecosystem, producers, consumers and decomposers, energy flow in the ecosystem, ecological succession, food chains, food webs and ecological pyramids; characteristic features, structure and function of the following ecosystem -forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystems.
- 4. BIODIVERSITY AND ITS CONSERVATION:** Biogeographical classification of India; biodiversity at global, national and local levels, India as a mega-diversity nation, hot-spots of biodiversity; value of biodiversity-consumptive use, productive use, social, ethical aesthetic and option values; threats to biodiversity; conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.
- 5. ENVIRONMENTAL POLLUTION:** Causes, effects and control measures of air pollution, water pollution, soil pollution, marine pollution, noise pollution, thermal pollution, solid waste management, e-waste management; disaster management – floods, earthquake, cyclone and landslides.
- 6. SOCIAL ISSUES AND THE ENVIRONMENT:** Water conservation, rain water harvesting,

watershed management; climate change, global warming, acid rain, ozone layer depletion; Environmental Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act.

- 7. HUMAN POPULATION AND THE ENVIRONMENT:** Population growth, population explosion – family welfare programmes; role of information technology in environment and human health; case studies, Chipko movement, Saradar Sarovar dam, mining and quarrying in Udaipur, salinity and water logging in Punjab, Haryana and Rajasthan, Bhopal gas tragedy, Chernobyl nuclear disaster, arsenic pollution in ground water.

TEXT BOOK

Kaushik, Anubha, and Kaushik, C.P., “Perspectives in Environmental Studies”, New Age International Publishers, 2004.

REFERENCE BOOKS

1. Agarwal, K. C., “Environmental Biology”, Nidhi Publ. Ltd., Bikaner, 2001
2. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., 2006
3. Brunner R. C., “Hazardous Waste Incineration”, McGraw Hill Inc., 1989.
4. Clark R.S., “Marine Pollution”, Clanderson Press Oxford, 1989
5. Cunningham, W.P., Cooper, T.H. Gorchani, E. & Hepworth, M.T., “Environmental Encyclopedia”, Jaico Publ. House, 2001.
6. De A. K., “Environmental Chemistry”, 2nd Edition, Wiley Eastern, 1989
7. Jadhav, H. and Bhosale, V.M., “Environmental Protection and Laws”, Himalaya Pub. House, Delhi, 1995.
8. Mckinney, M.L. and Schocl. R.M., “Environmental Science Systems & Solutions”, Web enhanced edition, 1996.
9. Rao M.N. and Datta, A.K., “Waste Water Treatment”, Oxford & IBH Publ. Co., 1987.
10. Sharma B.K., “Environmental Chemistry”, Goel Publ. House, Meerut, 2001
11. Trivedi R.K. and Goel, P.K., “Introduction to Air Pollution”, Techno-Science Publications, 1996

CH-101	APPLIED CHEMISTRY	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce to the students the latest topics of interests of the new generation science with the accomplishment of various technological advancements of biochemistry and texture of advanced photochemistry.

- 1. PHASE RULE:** Terminology of phases; components and degree of freedom; derivation of Gibbs phase rule equation; one component system (water system); application of reduced / condensed phase rule; two component system; eutectic (Pb-Ag) system; congruent (Zn-Mg) system; Incongruent system (Na-K) system; merits and demerits of phase rule.

- THERMODYNAMICS:** Entropy; entropy change for an ideal gas; free energy and its physical significance; variation of free energy with temperature and pressure; work function and its significance; relation between Gibb's free energy and work function; second law of thermodynamics; Gibbs Helmholtz equation; Its application and significance; chemical potential; Gibbs Duhem equation; Clausius Clapeyron equation and its application.
- WATER AND ITS TREATMENT:** Specification of water for different uses; hardness of water; equivalent of calcium carbonate; units of hardness; disadvantages of hard water and determination of hardness; alkalinity of water and its determination; related numericals; scale and sludge formation in boilers and its prevention; caustic embrittlement; water softening; Zeolite process; Ion exchange process and mixed bed demineralization; disinfection of water; desalination; reverse osmosis; electro dialysis.
- CORROSION AND ITS PREVENTION:** Introduction; classification; dry and wet corrosion; electrochemistry theory of corrosion; galvanic, pitting and waterline corrosion; differential aeration corrosion; stress corrosion; factors affecting corrosion; preventive measures; material selection; proper designing; barrier protection; sacrificial protection; cathodic; anodic protection.
- LUBRICATION AND LUBRICANTS:** Friction; mechanism of lubrication; classification of lubricants; additives of lubricants; synthetic lubricants; properties of lubricants; consistency; drop point; fire and flash point; cloud point; pour point; viscosity; viscosity index; Iodine no.; aniline no.; saponification no.; steam emulsion no.; neutralization no.; decomposition stability and their significance.
- PHOTOCHEMISTRY:** Photochemical and dark reactions; laws of photochemistry; quantum efficiency; classification of photochemical reactions on the basis of their quantum efficiencies; non-radiative processes (ISC and IC); fluorescence; phosphorescence (Jablonski diagram); chemiluminescence; photosensitization; technology based on photochemical processes.
- BIOMOLECULES:** Structure; function; diversity and distribution; general composition of living matter. carbohydrates; monosaccharides and their inter-relationship; structure of sugars; glucose; fructose; maltose; lactose, sucrose; stereoisomerism and optical isomerism of sugars; ring structure and tautomeric form and mutarotation; lipids: definitions; classification of lipids; fatty acids; glycerol; building block of lipid; proteins and amino acid; classification and formulae; proteinous and non-proteinous; essential and non-essential amino-acids; primary, secondary, tertiary, quaternary structure of proteins; N and C terminal determination.

TEXT BOOK

Srivastava, H.C., "Engineering Chemistry", Pragati Prakashan Publishing House.

REFERENCE BOOKS

- Chawla, Shashi, "Engineering Chemistry", First Edition, Dhanpat Rai and Co., 2003

- Ambasta, B.K, "Engineering Chemistry", Laxmi Publications, 2007
- Singh, Devender and Vats Satish K., "Comprehensive Engineering Chemistry", I. K. International Publication, 2007
- Chatwal Gurdeep "Organic Chemistry on Natural Products", Vol. 1, Himalaya Publishing House, Reprint 2002.
- Chatwal Gurdeep, "Photochemistry", Himalaya Publishing House, 2003.
- Jain, P.C., and Jain, Monica, "Engineering Chemistry", Dhanpat Rai & Co.
- Morrison, R.T., and Boyd, R.N., "Organic Chemistry", 6th Edition, Pearson Education, 1994

CH-151	APPLIED CHEMISTRY LAB	L	T	P	Cr
		0	0	2	1

LIST OF EXPERIMENTS

- Determination of Ca⁺⁺ and Mg⁺⁺ hardness of water using EDTA solution.
- Determination of alkalinity of water sample.
- Find the melting and eutectic point for a two component system by using method of cooling curve.
- Determination of viscosity of lubricant by Red Wood viscometer (No. 1 & No. 2).
- Prepare Phenol-formaldehyde and Urea formaldehyde resin.
- Find out Saponification number of oil.
- Determination of concentration of KMnO₄ solution spectro-photometrically.
- Determination of strength of HCl solution by titrating it against NaOH solution conductometrically.
- Determination of drop point of given lubricant using drop point apparatus.
- Estimate the sugar (Glucose) using Fehling solution method.
- Determine flash point and fire point of oil by Pensky - Marten's flash point apparatus.
- Determine amount of sodium and potassium in a given water sample by flame photometer.

REFERENCE BOOKS

- Dara, S. S. "A Text Book on Experimental and Calculation – Engineering Chemistry", S. Chand & Company.
- Chawla, Shashi, "Essential of Experimental Engineering Chemistry", 2nd Edition, Dhanpat Rai Publishing Company, 2006
- Virmani, O. P., and Narula, A. K., "Theory & Practice Applied Chemistry", New Age Publications.

CS-101	COMPUTER PROGRAMMING	L	T	P	Cr
		5	1	0	4

OBJECTIVE

To provide sound conceptual understanding of the fundamental concepts of computing hardware, software, networking and services; build programming logic and developing skills in problem solving using C/C++; Introduce the concept of object orientation and on how to handle data in different forms; Emphasize the concepts and constructs rather than on language features.

- 1. AN OVERVIEW OF COMPUTER SYSTEM:** Anatomy of a digital computer; memory units; main and auxiliary storage devices; input devices; output devices; classification of computers; computer hardware; computer software; data representation – bits and bytes and operations of data; radix number system – decimal, binary, octal, hexadecimal numbers and their inter-conversions; representation of information inside the computers.
- 2. OPERATING SYSTEM BASICS:** The user interface; running programs; managing files; introduction to PC operating systems: Unix/Linux, DOS, MacOS and Windows, file system; file formats.
- 3. INTERNET BASICS:** Introduction to computer networks; what is internet and WWW; basic WWW concepts; surfing the web; web multimedia; internet applications and features.
- 4. PROGRAMMING LANGUAGES:** Machine level language; assembly level language; high level language; system software: assembler, compiler, interpreters, linker and loader, and their inter-relationship, debuggers, IDE; programming fundamentals – problem definition, algorithms, flow charts and their symbols.
- 5. C PROGRAMMING LANGUAGE CONSTRUCTS:** An overview of C; expressions – data types, identifiers names, variables, type qualifiers, storage class specifiers, operators, type conversion in expression, type casting; console I/O: I/O functions; the C standard library; problem solving process algorithm: pseudo code and flowchart; statements – true and false in C, selection statements, iteration statements, jump statements, expression statements and block statements; arrays – single dimensions arrays, generating a pointer to an array, passing 1D array to functions; string: 2D arrays, multidimensional array, indexing pointers, array initialization, variable-length array
- 6. DATA HANDLING:** Pointers – Pointer variables, pointer operators, pointer expressions, pointers and arrays, multiple indirection, initializing pointers, C's dynamic allocation functions, restrict-qualified pointers, problems with pointers; functions: the general form of a function, scope of a function, function arguments, argc and argv — arguments to main(), the return statement, purpose of main(), recursion, function prototypes, the "implicit int" rule; structures, unions, enumerations, and typedef – structures, arrays of structures, passing structures to functions, structure pointers, arrays and structures within structures, unions, bit-fields, enumerations, using sizeof to ensure portability, typedef; important differences between C and C++.
- 7. ADVANCED DATA HANDLING:** Basic file I/O – C vs. C++ File I/O, standard C Vs. Unix file I/O streams and files, file system basics, fread() and fwrite(), fseek() and random-access, fprintf() and fscanf(); the preprocessor and comments – the preprocessor, conditional compilation directives, using defined, the # and ## preprocessor operators, predefined macro names, comments.

TEXT BOOK

Schildt, Herbert "The Complete Reference C", 4th Edition, Tata McGraw Hill, 2004.

REFERENCE BOOKS

1. Balagurusamy, E., "Computing Fundamentals and C Programming", Tata McGraw Hill, 5th Edition, 2010.
2. Dennis, P. Curtin, Foley Kim, Sen Kunal and Morin Cathleen, "Information Technology", Tata McGraw Hill, 17 Edition, 2005.
3. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language, Prentice Hall of India, 1988.
4. Nabajyoti, Barkakati, "Object Oriented Programming in C++", Prentice Hall of India, 3rd Edition, 1995.
5. Jack, B. Rochester, "Using Computers and Information", Prentice Hall of India, 1996.
6. Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
7. Press, Barry and Press, Marcia, "Teach Yourself all About Computers", IDG Books India, 2000.
8. Schildt, Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003
9. Liberty, Jesse, "Programming C#", O'Reilly, 4th Edition, 2005.

WEB REFERENCES

1. http://www.physics.drexel.edu/courses/Comp_Physics/General/C_basics/c_tutorial.html
2. <http://www.eskimo.com/~scs/c/class/notes/top.html>
3. <http://www.lysator.liu.se/c/bwk-tutor.html>

CS-151	COMPUTER PROGRAMMING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS/EXERCISES

1. Basic/Simple logic building
2. Handling mathematical data
3. Use of control structures
4. Use of Function
5. Handling mathematical problems
6. Array and Pointer
7. Searching and Sorting
8. String Manipulation
9. Use of Structure and Union
10. File handling

Note: Write and run at least three programmes for each topic.

REFERENCE BOOKS

1. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language", Prentice Hall of India, 1988.
2. Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill
3. Barkakati, Nabajyoti, "Object Oriented Programming in C++", Prentice Hall of India, 2001.
4. Schildt, Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Edition, 2003

CS-201	DATA STRUCTURES & ALGORITHMS	L T P	Cr
		5 0 0	3

OBJECTIVE

To relay the theoretical and practical fundamental knowledge of most commonly used algorithms.

PRE-REQUISITES

Knowledge of basic computer programming

- 1. INTRODUCTION TO DATA STRUCTURES:** Definition of data structures and abstract data types; polymorphic data types; linear vs. non-linear data types; primitive vs. non-primitive data types; static and dynamic implementations; arrays, 2, 3 and multi-dimensional arrays; examples and real life applications.
- 2. RUNNING TIME:** Time complexity; Big Oh notation; running times; best case, worst case, average case; factors depends on running time; introduction to recursion; divide and conquer algorithm; evaluating time complexity.
- 3. STACKS AND QUEUES:** Stacks: definition, array based implementation of stacks, linked list based implementation of stacks; examples: infix, postfix, prefix representation; conversions, applications; definition of queues; array based implementation of queues
- 4. LINKED LISTS:** Lists; linked list implementation of stacks and queues; circular implementation of queues and singly linked lists; straight / circular implementation of doubly linked queues; priority queues; applications.
- 5. TREES:** Definition of trees and binary trees; properties of binary trees and implementation; binary traversal pre-order, post-order, in-order traversal; binary search trees; implementations; threaded trees; balanced multi way search trees; AVL trees; implementations
- 6. GRAPHS:** Definition of undirected and directed graphs and networks; array based implementation of graphs; adjacency matrix; path matrix implementation; linked list representation of graphs; shortest path algorithm, graph traversal: breadth first traversal, depth first traversal; hash tables, hash function; implementations and applications.
- 7. SORTING AND SEARCHING ALGORITHMS:** Introduction, sorting by exchange, selection, insertions, bubble sort, straight selection sort, efficiency of above algorithms; shell sort, performance of shell sort, merge sort, merging of sorted arrays and algorithms; quick sort algorithm analysis, heap sort: heap construction, heap sort, bottom – up, top – down heap sort approach; searching algorithms: straight sequential search, binary search (recursive & non-recursive algorithms)

TEXT BOOK

Tenenbaum, A. M., Langsam and Augentem Moshe J., "Data Structures Using C", Prentice Hall of India, 1995

REFERENCE BOOKS

1. Aho A. V., Hopcroft J. E. and Ullman T. D., "Data Structures and Algorithms", Original Edition, Addison-Wesley, Low Priced Edition, 1983.
2. Horowitz Ellis and Sahni Sartaj, "Fundamentals of Data Structures", Addison-Wesley Pub, 1984.
3. Horowitz, Sahni and Rajasekaran, "Fundamentals of Computer Algorithms" 2007.
4. Kruse Robert, "Data Structures and Program Design in C", Prentice Hall of India, 1994

5. Lipschetz Jr. Seymour, "Theory & Problems of Data Structures", Schaum's Outline, Tata McGraw Hill
6. Weiss Mark Allen, "Data Structures and Algorithms Analysis in C", Pearson Education, 2000
7. Cormen T. H. et al., "Introduction to Algorithms", 2nd Edition, Prentice Hall of India, 2001.
8. Dasgupta Sanjay, Christos P. and Vazirani Umesh, "Algorithms", Tata McGraw Hill, 2008

WEB REFERENCES

1. http://www.cs.auckland.ac.nz/software/AlgAnim/ds_ToC.html
2. http://en.wikipedia.org/wiki/Data_structure
3. <http://www.itl.nist.gov/div897/sqg/dads/>
4. <http://www.brpreiss.com/books/opus4/html/book.html>

CS-402	ARTIFICIAL INTELLIGENCE	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES

Knowledge of neural networks, data structures

- 1. INTRODUCTION TO AI AND SEARCH TECHNIQUES:** Foundation and history of AI; data, information and knowledge; AI problems and techniques – AI programming languages, problem space representation with examples; blind search strategies, breadth first search, depth first search, heuristic search techniques: hill climbing; best first search, A * algorithm AO* algorithm, Means-ends analysis.
- 2. KNOWLEDGE REPRESENTATION ISSUES:** predicate logic; logic programming; constraint propagation; representing knowledge using rules.
- 3. REASONING UNDER UNCERTAINTY:** Reasoning under uncertainty, non monotonic reasoning; review of probability; Bayes' probabilistic interferences and Dempster Shafer theory; heuristic methods; symbolic reasoning under uncertainty; statistical reasoning, fuzzy reasoning.
- 4. PLANNING & GAME PLAYING:** Minimax search procedure; goal stack planning; non linear planning, hierarchical planning, planning in situational calculus; representation for planning; partial order planning algorithm
- 5. LEARNING:** Basic concepts; rote learning, learning by taking advices, learning by problem solving, learning from examples, discovery as learning, learning by analogy; explanation based learning; neural nets; genetic algorithms.
- 6. OTHER KNOWLEDGE STRUCTURES:** semantic nets, partitioned nets, parallel implementation of semantic nets; frames, common sense reasoning and thematic role frames; architecture of knowledge based system; rule based systems; forward and backward chaining; frame based systems.

7. **APPLICATIONS OF ARTIFICIAL INTELLIGENCE:** Principles of natural language processing; rule based systems architecture; expert systems, knowledge acquisition concepts; AI application to robotics, and current trends in intelligent systems; parallel and distributed AI: psychological modeling, parallelism in reasoning systems, distributed reasoning systems and algorithms

TEXT BOOK

Rich Elaine and Knight Kevin, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 1991

REFERENCE BOOKS

1. Nilson Nils J., "Artificial Intelligence", McGraw-Hill, New York 1971
2. Russell Stuart and Norvig Peter, "Artificial Intelligence: A Modern Approach", Prentice Hall of India, 1998
3. Negnevitsky, "Artificial Intelligence: A Guide to Intelligent System", Pearson Education, 2004.
4. Patterson O. W., "Introduction to Artificial Intelligence & Expert Systems", Prentice Hall of India, 1996.
5. Winston Patrick Henry, "Artificial Intelligence", 3rd Edition, Addition Wesley, 1992
6. Clockson & Mellish, "Programming PROLOG", 3rd Edition, Narosa Publications, 2002.

WEB REFERENCES

1. <http://wwwformal.stanford.edu/jmc/whatisai/>
2. <http://library.thinkquest.org/2705/>
3. www.imdb.com.

EC-201	ELECTRONICS ENGINEERING	L T P	Cr
		5 1 0	4

OBJECTIVE

The purpose of this course is to give basic electronics concept; their operational significance and its basic application.

PRE-REQUISITES

Knowledge of electricity, solid state physics

1. **HISTORICAL BACKGROUND:** Vacuum tubes; working of vacuum tube and their characteristics; vacuum diode; triode; tetrode and pentode
2. **PN JUNCTION:** Depletion layer; Barrier potential; Forward and reverse bias; Breakdown voltage; PIV; switching characteristics of p-n junction diode; knee voltage; load line; and operating Point Ideal p-n junction diode; junction capacitance; zener diode.
3. **RECTIFIERS AND FILTERS:** Half wave; centre tap full wave and bridge rectifier; percentage of regulation; PIV; ripple factor; C; RC; LC and PI filter; voltage doubler; clipping and clamping circuit; voltage regulation.
4. **BIPOLAR JUNCTION TRANSISTOR:** Introduction; basic theory of operation of PNP and NPN transistor-I characteristics; CB; CE and CC configuration; different biasing techniques.

5. **FET:** Introduction; Theory of operation; **JFET** Parameters; and JFET Amplifiers. **MOSFET:** Introduction; theory of operation; MOSFET parameters; application; graphical analysis of BJT and FET circuits; linear models of BJT and FET; pulse and large signal models of BJT and FET
6. **BIASING TECHNIQUES OF FET:** Introductory idea of multistage and feedback amplifiers; base bias; emitter feedback bias; collector voltage divider bias; Load line and operating point.
7. **INTEGRATED CIRCUIT:** Analysis of principle of integration. Introduction to Digital Integrated circuits; **THYRISTORS:** Introduction to thyristor family; SCR theory of operation; SCR characteristics and triggering; **TRIAC:** Theory of operation; Characteristics and control by SCR and TRIAC Introduction to op-amp; **UJT:** Introduction; Basic theory of operation characteristics and structure; Complementary and programmable UJT relaxation oscillator.

TEXT BOOK

Millman and Halkias, "Electronic Devices and Circuits", 2nd Edition, Tata McGraw Hill, 2000

REFERENCE BOOKS

1. Millman and Halkias, "Integrated Electronic", Tata McGraw Hill, 3rd Edition, 2001.
2. Boylestad and Nashelsky, "Electronic Devices and Circuits", 4th Edition, Pearson Education, 1999.
3. Malvino, "Electronic Principles", 5th Edition, Tata McGraw Hill, 2004.
4. Bell David A., "Electronic Devices and Circuits", 3rd Edition, Prentice Hall of India, 2007
5. Bhargave N. N., "Basic Electronics and Linear Circuits", Tata McGraw Hill, 2007
6. Salivahan, "Electronics Devices and Circuits", Tata McGraw Hill, 3rd Edition, 2003.

EC-202	ELECTRICAL ENGINEERING MATERIALS AND SEMICONDUCTOR DEVICES	L T P	Cr
		5 1 0	4

OBJECTIVE

The objective of this course is to introduce the student to basic concept of semiconductor device operation based on energy bands and carrier statistics. It also provides the operation of p-n junctions and metal-semiconductor junctions. It extends this knowledge to descriptions of bipolar and field effect transistors, and other microelectronic basic devices. This course is intended for students who plan to study in the area of microelectronics or just have an interest in that area. This course emphasizes the fundamentals of materials and device operation. It is expected that the students taking this course will include ECE and non-EE majors. In this course, one will study semiconductor devices from a fundamental point of view emphasizing a thorough understanding of the mechanisms of device operation. It is expected that students who successfully complete the course will have an understanding of basic semiconductor devices sufficient to design transistors and diodes to particular specifications.

- 1 CONDUCTING MATERIALS:** Drift velocity, collision time; Mean free path; mobility; conductivity; relaxation time; factors affecting conductivity of materials; types of thermal conductivity; Wiedemann-Franz law; Super conductivity; applications.
- 2 DIELECTRIC MATERIALS:** Behavior of dielectric materials in static electric field; Dipole moments; Polarization; Dielectric constant; Polarizability, Susceptibility; mechanisms of polarization; behavior in alternating field; dielectric loss; loss tangent types of dielectric and insulating materials; electrostriction; Piezo-electricity.
- 3 MAGNETIC MATERIALS:** Permeability; Magnetic susceptibility; magnetic moment; origin of magnetic dipole moment; angular momentum; Magnetization; Classification of magnetic materials-Para; Dia, ferro, antiferro; and ferri; Langevin's theory of dia; Curie-Weiss law; spontaneous magnetism; domain theory; Magnetoresistance; eddy current and hysteresis losses; applications.
- 4 SEMICONDUCTORS:** Review of Si and Ge as semi-conducting materials; Continuity Equation; P-N junction; Drift and Diffusion; Diffusion and Transition capacitances of P-N junction; breakdown mechanisms; ZENER diode.
- 5 OPTICAL PROPERTIES OF MATERIALS:** Optical properties of metals; semiconductors and insulators; Phosphorescence; Luminiscence; Phosphors for CRO; display material for LCD; LED; solar cells and photo-detectors.
- 6 SEMICONDUCTOR DEVICES:** Brief introduction to Planar Technology for device fabrication; BJT; JFET; MOSFETS.
- 7 POWER DEVICES:** Thyristor; IGBT; VMOS; UJT; GTO; their working principles and characteristics.

TEXT BOOK

Dekker, A.J., "Electrical Engineering Materials", 3rd Ed. Pentice Hall of India; 2009

REFERENCE BOOKS

- Boylested and Nashelsky, "Electronic Devices and Circuit Theory", Pearson. Education, 2009
- Dutta Alok, "Semiconductor Devices and Circuits", Oxford University Press, 2008
- Streetman and Banerjee, "Solid State Electronic Devices", Pearson, 2010
- Millman and Halkias, "Electronic Devices and Circuits", McGraw Hill, 1996
- Gupta, J.B., "Electrical Engineering Materials and Semiconductor Devices", Katsons, 2006

EC-203	ELECTROMAGNETIC THEORY	L T P	Cr
		5 0 0	3

OBJECTIVE

To provide a sound understanding of the fundamental concepts of electromagnetic field theory; explaining various basic laws governing it; and its application to communications.

- 1 INTRODUCTION:** Vector Relation in rectangular; Cylindrical; Spherical and general curvilinear

- coordinate system. Concept and physical interpretation of gradient; Divergence and curl; Gauss's Divergence and Stoke's theorems.
- 2 ELECTROSTATICS - I:** Electric field intensity; flux density and polarization; Electric field due to various charge configurations. Potential functions and displacement vector.
- 3 ELECTROSTATICS-II:** Gauss's law; Poisson's and Laplace's equation and their solution in rectangular coordinates; Uniqueness theorem; Capacitance and electrostatics energy; methods of electrostatics images; boundary conditions.
- 4 MAGNETOSTATICS – II:** Magnetic field vector; Magnetic field intensity; flux density and magnetization.
- 5 MAGNETOSTATICS –II:** Bio-Savart's law; Ampere's law; Magnetic vector potential; Energy stored in magnetic field; Boundary conditions; Analogy between electric and magnetic field;
- 6 TIME VARYING FIELDS:** Faraday's law; Displacement currents and equation of continuity. Maxwell's equations; Uniform plane wave in free space; Reflections; refraction and polarization of UPW; surface impedance; standing wave ratio. Poynting theorem and power considerations.
- 7 ELECTROMAGNETIC FIELDS:** EM wave in Dielectrics; Conductors and Magnetic Materials and Skin effect.

TEXT BOOK

Jordan and Balmain, "Electromagnetic Waves and Radiating Systems", 4th Ed., Prentice Hall of India, 2004

REFERENCE BOOKS

- Krauss, J.D., "Electromagnetics", Tata McGraw Hill, 5th Edition, 2005.
- Griffith, "Introduction to Electrodynamics", 2nd Edition, 2005.
- Loprrain, P. and Corson; D.R. and Eastern, Wiley, "Electromagnetic Field and Waves Antenna and Wave Propagating", Satya Prakashan, 3rd Edition, 2001.

EC-204	ELECTRONICS MEASUREMENT AND INSTRUMENTATION	L T P	Cr
		5 0 0	3

OBJECTIVE

Fourier Transform and spectrum analyzer also be discussed in digital. These two digital instrument are gaining wide acceptance in electronics instrumentation. Transducer and data acquisition have received considerable overhead to include modern transducer.

- 1. ELECTRONIC INSTRUMENTS:** Instruments for measurement of voltage; current and other circuit parameters; Q; meters; R.F. power measurements; introduction to digital meters.
- 2. OSCILLOSCOPE:** Block diagram; study of various stages in brief; high frequency CRO considerations. Sampling and stoppage oscilloscope.
- 3. GENERATION and ANALYSIS OF WAVEFORMS:** Block diagram of pulse generators; signal generators; function generators wave analysers;

- distortion analysers; spectrum analyser; Harmonic analyser; introduction to power analyser.
- FREQUENCY and TIME MEASUREMENT:** Study of decade counting Assembly (DCA); frequency measurements; period measurements; universal counter; introduction to digital meters.
 - TRANSDUCERS:** Classification; Transducers of types: RLC photocell; thermocouples etc. basic schemes of measurement of displacement; velocity; acceleration; strain; pressure; liquid level and temperature.
 - DISPLAY DEVICES:** Nixie tubes; LED's LCD's; discharge devices; data acquisition and conversion system.
 - INTRODUCTION TO SIGNAL CONDITIONING:** DC signal conditioning system; AC signal conditioning system; data accusation and conversion system.

TEXT BOOK

Sawhney, A.K., "A Course in Electrical and Electronics Measurements and Instrumentation", 8th Edition, Dhanpat Rai and Sons, 2009.

REFERENCE BOOKS

- Cooper, "Electronics Instrumentation and Measurement Techniques", 3rd Edition, Prentice Hall of India, 2000.
- Kalsi, "Electronics Instrumentation", 2nd Edition, Tata McGraw Hill, 2004.

- TRANSISTOR AT HIGH FREQUENCIES:** Hybrid model; CE short circuit current gain; frequency response; alpha; cutoff frequency; gain bandwidth product; emitter follower at high frequencies.
- FIELD EFFECT TRANSISTORS:** Junction field effect transistor; MOSFET Enhancement and Depletion mode; V-MOSFET; Common source amplifier; source follower; biasing of FET; applications of FET as a voltage variable resistor (V V R).
- REGULATED POWER SUPPLIES:** Series and shunt voltage regulators; power supply parameters; three terminal IC regulators; SMPS.

TEXT BOOK

Millman and Halkias, "Integrated Electronics", 2nd Edition, Tata McGraw Hill, 1998.

REFERENCE BOOKS

- Neamen, D.A., "Electronic Circuit Analysis and Design", 2nd Edition, Tata McGraw Hill, 2004.
- Malvino, "Electronics Principles", 6th Edition McGraw Hill, 2003.
- Schilling, Donald L. and Boylestad, Charles Belove and Nashelsky, "Electronics Circuits", 8th Edition, McGrawHill, 2005.
- Bell, David A., "Electronic Devices and Circuits", 3rd Edition, Prentice Hall of India, 2007.
- Motorstad, "Electronics Devices and Circuits", 2nd Edition, Prentice Hall of India, 2004.

EC-205	ANALOG ELECTRONICS	LTP	Cr
		5 1 0	4

OBJECTIVE

To show the students the physical picture of the internal behaviour of semiconductor diode and its different type of circuit. Among these are rectifier; clipper; clamper; and filter. also gives knowledge of internal behaviour of transistor; FET and its application. regulated power supplies. Step knowledge from semiconductor physics to devices; model; circuit and system is.

- SEMICONDUCTOR DIODE:** Diode as a rectifier; switching characteristics of diode; Diode as a circuit element; the load-line concept.
- SEMICONDUCTOR DIODE CIRCUITS :** Half-wave and full wave rectifiers; clipping circuits; clamping circuits; filter circuits; peak to peak detector; voltage doublers and voltage multiplier circuits.
- TRANSISTOR AT LOW FREQUENCIES:** Bipolar junction transistor : π characteristics; Ebers-moll model of transistor; hybrid model; h-parameters (CE; CB; CC configurations); analysis of a transistor amplifier circuits using h-parameters; emitter follower; Miller's Theorem ;Effect of Emitter by pass capacitor on low frequency response; Step response of an amplifier; frequency response of R-C coupled amplifier; pass band of cascaded stages; Multi stage CE Amplifier.
- TRANSISTOR BIASING:** Operating point; bias stability; collector to base bias; self-bias; emitter bias; bias compensation; thermistor and sensistor compensation; thermal runaway.

EC-206	NETWORK THEORY	LTP	Cr
		5 1 0	4

OBJECTIVE

To introduce the Laplace transform. To help the student to take the advantages of this technique from the earlier stage. It also deals with elementary network Theory and transient response of circuit with various type of Signals. It also give the students the knowledge of fundamental of network synthesis in order to solve the problem involved in design. It also includes two port network; electrical filter; and topology. All these Topics are concerned with and are based on electric circuit theory and it is hoped that the students will find to this advantages to under stand the basic approach from circuit view point.

- TOPOLOGY:** Principles of network topology; graph matrices; network analysis using graph theory; cut and tie set.
- LAPLACE TRANSFORMATION and ITS APPLICATION IN CIRCUIT ANALYSIS:** Introduction; Laplace transformation of derivative; integral; common forcing function; application of Laplace transform in circuit analysis; step response of RL; RC series and parallel circuit; impulse response of RL; RC Series and parallel circuit.
- TRANSIENT RESPONSE:** Introduction; Transient Response of RC; RL; RLC Circuits to various excitation signals such as step; ramp; impulse and sinusoidal excitations using laplace transform.
- NETWORK FUNCTIONS:** Terminal pairs or Ports; Network functions for one-port and two-port networks; poles and zeros of Network functions;

- Restrictions on pole and zero Locations for driving point functions and transfer functions; Time domain behavior from the pole-zero plot.
- CHARACTERISTICS AND PARAMETERS OF TWO PORT NETWORKS** : Relationship of two-port variables; short-circuit Admittance parameters; open circuit impedance; parameters; Transmission parameters; hybrid parameters; relationships between parameter sets; Inter-connection of two port networks.
 - TYPES OF FILTERS AND THEIR CHARACTERISTICS**: Filter fundamentals; high-pass; low-pass; band-pass; and band-reject Filters.
 - NETWORK SYNTHESIS**: Positive real functions; synthesis of one port and two port networks; elementary ideas of Active networks.

TEXT BOOKS

Soni and Gupta ,”A Course in Electrical Circuit Analysis”,13th edition, Dhanpat Rai Publication 1998.

REFERENCE BOOKS

- Umesh Sinha ,”Network Analysis and Synthesis,” 2nd edition, Satya Prakash Pub 2002.
- D.Roy Choudhury ,”Networks and Systems” ,2nd edition, New Age International 2006.
- F.F.Kuo ,”Network Analysis and Synthesis”,2nd edition ,John Wiley and Sons Inc 2003.
- Sudhakar and Shyam Mohan ,”Circuits and Networks” 3rd edition TMH 2004.
- Van Valkenburg ,”Introduction to modern Network Synthesis” 8th edition , John Wiley 2006.
- Van Valkenburg ,”Network Analysis”,3rd edition, PHI 2000.
- Dasoer Kuh ,”Basic circuit theory”2nd edition, McGraw Hill 1998.
- G.K. Mithal,” Circuit Analysis “,2nd edition, Khanna Publication 2000.

EC-207	DIGITAL ELECTRONICS	L T P 5 1 0	Cr 4
---------------	----------------------------	------------------------------	-----------------------

OBJECTIVE

Modern world deals with digital conditioning of various signals. Digitally manipulating signals or using digital circuits have a lot of advantages in terms of accuracy etc. This subject introduces concept of basic digital electronics: gates; combinational and sequential circuits and their designing

- FUNDAMENTALS OF DIGITAL TECHNIQUES**: Digital signal; logic gates: AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR; Boolean algebra. Review of Number systems. Binary codes: BCD; Excess-3; Gray; EBCDIC; ASCII; Error detection and correction codes.
- COMBINATIONAL DESIGN USING GATES**: Design using gates; Karnaugh map and Quine Mccluskey methods of simplification.
- COMBINATIONAL DESIGN USING MSI DEVICES**: Multiplexers and Demultiplexers and their use as logic elements; Decoders; Adders/Subtractors; BCD arithmetic circuits; Encoders; Decoders/Drivers for display devices.

- SEQUENTIAL CIRCUITS**: Flip Flops : S-R; J-K; T; D; master-slave; edge triggered; shift registers; sequence generators; Counters; Asynchronous and Synchronous Ring counters and Johnson Counter; Design of Synchronous and Asynchronous sequential circuits.
- DIGITAL LOGIC FAMILIES**: Switching mode operation of p-n junction; bipolar and MOS. devices. Bipolar logic families:RTL; DTL; DCTL; HTL; TTL; ECL; MOS; and CMOS logic families. Tristate logic; Interfacing of CMOS and TTL families.
- A/D AND D/A CONVERTERS**: Sample and hold circuit; weighted resistor and R -2 R ladder D/A Converters; specifications for D/A converters. A/D converters : successive approximation; counting type.
- PROGRAMMABLE LOGIC DEVICES**: ROM; PLA; PAL; PEEL; GAL; FPGA and CPLDs.

TEXT BOOK

Jain, R.P., “Modern Digital Electronics”, 4th Ed.; Tata McGraw Hill, 2003

REFERENCE BOOKS

- Taub and Schilling, ”Digital Integrated Electronics”, Tata McGraw Hill,1997
- Malvino and Leach; ”Digital Principles and Applications”, 6th Edition, Tata McGraw Hill, 2006
- Mano, Morris, “Digital Design”, 3rd Edition, Prentice Hall of India,1994
- Gupta and Singhal, “Digital Electronics”, 2nd Edition, Dhanpat Rai and Sons, 2000.
- Wakerly, John F, ”Digital Design Principles and Practices”, 4th Edition, Prentice Hall of India, 2005

EC-251	ELECTRONICS ENGINEERING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To study V-I characteristics of diode; and its use as a capacitance.
- Study of the characteristics of transistor in Common Base configuration.
- Study of the characteristics of transistor in Common Emitter configuration.
- Study of V-I characteristics of a photo-voltaic cell.
- Study of characteristics of MOSFET/JFET in CS configuration.
- To plot characteristics of thyristor.
- To plot characteristics of UJT.
- To plot characteristics of diac and Triac.
- Introduction to Orcad PSPICE Software.
- Simulation of semiconductor device circuits using Orcad PSPICE.

REFERENCE BOOKS

- Boylestad and Nashelsky, “Electronic Devices and Circuits”, 4th Edition, Pearson Education, 1999.
- Bell David A., “Electronic Devices and Circuits”, 3rd Edition, Prentice Hall of India, 2007
- Bhargava N. N., “Basic Electronics and Linear Circuits”, Tata McGraw Hill, 2007
- Salivahan, “Electronics Devices and Circuits”, Tata McGraw Hill, 3rd Edition, 2003.

EC-252	ELECTRICAL ENGINEERING MATERIALS AND SEMI- CONDUCTOR DEVICES LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To study V-I characteristics of diode, and its use as a capacitance.
- Study of the characteristics of transistor in Common Base configuration.
- Study of the characteristics of transistor in Common Emitter configuration.
- Study of V-I characteristics of a photo-voltaic cell.
- Study of characteristics of MOSFET/JFET in CS configuration.
- To plot characteristics of thyristor.
- To plot characteristics of UJT.
- To plot characteristics of diac & Triac.
- Study of loss factor in a dielectric by an impedance bridge.
- Study of photo-resist in metal pattern for planar technology.

EC-254	ELECTRONIC MEASUREMENT AND INSTRUMENTATION LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Measurement of displacement using LVDT.
- Measurement of distance using LDR.
- Measurement of temperature using R.T.D.
- Measurement of temperature using Thermocouple.
- Measurement of pressure using Strain Gauge.
- Measurement of pressure using Piezo-Electric Pick up.
- Measurement of distance using Capacitive Pick up.
- Measurement of distance using Inductive Pick up.
- Measurement of speed of DC Motor using Magnetic Pick up.
- Measurement of speed of DC Motor using Photo Electric Pick up.

EC-256	NETWORK THEORY LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Transient response of RC circuit.
- Transient response of RL circuit.
- To find the resonance frequency, Band width of RLC series circuit.
- To calculate and verify "Z" parameters of a two port network.
- To calculate and verify "Y" parameters of a two port network.
- To determine equivalent parameter of parallel connections of two port network.
- To plot the frequency response of low pass filter and determine half-power frequency.
- To plot the frequency response of high pass filter and determine the half-power frequency.
- To plot the frequency response of band-pass filter and determine the band-width.
- To calculate and verify "ABCD" parameters of a two port network.
- To synthesize a network of a given network function and verify its response.
- Introduction of P-Spice

EC-257	DIGITAL ELECTRONICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Study of TTL gates – AND; OR; NOT; NAND; NOR; EX-OR; EX-NOR.
- Design and realize a given function using K-maps and verify its performance.
- To verify the operation of multiplexer and Demultiplexer.
- To verify the operation of comparator.
- To verify the truth tables of S-R; J-K; T and D type flip flops.
- To verify the operation of bi-directional shift register.
- To design and verify the operation of 3-bit synchronous counter.
- To design and verify the operation of synchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
- To design and verify the operation of asynchronous UP/DOWN decade counter using J K flip-flops and drive a seven-segment display using the same.
- To design and realize a sequence generator for a given sequence using J-K flip-flops.
- Study of CMOS NAND and NOR gates and interfacing between TTL and CMOS gates.
- Design a 4-bit shift-register and verify its operation. Verify the operation of a ring counter and a Johnson counter.

EC-301	ANALOG ELECTRONIC CIRCUITS	L T P	Cr
		5 0 0	3

OBJECTIVE

Most of the signals in physical world are analog; thus requiring array of analog circuits for conditioning of such signals. This subject deals with the study of circuits designed using Transistors/FETs. It also aims to impart knowledge to the students about Operational Amplifiers and their various linear and non linear applications

- FEEDBACK AMPLIFIERS:** Revision of Amplifiers (AE); Feedback concept; transfer gain with feedback; general characteristics of negative feedback amplifiers; Feedback Topologies: voltage series feedback; current series feedback; current shunt feedback; voltage shunt feedback and their impact on input and output resistance
- OSCILLATORS:** Sinusoidal oscillators; Barkhausen criteria; R-C phase shift oscillator; wien-bridge oscillator; crystal oscillator; General form of Oscillator Circuit; Hartley and Colpitt Oscillator
- POWER AMPLIFIERS:** Classification of Amplifiers; Distortions in Amplifiers; Class A large signal amplifiers; higher order harmonic distortion; efficiency; transformer coupled power amplifier; class B amplifier : efficiency and distortion; class A and class B push-pull amplifiers; Introduction to Class C and Class D power amplifiers
- OPERATIONAL AMPLIFIERS:** Emitter coupled differential amplifier; transfer characteristics of a differential amplifier; Ideal and practical operational amplifiers; Study of 741; inverting and

- non-inverting and differential configuration; Instrumentation Amplifier; DC Imperfections
- LINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:** Scale changer; phase shifter; adder; voltage to current converter; current to voltage converter; DC voltage follower; Bridge amplifier; AC coupled amplifier; AC voltage follower; Integrator; differentiator.
 - NONLINEAR APPLICATIONS OF OPERATIONAL AMPLIFIERS:** Comparators; sample and hold circuits; Logarithmic/anti-log amplifier; logarithmic multiplier; Miller and Bootstrap sweep generators; multivibrators and waveform generators; Voltage Controlled Oscillators; Monolithic Timer – NE555 and its applications; ADC.
 - FILTERS:** Active RC Filters: Idealistic and Realistic response of filters (LP; BP; and HP); Butter worth and Chebyshev filter functions all pass; Notch Filter; Operational transconductance amplifier (OTA)-C filters.

TEXT BOOK

Millman Halkias, "Integrated Electronics", 6th Edition, Tata McGraw Hill, 2008

REFERENCE BOOKS

- Sedra and Smith, "Microelectronic Circuits", 2nd Edition, Oxford, 2004.
- Gaekwad, "Operational Amplifier", 8th Edition, Prentice Hall of India, 2009.
- Neamen, Donald A., "Electronic Circuit Analysis and Design", 2nd Edition, Tata McGraw Hill, 2002.
- Franco, Sergio, "Design with Operational Amplifiers and Analog Integrated Circuit", 3rd Edition, Tata McGraw Hill, 2001.

EC-302	MICROPROCESSORS & INTERFACING	L T P 5 0 0	Cr 3
--------	-------------------------------	----------------	---------

OBJECTIVE

This subject introduces the concept of Microprocessors to the students. It covers 8 bit (8085) and 16-bit (8086) Microprocessors: their architecture, assembly language programming and interfacing with peripheral devices

PRE-REQUISITES

Knowledge of Boolean algebra, number systems and basic digital circuitry

- THE 8085 PROCESSOR:** Introduction to microprocessor; 8085 microprocessor: Architecture; Pin Diagram; instruction set; interrupt structure; Addressing modes and assembly language programming.
- THE 8086 MICROPROCESSOR ARCHITECTURE:** Architecture; block diagram of 8086 with details of sub-blocks; memory segmentation and physical address computations; program relocation; addressing modes; pin diagram and description of various signals; Interrupt Structure.
- INSTRUCTION SET OF 8086:** Data transfer instructions; arithmetic instructions; branch instructions; looping instructions; NOP and HLT instructions; flag manipulation instructions; logical instructions; shift and rotate instructions; directives; programming examples.

- INTERFACING DEVICE:** The 8255 PPI chip: Architecture; control words and modes; interfacing and programming with 8085.
- DMA:** Introduction to DMA process; 8257 pin diagram; architecture; operation; command words; interfacing and programming with 8085.
- PROGRAMMABLE INTERRUPT CONTROLLER:** 8259 pin diagram; architecture; initialization command words; operational command words.
- PROGRAMMABLE INTERVAL TIMER:** 8253 pin diagram; architecture; modes.

TEXT BOOK

Gaonkar, Ramesh S., "Microprocessor Architecture: Programming and Applications with 8085", 5th Edition, Prentice Hall of India, 1995

REFERENCE BOOKS

- Brey, "The Intel Microprocessors 8086- Pentium Processor", 4th Edition, 2005
- Hall, "Microprocessors and interfacing", Tata McGraw Hill, 3rd Edition, 2003
- Liu Yu-Chang and Gibson Glenn A., "Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design", Prentice Hall of India, 2003
- Ray A. K. and Burchandi, "Advanced Microprocessors and Peripherals Architectures, Programming and Interfacing", Tata McGraw Hill, 2002
- Rafiquzzman, "Microprocessor based System Design UBS" Wiley-Interscience, 5th Edition, 2005

EC-303	ANTENNA AND WAVE PROPAGATION	L T P 5 0 0	Cr 3
--------	------------------------------	----------------	---------

OBJECTIVE

The basic objective of Antenna and Wave Propagation is communication of information from source to destination and to understand the basic theory of electromagnetic waves traveling from transmitter to receiver. This course explains how antenna converts the electrical energy in the electromagnetic wave and vice versa. This course also explains the various types of transmitting and receiving antennas recently in use.

- ANTENNA PRINCIPLE:** Introduction to antenna; radiating system; vector potential; retarded vector potential; definition of various potentials used in antenna theory; radiation from an oscillating current elements; power radiated by a current element; short dipole antenna; effective length of short antenna; field strength of isotropic antenna in terms of power; radiation from a quarter wave monopole.
- ANTENNA PARAMETERS:** Isotropic radiators; radiation pattern antenna gain or directivity; beamwidth and polarization; antenna efficiency; radiating resistance; aperture of antenna; Reciprocity theorem for antenna; antenna impedance; antenna temperature and signal to noise ratio.
- THE ELECTRIC DIPOLE AND LINEAR ANTENNAS:** The short electric dipole; field of a short dipole; radiation resistance of short electric dipole; linear antenna; half wave antenna; antenna

impedance; directivity; radiation resistance and directional properties of half wave dipole; effect of ground on antenna pattern; input impedance; broad band matching.

4. **ANTENNA ARRAYS:** Two element array; broad side; End fired pattern; Beam width pattern multiplication; multi element array and their properties; Synthesis of an array.
5. **PRACTICAL ANTENNAS:** Parabolic reflectors; cassegrain antennas; horn antennas; lens antennas; Yagi-Uda antennas; Yagi-Uda modifications; broad band antennas; microstrip antennas.
6. **ANTENNA MEASUREMENTS:** Radiation pattern measurements; gain measurements; phase measurements; measurements of antenna efficiency; impedance measurements.
7. **PROPAGATION:** Ground waves; Space waves; Effect of Earth; Duct formation; Ionosphere; and sky waves.

TEXT BOOK

Kraus, J.D., "Antennas", 2nd Edition, Tata McGraw Hill, 2003.

REFERENCE BOOKS

1. Prasad., K.D., "Antenna and Wave Propagation" 8th Edition, Dhanpat Rai Publication, 2000.
2. Collin, "Antenna and Radiowave Propogation" 3rd Edition ,Tata McGraw Hill 2004.
3. Jordan and Balman, "Electromagnetic Waves and Radiating Systems", 6th Edition, Prentice Hall of India, 2007.
4. Sharma, K.K., "Antenna and Wave Propagation"; Shubham Publications.

EC-304	DIGITAL SYSTEM DESIGN	L T P	Cr
		5 1 0	4

OBJECTIVE

This course provide student with a foundation in digital system. The course will explore the essential topic related to the design of modern digital circuit and to go about designing complex, high speed digital system and implement such design using programmable logic.

1. **INTRODUCTION:** Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL; data objects; classes and data types; Operators; Overloading; logical operators. Types of delays Entity and Architecture declaration. Introduction to behavioural; dataflow and structural models.
2. **VHDL STATEMENTS:** Assignment statements; sequential statements and process; conditional statements; Generate statement; case statement Array and loops; resolution functions; concurrent statements.
3. **ADVANCE VHDL STATEMENTS:** Packages and Libraries; Subprograms: Application of Functions and Procedures; Structural Modelling; component declaration; structural layout and generics; Configuration Statements
4. **COMBINATIONAL CIRCUIT DESIGN:** VHDL Models and Simulation of combinational circuits

such as Multiplexers; Demultiplexers; encoders; decoders; code converters; comparators; implementation of Boolean functions etc.

5. **SEQUENTIAL CIRCUITS DESIGN:** VHDL Models and Simulation of Sequential Circuits Flip Flops; Shift Registers; Counters etc.
6. **ADVANCED TOPICS IN VHDL:** Introduction to FSM; Test Benches; ALIAS; Generate statement.
7. **DESIGN OF DIGITAL SYSTEM:** Basic components of a computer; specifications; architecture of a simple computer system; Design of ALU; Memory Unit; CPLDs and FPGAs. Design implementation using CPLDs and FPGAs

TEXT BOOK

Brown and Vranesic, "Fundamentals of Digital Logic with VHDL Design", Tata McGraw Hill, 2nd Edition, 2000

REFERENCE BOOKS

1. IEEE Standard VHDL Language Reference Manual, 1993.
2. Chang, K.C., "Digital Design and Modelling with VHDL and Synthesis", 1st Edition, Wiley-IEEE Computer Society Press., 1999
3. Bhasker, "A VHDL Primmer", 2nd Edition, Star Galaxy, 1998.
4. Roth, Charles. H., "Digital System Design Using VHDL", PWS, 1998.
5. Navabi, Z, "VHDL-Analysis and Modelling of Digital Systems", 2nd Edition, McGraw Hill, 1998.
6. Douglas, Perry L., "VHDL" IV Edition, Tata McGraw Hill, 2008
7. Ercegovac, Lang and Moreno, "Introduction to Digital Systems", PWS, 2000.
8. Jain, R.P., "Modern Digital Electronics", 3rd Edition, Tata McGraw Hill, 2003.

EC-305	EMBEDDED SYSTEM DESIGN	L T P	Cr
		5 1 0	4

OBJECTIVE

The course intends to cover the design issues involved in embedded systems and system-on-chip technologies. The course also deals with the applications and programming languages and processor architectures used for embedded systems. This course introduces the students to standard Embedded System Development tools and gives a hands-on experience in developing various embedded applications.

1. **INTRODUCTION:** Different types of microcontrollers: Embedded microcontrollers; External memory microcontrollers; Processor Architectures: Harvard V/S Princeton; CISC V/S RISC; microcontrollers memory types; Introduction to Real Time Operating System.
2. **8051 MICROCONTROLLER ARCHITECTURE:** Architecture; memory considerations; Addressing modes; clocking; i/o pins; interrupts; timers; peripherals; serial communication; Instruction set; simple operations.
3. **PIC MICROCONTROLLER ARCHITECTURE:** Introduction to PIC microcontrollers; Architecture and pipelining; program memory considerations;

- Addressing modes; CPU registers; Instruction set; simple operations.
- INTERRUPTS AND I/O PORTS:** Interrupt logic; Timer2 scalar initialization; In-Service Interrupt service routine; loop time subroutine; External interrupts and timers; Synchronous serial port module; Serial peripheral device; O/p port Expansion; I/p port expansion; UART.
 - SOFTWARE:** Development tools/ environments; Assembly language programming style; Interpreters; High level languages; Intel hex format object files; Debugging.
 - PROGRAMMING WITH MICROCONTROLLERS:** Arithmetic operations; Bit addressing; Loop control; Stack operation; Subroutines; interfacing of 8051 with LCD; LED; Keyboard; Motors; Seven segment and other interfacing. PIC simple operations.
 - DESIGNING USING MICROCONTROLLERS:** Music box; Mouse wheel turning; PWM motor control; Aircraft Demonstration; ultra sonic distance measuring; Temperature Sensor; Pressure Sensor; Magnetic Field Sensor.

TEXT BOOK

Peatman, John B., "Design with PIC Microcontrollers", 4th edition, Pearson Education, 2005.

REFERENCE BOOKS

- Mazidi; "8051 Microcontroller", 2nd Edition, Prentice Hall, 2005.
- Predko; "Programming and Customizing the 8051 Microcontroller", 2nd Edition, McGraw Hill, 2002.
- John Catsoulis; "Designing Embedded Hardware", 2nd Edition, O'Media, 2005.
- Barr, Michael, "Programming Embedded Systems in C and C++", 3rd edition, Shroff Pub. and Distr. ND, 2003.
- Ayala, A.J., "The 8051 Microcontroller: Architecture, Programming and Applications", Pap/Dsk Edition, West Publishing Company, 1991
- Shankar, Udai, "8051 Microcontrollers", CSVTU Research Journal, Chhattisgarh Swami Vivekanand Technical University, 2010.

EC-306	COMMUNICATION ENGINEERING	L T P	Cr
		5 1 0	4

OBJECTIVE

To study about the behavior and noise performance characteristics of the various methods; processes involved in the communication equipments. It includes the mathematical analysis of various principles and processes; their merits and demerits. It also involves the coding and decoding of information to be transmitted.

- INTRODUCTION TO SIGNALS:** Classification of signals; basic operations of signals; Fourier-Series; Fourier Transforms;
- INTRODUCTION TO SYSTEMS:** Classifications of systems; LTI systems; convolution Theorem; Correlation; Cross-correlation and autocorrelation.
- BASIC OF RANDOM VARIABLE:** Representation of random signals; concepts of probability; probability of joint occurrence; conditional

probability; discrete probability theory; continuous random variables; probability distribution function; probability density functions; joint probability density functions.

- RANDOM PROCESSE:** Statistical average and moments. Ergodic processes; correlation function; power spectral density. central limit theory; response of linear system to random signals. Error function; regularity; covariance relation among the spectral densities of the two input-output random processes. Cross spectral densities; optimum filters.
- MULTIPLE RANDOM VARIABLES:** Introduction to multiple random variable; joint density function; joint distribution function; condition distribution function; conditional mean and variance functions.
- INFORMATION THEORY:** Introduction to information and entropy; information rate; joint and conditional entropy and redundancy; mutual information; channel capacity for discrete and continuous channels; Shannon's Theorem; Shannon-Hartley Theorem; Noisy-channels.
- CODING THEORY:** Source coding; fixed and variable length code wards; Shannon-Fano coding; minimum redundancy (Huffman) coding; Hamming Codes; Cyclic Codes; Cyclic Redundancy Code (CRC); maximization of entropy of a continuous message transmission rate; effect of medium on the information; selection of channels; effect of noise and its minimization.

TEXT BOOK

Haykins, Syman, "Communication System", 8th Edition, Wiley, 2009.

REFERENCE BOOKS

- Lathi, B.P., "Modern Digital and Analog Communication Systems", 3RD Edition, Oxford University Press, USA, 1998
- Taub and Schilling, "Principles of Communication Systems", 2nd edition, Tata McGraw Hill, 1986
- Singh and Sapre, "Communication Systems: Analog and Digita", 2st Edition, Tata McGraw Hill, 2008

EC-307	WIRELESS COMMUNICATION	L T P	Cr
		5 1 0	4

OBJECTIVE

To cover the entire concept behind the cellular technology, including, the standards like GSM; CDMA and various design parameters for wireless system. Going through these topics will help the students to face telecom sector and software companies.

- INTRODUCTION TO WIRELESS COMMUNICATION SYSTEMS:** Evolution of mobile radio communications; examples of wireless comm. systems; paging systems; Cordless telephone systems; comparison of various wireless systems.
- MODERN WIRELESS COMMUNICATION SYSTEMS:** Second generation cellular networks; third generation wireless networks; wireless in local loop; wireless local area networks; Blue tooth and Personal Area networks.

3. **INTRODUCTION TO CELLULAR MOBILE SYSTEMS:** Spectrum Allocation; basic Cellular Systems; performance Criteria; Operation of cellular systems; analog cellular systems; digital Cellular Systems.
4. **CELLULAR SYSTEM DESIGN FUNDAMENTALS:** Frequency Reuse; channel assignment strategies; handoff Strategies; Interference and system capacity; tracking and grade off service; improving coverage and capacity.
5. **MULTIPLE ACCESS TECHNIQUES FOR WIRELESS COMMUNICATION:** Introduction to Multiple Access; FDMA; TDMA; Spread Spectrum multiple Access; space division multiple access; packet ratio; capacity of a cellular systems.
6. **WIRELESS NETWORKING:** Difference between wireless and fixed telephone networks; development of wireless networks; fixed network transmission hierarchy; traffic routing in wireless networks; wireless data services; common channel signaling; ISDN (Integrated Services digital Networks); advanced intelligent networks.
7. **INTELLIGENT CELL CONCEPT AND APPLICATION:** Intelligent cell concept; applications of intelligent micro-cell Systems; in-Building Communication; CDMA cellular Radio Networks.

TEXT BOOK

Rappaport, Theodore S., "Wireless Communications", 5th Edition, Pearsons, 2008.

REFERENCE BOOK

1. Schiller, Jochen, "Mobile Communications", 2nd Edition, Addison Wesley, 2003
2. Lee, W.C.Y., "Mobile Cellular Telecommunication", 2nd Edition, McGraw Hill, 1998

EC-308	MOS IC's AND TECHNOLOGY	L T P	Cr
		5 1 0	4

OBJECTIVE

The objective of this course is to introduce the students to the concepts in VLSI circuits. The course also aims to provide students with the knowledge required to design, implement, and test digital VLSI circuits through nMOS, pMOS, and CMOS and BiCMOS technologies and to integrate those VLSI circuits in complex digital systems.

1. **FUNDAMENTALS OF MOS TECHNOLOGY:** Introduction to IC technology; MOS Transistor enhancement mode and depletion mode operations; fabrication of NMOS; CMOS and BiCMOS devices. Equivalent circuit for MOSFET and CMOS.
2. **VLSI FABRICATION - I:** Crystal growth; wafer preparation; epitaxy; oxidation; lithography; etching;
3. **VLSI FABRICATION - II:** Diffusion; dielectric and poly-silicon film deposition; ion implantation; yield and reliability; metalization.
4. **MOS TRANSISTOR THEORY:** MOS device design equations; MOS transistor; Evaluation aspects of MOS transistor; threshold voltage; MOS transistor transconductance and output

conductance; figure of merit; determination of pull-up to pull-down ratio for an n-MOS inverter driven by another n-MOS inverter and by one or more pass transistor; alternative forms of pull-up; CMOS and BiCMOS-inverters. Latch up in CMOS circuitry and BiCMOS Latch up susceptibility.

5. **MOS CIRCUITS AND LOGIC DESIGN:** Basic physical design of simple logic gates using n-MOS; p-MOS and CMOS; CMOS logic gate design considerations; CMOS logic structures; clocking strategies.
6. **CIRCUIT CHARACTERIZATION AND PERFORMANCE ESTIMATION:** Resistance estimation; capacitance estimation; inductance; switching characteristics; CMOS gate transistor sizing; power dissipation.
7. **DESIGN EXAMPLE USING CMOS :** Incrementer / decrementer; left/right shift serial/parallel register; comparator for two n-bit number; a two-phase non-overlapping clock generator with buffered output on both phases; design of an event driven element for EDL system

TEXT BOOK

Weste, N.H.F and Eshrhgian, "Principal of CMOS VLSI Design", 2nd Edition, John Wiley & sons, 2000

REFERENCE BOOKS

1. Kang, Sung-MO and Leblebici, Yusuf, "CMOS Integrated Circuit", 3rd Edition, Tata McGraw Hill, 1999.
2. Botkar, K.R., "Integrated Circuit", 4th Edition, Prentice Hall of India, 2000.
3. Sze, S.M., "VLSI Technology", 2nd Edition, Tata McGraw Hill, 2001.
4. Pucknell, Douglas A., "Basic VLSI Design", Kamsan Eshraghian, 5th Edition, Prentice Hall of India, 2005.

EC-309	DIGITAL SIGNAL PROCESSING	L T P	Cr
		5 0 0	3

OBJECTIVE

- To induce a thorough understanding of theory of DSP.
- To get in-depth knowledge of various applications- Filters, MultiMate DSP, DSP to speech & Radar, Transforms etc.

1. **DISCRETE-TIME SIGNALS:** Signal classifications; frequency domain representation; time domain representation; representation of sequences by Fourier transform; properties of Fourier transform; discrete time random signals; energy and power theorems.
2. **DISCRETE-TIME SYSTEM:** Classification; properties; time invariant system; finite impulse Response (FIR) system; infinite impulse response (IIR) system.
3. **SAMPLING OF TIME SIGNALS:** Sampling theorem; applications; frequency domain representation of sampling, reconstruction of band limited signal from its samples; discrete time processing of continuous time signals; changing the sampling rate using discrete time processing.

4. **Z-TRANSFORM:** Introduction, properties of the region of convergence; properties of the Z-transform, inversion of the Z-transform, applications of Z-transform.
5. **BASICS OF DIGITAL FILTERS:** Fundamentals of digital filtering; various types of digital filters; design techniques of digital filters: window technique for FIR, bi-linear transformation and backward difference methods for IIR filter design, analysis of finite word length effects in DSP; DSP algorithm implementation consideration. Applications of DSP.
6. **ERRORS IN DIGITAL FILTERING:** Errors resulting from rounding and truncation, round-off effects in digital filters. Finite word length effects in digital filter.
7. **MULTIRATE DIGITAL SIGNAL PROCESSING:** Introduction to multirate digital signal processing; sampling rate conversion; filter structures; multistage decimator and interpolators; digital filter banks.

TEXT BOOK

Proakis and Manolakis, "Digital Signal Processing", Prentice Hall of India.

REFERENCE BOOKS

1. Salivahanan, Vallavaraj and Gnanapriya, "Digital Signal Processing", Tata McGraw Hill.
2. V. Alon., Oppenheim, "Digital Signal Processing", Prentice Hall of India
3. Mitra, "Digital Signal Processing", 2nd Edition, Tata McGraw Hill

EC-310	TELEVISION ENGINEERING	L T P	Cr
		5 1 0	4

OBJECTIVE

To provide an insight of fundamentals of TV systems and get indepth knowledge of various applications of TV – Cable TV; Satellite TV; VCR; TV games; Digital TV; HDTV.

1. **ELEMENTS OF A TELEVISION SYSTEM:** Picture transmission; sound transmission; picture reception; sound reception; receiver controls. Aspect Ratio; Scanning; Number of Scanning Lines; Flicker; Fine Structure; Interlace Scanning; Tonal gradation.
2. **COMPOSITE VIDEO SIGNAL:** Positive and Negative modulation; Video signal dimensions; horizontal sync details; vertical sync details; scanning sequence details; functions of vertical pulse train; sync details of 525 line system.
3. **SIGNAL TRANSMISSION AND CHANNEL BANDWIDTH:** Amplitude Modulation; channel bandwidth; vestigial side band transmission; Transmission efficiency; complete channel bandwidth; frequency modulation; FM channel bandwidth; channel bandwidth for color transmission; allocation of frequency bands for television signal transmission; television standards.
4. **CAMERA TUBE AND PICTURE TUBE:** Camera Tube- image orthicon; Vidicon; Monochrome picture tube; Beam deflection; screen phosphor; face plate; pincushion effect; implosion.

5. **COLOR TELEVISION FUNDAMENTALS:** Compatibility; the luminance signal; Chrominance Signal; Additive Mixing of Colours; Grassman's Law; chromaticity diagram; bandwidth for color signal transmission; three color television camera.
6. **COLOR SIGNAL TRANSMISSION AND RECEPTION:** Basic block diagram of color transmitter and color receiver; color picture tube – Trinitron.
7. **TELEVISION APPLICATIONS AND MODERN TELEVISION:** Cable television; television via satellite; microprocessor controlled TV games; Introduction to LCD and Plasma TV.

TEXT BOOK

Gulati, R.R., "Monochrome and Color Television"; 4th Edition, New Age, 2000.

REFERENCE BOOKS

1. Bali, S.P., "Color TV theory and Practice", 3rd Edition, Tata McGraw Hill, 2001.
2. Dhake, "TV and Video Engineering" 2nd Edition, Tata McGraw Hill, 2002.

EC-351	ANALOG ELECTRONIC CIRCUITS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Study the effect of voltage series; current series; voltage shunt; and current shunt feed- back on amplifier using discrete components.
2. Design and realize inverting amplifier; non-inverting and buffer amplifier using 741 Op Amp.
3. Verify the operation of a differentiator (ideal and practical) circuit using 741 op amp and show that it acts as a high pass filter.
4. Verify the operation of a integrator circuit (ideal and practical) using 741 op amp and show that it acts as a low pass filter.
5. Design and verify the operations of op amp adder and subtractor circuits.
6. Plot frequency response of AC coupled amplifier using op amp 741 and study the effect of negative feedback on the bandwidth and gain of the amplifier.
7. Design and realize using op amp 741; Sine wave oscillator.
8. To design and realize using op amp 741; triangular wave generator.
9. To design and realize using op amp 741; logarithmic amplifier and VCCS.
10. Study of Timer circuit using NE555 and configuration for monostable and astble multivibrator
11. Realization of a V-to-I and I-to-V converter using Op-Amps.
12. To Study and construct class-A and class-B Power amplifier
13. To study and construct Active filters using Op amps

EC-352	MICROPROCESSORS AND INTERFACING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Familiarization with the operation of 8085 Microprocessor kit.

2. Write a program using 8085 for:
 - a) Addition of two 8-bit numbers.
 - b) Addition of two 16-bit numbers
3. Write a program using 8085 for :
 - a) 8-bit subtraction
 - b) 16-bit subtraction
4. Write a program using 8085 for
 - a) Multiplication of two 8- bit numbers
 - b) Division of two 8- bit numbers
5. Write a program using 8085 to arrange an array of 10 Nos in-
 - a) Ascending order
 - b) Descending order
6. Familiarization with the operation of 8086 microprocessor kit
7. Write a program using 8086 for copying 12 bytes of data from source to destination.
8. Write a program using 8086 for:
 - a) Finding the largest number from an array.
 - b) Finding the smallest number from an array.
9. Write a program using 8086 for arranging an array of numbers in descending order and ascending order
10. Write a program for finding square of a number using look-up table and verify.
11. Write a program to interface a two digit number using seven-segment LEDs. Use 8085 microprocessor and 8255 PPI.

EC-354	DIGITAL SYSTEM DESIGN LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Design all gates using VHDL.
2. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
 - a) half adder
 - b) full adder
3. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
 - a) multiplexer
 - b) demultiplexer
4. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
 - a) decoder
 - b) encoder
5. Write a VHDL program for a comparator and check the wave forms and the hardware generated
6. Write a VHDL program for ALU.
7. Write a VHDL program for a FLIP-FLOP and check the wave forms and the hardware generated
8. Write a VHDL program for a counter and check the wave forms and the hardware generated
9. Write VHDL programs for the following circuits; check the wave forms and the hardware generated
 - a) register
 - b) shift register
10. Implement any three (given above) on FPGA/CPLD kit

EC-355	EMBEDDED SYSTEM DESIGN LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

8051 Micro Controller

1. Write an Assembly language Programme (ALP) to generate 10kHz square wave.

2. Write an ALP to generate 10 kHz frequency using interrupts.
3. Write an ALP to interface one Microcontroller with other using serial/parallel communication.
4. Write an ALP for temperature and pressure measurement and to display on intelligent LCD display
5. Study of Development tools/environment for Microcontroller Programme.
6. Develop an embedded system for traffic light controller using Micro controller
7. Develop an embedded system for the automatic motion of a car (Model of car) and Subsequent display on LCD using Microcontroller.

PIC Microcontroller

8. Write an ALP for PWM based speed control of motor.
9. Write an ALP for PWM based regulator of voltage.
10. Write an ALP to send/receive the data from an computer to MC through serial communication

EC-358	MOS IC's AND TECHNOLOGY LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. Introduction to the Simulation software PSPICE.
2. To obtain the drain current of the enhancement PMOS using PSPICE. Also compare with the theoretical value.
3. To obtain the noise margin of a CMOS inverter using PSPICE.
4. To obtain dynamic power dissipation of a CMOS inverter using PSPICE.
5. To obtain propagation delay of CMOS NAND gate using PSPICE.
6. To plot voltage transfer characteristics of a depletion load MOSFET with substrate connected to ground.
7. Evaluation of transient response of enhancement MOSFET and comparison.
8. Evaluation of frequency response of CMOS amplifier.
9. To study the effect of change in temperature on CMOS inverter.
10. To study the effect of change in W/L ratio on CMOS inverter.
11. Study of power dissipation in Pseudo-NMOS inverter and comparison with CMOS inverter using PSPICE.
12. Evaluation of electrical parameters of an OPAMP

EC-359	DIGITAL SIGNAL PROCESSING LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

Perform the experiments using MATLAB:

1. To represent basic signals (Unit step, unit impulse, ramp, exponential, sine and cosine).
2. To develop program for discrete convolution.
3. To develop program for discrete correlation.
4. To understand stability test.
5. To understand sampling theorem.

6. To design analog filter (low-pass, high pass, band-pass, band-stop).
7. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).
8. To design FIR filters using windows technique.
9. To design a program to compare direct realization values of IIR digital filter
10. To develop a program for computing parallel realization values of IIR digital filter.
11. To develop a program for computing cascade realization values of IIR digital filter
12. To develop a program for computing inverse Z-transform of a rational transfer function.

EC-401	MOBILE COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

This subject covers the entire concept behind the cellular technology. It covers the different standards like GSM; CDMA and going through these topics will help the students to face telecom sector and software companies.

1. **MOBILE RADIO SYSTEM:** reference model; frequencies for radio transmission; signals; antennas; signal propagation; multiplexing; modulation
2. **CHARACTERISTICS OF RADIO WAVES:** Multipath characteristics of radio waves; signal fading; time dispersion; Doppler spread; coherence time; LCR ; fading statistics; diversity techniques
3. **MOBILE RADIO PROPAGATION:** Mechanism; free space path loss; long distance path loss model; Okumara model; Hata model, PCS model; wideband PCS; Microcell model; indoor propagation model; Jake's channel model
4. **WIRELESS SYSTEMS:** GSM: architecture; services; frame structure; signal processing
Wireless data services :RAM; CDPD; GPRS
5. **WI-FI AND THE IEEE STANDARD 802.11:** 802.11 architecture; MAC layer; PHY layer; Bluetooth and the IEEE standard 802.15
6. **MOBILE NETWORK LAYER: MOBILE IP:** Goals and requirements; IP packet delivery; agent discovery; registration; tunneling and encapsulation; optimization; reverse tunneling; IP-V6; Mobile ad-hoc networks
7. **MOBILE TRANSPORT LAYER:** Traditional TCP; classical TCP improvement; TCP over 2.5 G/3G wireless networks; performance enhancing proxies

TEXT BOOKS

Rappaport, T.S., "Wireless Communication, Principles and Practice"; 2nd Edition, Prentice Hall of India, 2001

REFERENCE BOOK

1. Schiller, Jochen "Mobile communication" 2nd Edition, Pearson Education, 2005
2. William, C. Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, McGraw Hill, 1995.

EC-402	MICROWAVE AND RADAR ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

- To understand theoretical principals underlying microwave devices and networks
- To study microwave components such as power dividers; hybrid junctions; cavity resonant ferrite devices; and a single stage microwave transistor amplifiers and various results of electromagnetic theory including Maxwell's Equations.

1. **TRANSMISSION LINE THEORY:** Transmission line as a distributed circuit; transmission line equation and parameters; traveling and standing wave; characteristic impedance; VSWR; reflection coefficients; smith chart and applications.
2. **WAVEGUIDES:** Introduction; comparison with transmission lines; propagation in TE and TM mode; rectangular wave guide; TEM mode in rectangular wave guide; characteristic impedance; introduction to circular waveguides and planar transmission lines.
3. **MICROWAVE COMPONENTS:** S-parameters; Directional couplers; tees; hybrid ring; attenuators; cavity resonators; mixers and detectors; phase shifter; Ferrite devices: Isolators; circulators and gyrators.
4. **MICROWAVE TUBES:** Limitation of conventional tubes; Construction; operation and properties of Klystron amplifier; reflex Klystron; magnetron; TWT; BWO ; crossed field amplifiers.
5. **MICROWAVE SOLID STATE DEVICES:** Varactor diode; Tunnel diode; Schottky diode; GUNN diode; IMPATT; TRAPATT and PIN diodes. MASER; parametric amplifiers.
6. **MICROWAVE MEASUREMENTS :** Power measurement using calorimeter and bolometers; measurement of SWR; frequency; wavelength and impedance. Microwave bridges.
7. **INTRODUCTION TO RADAR :** Block Diagram and operation; Radar Frequencies; Simple form of Radar Equation; Prediction of Range Performance; Pulse Repetition frequency and Range Ambiguities; Applications of Radar

TEXT BOOK

Liao, Samuel, "Microwave Devices and Circuits", 3rd Edition, Prentice Hall of India, 1996.

REFERENCE BOOKS

1. Sharma, K.K., "Microwave and Radar", S.Chand, 2007.
2. Kulkarni, M, "Microwave Devices and Radar Engineering", 2nd Edition, Umesh Publications, 2002.
3. Maini, A.K., "Microwaves and Radar"; Khanna Publications, 2001.
4. Das, "Microwave Engineering", Tata McGraw Hill, 2000.
5. Sharma; K.K., "Radar; Sonar and Navigation Engineering"; S.K. Kararia and Sons, 2006.

EC-403	OPTICAL COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The aim of this course is to describe the various technologies, implementation, methodologies and performance measurement techniques that make optical fibre communication system possible.

- 1. INTRODUCTION TO OPTICAL COMMUNICATION SYSTEMS:** Electromagnetic spectrum used for optical communication; block diagram of optical communication system. Basics of transmission of light rays. Advantages of optical fiber communication.
- 2. OPTICAL FIBERS:** Optical fibers structures and their types; fiber characteristics : attenuation; scattering; absorption; fiber bend loss; dispersion; fiber couplers and connectors; splicing jointing
- 3. LED LIGHT SOURCE:** Light emitting diode : recombination processes; the spectrum of recombination radiation; LED characteristics; internal quantum efficiency; external quantum efficiency; LED structure; lens coupling to fiber; behavior at high frequencies.
- 4. LASER LIGHT SOURCE:** Basic principles of laser action in semi -conductors; optical gain; lasing threshold; laser structures and characteristics; laser to fiber coupling; comparison with LED source.
- 5. AVALANCHE AND PIN PHOTODETECTORS:** Principles of optical detection; quantum efficiency; responsivity; general principles of PIN photodetector; intrinsic absorption; materials and designs for PIN photodiodes; impulse and frequency response of PIN photodiodes; noise in PIN Photodiodes; multiplication process; APD Design; APD bandwidth; APD noise.
- 6. OPTICAL AMPLIFIERS:** optical amplifier; optical cavity; Laser amplifiers; Doped fibre amplifiers; Noise Gain saturation Inhomogeneous broadening effects Polarization effects Erbium-doped fibre amplifiers Doped fibre amplifiers for other wavelength ranges Semiconductor optical amplifier (SOA) Vertical-cavity SOA Raman amplifier Optical parametric amplifier.
- 7. OPTICAL MODULATORS and DEMODULATORS:** Optical modulator Electro-optic modulator ; Spatial light modulator Optical tweezers Modulating retro-reflector Optical DPSK demodulator Delay line interferometer Michelson interferometer Optical hybrid Phase detector (section Optical phase detectors) Laserdisc Phase-shift keying T-carrier Photoelastic modulator Superheterodyne receiver Symbol rate Lock-in amplifier Orthogonal frequency-division multiplexing (redirect Optical Orthogonal Code) Telecommunication

TEXT BOOK

Selvarajan, Kar Srinivas, "Optical Fiber Communication", 4th Edition, Tata McGraw Hill, 2003.

REFERENCE BOOKS

1. Keiser, G., "Optical Fiber Communication", Tata McGraw Hill; 2008.

2. Aggarwal, Govind P., "Fiber Optic Communication System", 3rd Edition; John Wiley Publication; 1989.
3. Palais, Joseph C., "Fiber Optic Communication" 4th Edition, Prentice Hall of India, 2005.
4. Ramaswami, R. and Swarajan, K.N., "Optical Networks: a Practical Perspective", Morgan Kaufmann Publishers, 1998.
5. Gowar, J., "Optical Fiber Communication System", Prentice Hall of India, 1995
6. Senior, J.M., "Optical Fiber Communication Principles and Practice", Prentice Hall of India; 1992

EC-404	DATA COMMUNICATION	L T P	Cr
		5 1 0	4

OBJECTIVE

The subject focuses on the basic concepts involved in data communication particular attention is paid to be aspects of coding, modulation techniques, networks used, flow of data along with its security and multiplexing techniques.

- 1. DIGITAL COMMUNICATION:** Introduction; digital communication; Shannon limit for information capacity; digital radio; digital amplitude modulation; frequency shift keying (FSK); phase shift keying (PSK); quadrature amplitude modulation (QAM); band width efficiency; carrier recovery; differential phase shift keying;(DPSK); clock recovery; probability of error and bit error rate; trellis encoding. NRZ Encoding Operation; Bandwidth; Use with synchronous and asynchronous circuits. Manchester Encoding Operation; Bandwidth; Use in Ethernet.
- 2. DATA COMMUNICATIONS:** Introduction; history of data communication; standard organization for data communication; data communication circuits; data communication codes; error control; synchronization; data communications hardware;
- 3. DATA COMMUNICATION INTERFACES:** Serial interfaces: RS-232; RS-449 and RS-530; CCITT X.21; parallel interfaces: centronics parallel interfaces. the telephone network: DDD network; private- line service; the telephone circuit; data modems: synchronous modems; asynchronous modems; modem synchronization.
- 4. DATA COMMUNICATIONS PROTOCOLS AND NETWORK CONFIGURATIONS:** Introduction; open system interconnection (OSI); data transmission mode; asynchronous protocols; synchronous protocols; public data network; integrated services digital network (ISDN); local area networks; token pass ring; Ethernet. Packet headers; pipelining; datagram networks; (e.g. Internet) Communications between layers Protocols Peer to Peer Communication between Remote Layers Service Access Points Service Primitives and Communication Between Adjacent Layers
- 5. MULTIPLEXING:** Introduction; time division multiplexing; T1 digital carrier system; CCITT time division multiplexed carrier systems; CODECS; COMBO chips; line encoding; T-CARRIERS; frame synchronization; Drawing Frame Transition Diagrams Time Axis; Effect of data rate; Effect of

- propagation delay. Calculating Utilisation Size of frame headers; Transmission delay. Calculating Throughput bit interleaving VS word interleaving; frequency division multiplexing; ATandT's FDM hierarchy; composite base band signal; formation of a master group.
- INTERNET AND TCP/IP:** Introduction; history; use of Internet; accessing the Internet; Internet addresses; security on the internet; authentication; firewalls; intranet and extranet;
 - TCP/IP:** Introduction to TCP/IP reference model; domain name service; World Wide Web. IP over Ethernet Encapsulation; Protocol headers added on transmission. Hardware Address (i.e. MAC address) Difference between network address and link layer hardware address. Address Resolution (arp) arp server and client; Use of Broadcast address for request; Unicast reply; Information exchanged by arp request and reply.

TEXT BOOK

Thomasi, Wayne, "Electronic Communications Systems", 4th Edition, Pearson Education, 2001.

REFERENCE BOOKS

- Forauzan and Thomasi, "Data Communication and Networking", 2nd Edition, Pearson Education, 2004.
- Singh and Sapre, "Communication Systems", Tata McGraw Hill, 2002.
- Bruce, A. Carlson, "Communication Systems", 4th Edition, Tata McGraw Hill, 2003.

EC-421	ADVANCE DIGITAL SIGNAL PROCESSING	L T P	Cr
		5 0 0	3

OBJECTIVE

This course aims to enable students to study advanced topics of digital signal processing which include DSP processors, Digital filters and Multirate Processing.

- DIGITAL FILTER STRUCTURES:** FIR digital filter structures; Direct form; Cascade form; Frequency Sampling structures; Lattice structure; IIR digital filter structure; Direct form; Cascade realization; Parallel realization; Lattice-Ladder filter structure.
- DESIGN OF FIR FILTERS:** Concept of Linear Phase; Design of Linear Phase FIR filters using Windows; Design of FIR filter using Frequency sampling methods; Design of FIR differentiators.
- DESIGN OF IIR FILTERS:** Design of IIR filters using Bilinear transformation method; Design of IIR filter using Impulse Invariant method.
- QUANTIZATION OF FILTER COEFFICIENTS:** Coefficient quantization effects in FIR and IIR filters; Round-off effects in digital filters; Statistical characterization of quantization effects.
- SAMPLING AND RECONSTRUCTION OF SIGNALS:** Representation of Band Pass signal; Sampling of Band Pass signal; A/D conversion; Sample and Hold; Quantization and Coding; Analysis of quantization error; White Noise model of quantization error; oversampling A/D converters; Sigma-Delta A/D converter.
- MULTIRATE DIGITAL SIGNAL PROCESSING:** 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; Sampling Rate conversion by an arbitrary factor; First Order approximation; Second Order approximation; introduction to DSP processors.

- DSP PROCESSORS:** Architecture of DSP processors; DSP devices; Von-Neumann model; Harvard architecture.

TEXT BOOK

Proakis; John G.; Dimitris G. Manolakis; and D. Sharma: "Digital Signal Processing": Principles; Algorithms; and Applications"; 2nd Edition, Pearson Education, 2006

REFERENCE BOOKS

- Ifeachor, Emmanuel C., Jervis, Barrie W, "Digital Signal processing", A Practical Approach", 5th Edition, Pearson Education, 2002
- Mitra, Sanjit. K, "Digital Signal Processing a Computer Based Approach", 4th Edition, Tata McGraw-Hill, 2001

EC-431	INDUSTRIAL ELECTRONICS AND APPLICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

Student will be able to:

- Choose a device for a specific application
 - Describe the operation of various converters; invertors; choppers; regulator
 - List applications of converters; invertors; choppers; regulator
 - Select proper device for a given application
- NON LATCHING DEVICES:** Need for power transistor; power MOSFET and IGBT Constructional details; operating principle; characteristics; Study of above devices with reference to the parameters: Voltage and current rating; Turn on and turn off time; leakage current; Conduction loss and switching loss; Gate triggering requirements – drive; Gate; dissipation; List of applications of above devices; Introduction to SIT ; MCT ; FCT
 - CHOPPERS:** Dc to dc converter (chopper); Basic block diagram; operating principle; Classification of choppers on the basis of: output voltage – step up and step down; Commutation method – series turn off and parallel turn Off; Quadrant of operation – single quadrant ; two quadrant; four quadrant; Jones chopper Circuit; operating principle; Applications of choppers;
 - INVERTERS:** DC to AC converter (Inverter); Basic principle of inverter; Classification on the basis of Energy source – voltage source and current source; Commutation – series and parallel; Voltage source invertors: Series inverter; Parallel inverter with R and RL load; Bridge inverter : simple bridge inverter with R load
 - AC AND DC VOLTAGE REGULATOR:** Ac voltage regulator; Need of ac voltage regulator (power line disturbances); Regulator types : Relay type ; servo type ; Resonant type; solid state type (tap changing and phase control):

- Circuit diagram; operating principle; applications of above types; Specifications; Switching regulator (SMPS): Need; Power supply requirements: (Regulated output; isolation; multiple outputs; efficiency; size; weight); Review of linear regulator; SMPS : Block diagram; Explanation of: Isolation transformer (it's requirements and core properties); Converter circuits (Push-pull ; half bridge and full bridge); PWM control; Specifications
- UNINTERRUPTIBLE POWER SUPPLY:** UPS (Need of UPS; Basic block diagram of UPS and operating principle; explanation of rectifier ; battery ; inverter ; static transfer switch); Types of UPS : Off line UPS ; On line UPS; Line interactive UPS and their comparison; UPS specifications – Input voltage range; dc voltage range; Transient response; response time; total harmonic distortion; output frequency; output waveform; transient recovery; load power factor and types of protection; Other applications: Ac voltage controller; HVDC and transmission
 - ELECTRIC WELDING:** SCR contactor; Electronic ballast; Battery charging regulator; emergency light; Temperature controller; Ac flasher; SCR ; UJT time delay and ultra precise time delay circuit; dielectric and induction heating.
 - PROTECTION CIRCUITS:** Protection circuits: Need of protection circuits; Snubber circuits: Their functions; operating principle of unpolarised RC; Polarized RC and polarized LR snubbers; Over current protection and over voltage protection; Isolation circuits : pulse transformer and optoisolator; Crowbar protection; current fold back; spike suppressor; Circuit breaker.

TEXT BOOK

Singh and Khan Chandani, "Power Electronics", 4th Edition, Tata McGraw-Hill, 2005.

REFERENCE BOOKS

- Bhattacharya, Industrial Electronics and Control, Tata McGraw-Hill, 1995.
- Paul B Zbar, Industrial Electronics, 7th Edition, A Text Lab Manual, Tata McGraw-Hill.
- Petruzella, Industrial Electronics, 1st Edition, McGraw-Hill International, 1995

EC-432	ADVANCED AUDIO AND VIDEO TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing sound knowledge and in-depth concepts of various technology used in audio and video engineering. It covers the audio communication and methods of sound recording and reproduction. It provides in-sight knowledge of digital TV, and various modern TV systems. It also discusses the various audio and video coding techniques.

- METHODS OF SOUND RECORDING AND REPRODUCTION:** Microphones; Audio amplifiers; Audio mixers; Methods of sound recording and reproduction; optical magnetic recording; CD recording; CD DVD player; MP3 player; audio std. MPEG.

- AUDIO COMMUNICATION:** Studio Acoustics; reverberation; PA system for auditorium; Acoustic chamber; chord less microphone systems; special type of speakers/ cell phones. Introduction to satellite radio reception (world space)
- DIGITAL TELEVISION:** Introduction to Digital TV; Principle of Digital TV; Digital TV signals and parameters; MAC signals; advanced MAC signal transmission; Digital TV receivers; NTSC; DTV; MPEG 2; JPEG 4 MAC production tools.
- MODERN TELEVISION SYSTEM-I:** HDTV standards and systems; HDTV transmitter and receiver/encoder; satellite TV; video on demand; CCTV; CATV.
- MODERN TELEVISION SYSTEM-II:** Direct to home TV; set top box; conditional access system (CAS); introduction to 3D stereoscopic; DTV systems; IPTV system.
- AUDIO CODING:** Introduction to Audio Coding; Audio compression; MPEG – Block diagram of audio encoder and decoder; Digital Audio Broadcasting- Block schematic explanation.
- VIDEO CODING:** Video coding and compression; Need for compression; video image representation; quantization of image data intraframe compression techniques: DPCM; DCT based transform coding; Motion Compensation; H261 video conference coding standard; MPEG video compression; HDTV- DVB-T

TEXT BOOKS

Whitaker, J.C., "The Electronics Hand Book", IEEE Press

REFERENCES BOOKS

- Halsal, Fred, "Multimedia Communications, Pearson Education.
- Jack, Kelth, "Video Demisified", Penram International Publication.
- Dhake, M., "Television and Video Engineering", Tata McGraw Hill.
- Sharma, KK, "Fundamentals of Television and Radar Engineering", S.K. Kataria & sons
- Gupta, R.G. "Audio Video Systems", Technical Education
- Kinsler, Frey, Coppens, "Fundamentals of Acoustics", 4th Edition, Wiley Eastern
- Whitaker, Jerry, "Mastering Digital Television, The Complete Guide to the DTV Conversion", McGraw Hil
- Gulati, RR, "Monochrome and Colour Television, New Asian Age

EC-433	SATELLITE COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The course aims to provide a comprehensive understanding of satellite communication to perform and verify link budget equations. It also discusses the modulation and multiplexing techniques for satellite, link and application areas of the satellite.

- PRINCIPLES OF SATELLITE COMMUNICATION:** Evolution and growth of communication satellite; Synchronous satellite;

- Satellite frequency allocation and Band spectrum; Advantages of satellite communication; Active and Passive satellite; Modem and Codec. Applications of satellite communication.
- COMMUNICATION SATELLITE LINK DESIGN:** Introduction; General link design equations; System noise temperature; C/N and G/T ratio; Atmospheric and Ionospheric effects on link design; Complete link design; Earth station parameters.
 - ANALOG SATELLITE COMMUNICATION:** Introduction; Baseband analog(Voice) signal; FDM techniques; S/N and C/N ratio in frequency modulation in satellite link; S/N ratio in FM with multiplexed telephone signal in satellite link; Single channel per carrier(SCPC) systems; Companded single sideband (CSSB) systems; Analog FM/FDM TV satellite link; Intermodulation products and their effects in FM/FDM systems; Energy disposal in FM/FDM systems.
 - DIGITAL SATELLITE COMMUNICATION:** Advantages of digital communication; Elements of digital satellite communication systems; Digital baseband signals; Digital modulation techniques; Satellite digital link design; Time Division Multiplexing.
 - MULTIPLE ACCESS TECHNIQUES:** Introduction; TDMA; TDMA-Frame structure; TDMA-Burst structure; TDMA-Frame efficiency; TDMA-superframe; TDMA-Frame acquisition and Synchronization; TDMA compared to FDMA; TDMA Burst Time Plan; Multiple Beam (Satellite switched) TDMA satellite system; Beam Hopping(Transponder Hopping) TDMA; CDMA and hybrid access techniques.
 - SATELLITE ORBITS:** Introduction; Synchronous orbit; Orbital parameters; Satellite location with respect to earth; Look angles; Earth coverage and slant range; Eclipse effect; Satellite placement in geostationary orbit; station keeping; Satellite stabilization.
 - SPECIAL PURPOSE COMMUNICATION SATELLITES:** BDS; INMARSAT; INTELSAT; VSAT (data broadband satellite); MSAT (Mobile Satellite Communication technique); Sarsat (Search and Rescue satellite) and LEOs (Lower earth orbit satellite); Satellite communication with respect to Fiber Optic Communication; LANDSAT; Defense satellite.

TEXT BOOK

Aggarwal, D.C., "Satellite Communication", Khanna, 5th Edition, 2001.

REFERENCE BOOK

- Gagliardi, "Satellite Communication", 4th Edition, CBS Publications, 2003.
- Roddy, "Satellite Communication" 5th Edition, Tata McGraw Hill, 2006.

EC-441	NANO TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

Explain the fundamentals of Nanotechnology; the relevance of its applications to modern civilization

along with experimental techniques for measurements up to Nanotechnology level.

- INTRODUCTION TO NANOTECH:** Crystalline Non-crystalline materials fundamental of Nanotechnology and Nanomaterials in Metals; other Materials and Biosystem; Molecular Recognition; Quantum Mechanics and Quantum ideas in Nanotechnology; Semiconductor Nano-particles.
- PREPARATION and CHARACTERIZATION OF NANO-PARTICLES:** Preparation: Nanoscale Lithography; Dip Pen Lithography; E-Beam Lithography; Nanosphere Lift-off lithography; Molecular Synthesis; Nanoscale Crystal Growth; Polymerization; Nanobricks and Building blocks.
- TOOLS FOR MEASURING NANOSTRUCTURES:** Scanning Probe Instrument; Spectroscopy; Electrochemistry; Election Microscope; Tools to make Nanostructure.
- PROPERTIES and APPLICATION OF NANO CRYSTALLINE MATERIALS:** Application in Sensors; Nanoscale Biostructure Electronics; Magnets; Optics; Fabrication.
- BIOMEDICAL APPLICATIONS:** Smart materials – Self Healing Structures; Heterogenous Nanostructure and composites; Encapsulation; Carbon Nanotubes.
- CHEMICAL SYNTHESIS and BUSINESS:** Synthesis of Semiconductor Nanoclusters; Processing of Nanomaterials; Nanobusiness - Boom; Bust and Nano Tech; NanoEthics.
- Nano Materials; Nano composites; Nanofying electronics; Sensing the environment; Mechanising the micro world; Energy and cleaner environment with nano technology.

TEXT BOOK

Ratner, Mark and Ratner, Daniel, "Nanotechnology – A Gentle Introduction to the Next Big Idea", 2nd Edition, Pearson Education, 2003.

REFERENCE BOOKS

- Cammarta, R.C. and Eddstein, A.S., "Nanomaterials Synthesis; Properties and Applications", 2nd Edition, Institute of Physics Publication, 1996
- Sihilia, J.P., "A guide to Material Characterization", 2nd Edition, Prentice Hall, 1996.
- Pradeep, T., "Nano The Essentials", 3rd Edition, Tata McGraw Hill, 2007.

EC-442	RF DEVICES AND CIRCUITS	L T P	Cr
		5 0 0	3

OBJECTIVE

- To learn fundamental of radio frequency transmitter and receiver and radio integrated circuit design and analysis technique.
- To acquire basic understanding of various radio frequency circuit block.

- INTRODUCTION TO RF ELECTRONIC:** The electromagnetic spectrum; unit and physical

constant; Microwave band; RF component layout and construction; Coax cable transmission line; Tuned resonant circuit Tuned RF/IF Transformer; Variable capacitor in RF circuit; Measuring inductor and capacitor at RF frequency; Impedance matching .

2. **LINEAR RF AMPLIFIER:** Introduction ; power gain ; Neutralization ; unilateral transducer gain ; stability consideration ;stability an active two port; stabilization of a bipolar transistor Transistor at radio frequency; RF power transistor characteristics ;transistor biasing.
3. **SMALL SIGNALS RF AMPLIFIER:** Introduction to small signals RF amplifier; Bilateral RF amplifier design for maximum small signal gain; multistage amplifier; Broadband amplifier ; Noise in RF.
4. **ACTIVE RF DEVICE AND MODELING :** The diode model ; two port device model ; the output terminal of at two port RF device The bipolar transistor ; the heterojunction bipolar transistor; the GaAs MESFET High electron mobility transistor ; Silicon LDMOS and CMOS technique.
5. **HIGH POWER RF TRANSISTOR AMPLIFIER:** Nonlinear concept; Quasi linear power amplifier design ; categories of amplifier (class A; class B ; class F) ; switching mode amplifier; cascade amplifier ;distortion reduction.
6. **RADIO SYSTEM APPLICATION :** Mobile telephony system ; software defined ratio; A 1.9 GHz radio chip set design overview; integrated system chip (RF receiver front end ; RF up converter and Transistor driver amplifier ; power amplifier modules)
7. **DEVICE PARASITICS:** RF modeling; Parasitics sensitive to RF. Issue in RF IC a brief review; Impedance matching; use and design of passive circuits; LNA Design; Matching Techniques using algebra techniques; Basic Bond circuits; UHF Mixer design.

TEXT BOOK

Rowan and LesBesser, "RF Circuit Design", CRC Press, 3rd Edition, 2003

REFERENCE BOOK

1. Esketrim, Pekka, "Introduction to RF Equipment and System Design", 4th Edition Artech House, 2004
2. Golio, Mike, "Semiconductor Device", 5th Edition, CRC Press, 2002
3. Razavi, "RF Microelectronics", 3rd Edition, Prentice Hall of India, 1998.

EC-451	MOBILE COMMUNICATION LAB.	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To identify and understand different selections and components of mobile phone units.
2. Study of GSM technology.
3. To observe and analysis input/output signals of different sections in mobile handset.
4. Study of GSM MODEM and its components.
5. Study of SIM identification.

6. To observed and understand the process of call connection and call release of mobile system.
7. Introduction to AT commands
8. Voice communication using AT commands.
9. Data communication using AT commands
10. Sending text message using flow code software
11. To understand handoff, frequency reuse, cell splitting in mobile communication system.
12. To understand & perform registration, activation & authentication of mobile phone.

EC-452	MICROWAVE AND RADAR ENGINEERING LAB.	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To study of wave guide component
2. To Study the characteristics of reflex Klystron and determine its timing range
3. To measure frequency of microwave source and demonstrate relationship among guide dimensions, free space wave length and guide wavelength
4. To measure VSWR of unknown load and determine its impedance using a smith chart
5. To study the properties of E-Plane tee junction and to determine isolation and coupling coefficient
6. To measure coupling and directivity of direction couplers
7. To measure insertion loss, isolation of a three port circulator
8. To study the V-I characteristics of GUNN diode
9. To study isolation and coupling of a Magic tee
10. To plot a radiation pattern of Antenna
11. To measure VSWR, insertion losses and attenuation of a fixed and variable attenuator.
12. To understand the operation of pulsed RADAR system by using block diagram Optional Experiment

EC-453	SATELLITE AND OPTICAL COMMUNICATION LAB.	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

1. To set up an active & passive satellite communication link and study their difference.
2. To study the communication satellite link design: process of transmitting a signal to a satellite (UPLINKING), reception of same signal via satellite (DOWN LINKING) and functioning of transponder of a satellite.
3. To measure the baseband analog signal parameters in a satellite link.
4. To measure the signal parameters in an analog FM/FDMTV Satellite link.
5. To study the phenomenon of Linear and Circular polarization of antennas.
6. To measure the C/N ratio.
7. To measure the S/N ratio.
8. To study the effect of fading and measure the fading margin of a received signal.
9. To measure the digital baseband signal parameters in a satcom link.
10. To send telecommand and receive the telemetry Data and study the operation of a codec
11. To setup a RS-232 satellite communication link using RS 232 ports.
12. To calculate Bit Error Rate in a satcom link.

- To calculate the Numerical Aperture (NA) of given optical fiber by using Trigonometric method (visual method)
- To measure the bend loss in given FOC

REFERENCE BOOKS

- Keiser, G., "Optical Fiber Communication", Tata McGraw Hill; 2008.
- Aggarwal, Govind P., "Fiber Optic Communication System", 3rd Edition; John Wiley Publication; 1989.
- Palais, Joseph C., "Fiber Optic Communication" 4th Edition, Prentice Hall of India, 2005.

EC-454	DATA COMMUNICATION LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To study different types of transmission media
- To study Quadrature Phase Shift Keying Modulation.
- To study Quadrature Amplitude Modulation.
- To Study Quadrature Amplitude Multiplexing.
- To Study Serial Interface RS-232 and its applications.
- To study the Parallel Interface Centronics and its applications.
- To configure the modem of a computer.
- To make inter-connections in cables for data communication in LAN.
- To install LAN using Tree topology.
- To install LAN using STAR topology.
- To install LAN using Bus topology.
- To install LAN using Token-Ring topology
- To install WIN NT
- To configure a HUB/Switch.

REFERENCE BOOKS

- Forouzan and Thomasi, "Data Communication and Networking", 2nd Edition, Pearson Education, 2004.
- Singh and Sapre, "Communication Systems", Tata McGraw Hill, 2002.

EC-461	BIOMEDICAL INSTRUMENTATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The course aims to give a complete exposure of various recording mechanisms and parameter measured for diagnostic application, electrodes used in biopotential recording, bioamplifiers, instrument concerned with measuring the blood flow volume and to select and properly use the optimal instrument for measurement in biological research.

- INTRODUCTION TO BIOMEDICAL INSTRUMENTATION:** System in terms of range; linearity; hysteresis; frequency response; accuracy; signal to noise ratio; stability insulation simplicity; physiological system of Biometrics; basic design; specifications of biomedical instrumentation body: biochemical system; cardiovascular system; respiratory system; nervous system. Source of bioelectric potential resting and action potential and propagation of action potential.

- ELECTRODES AND TRANSDUCERS:** Microelectrodes; skin surface electrode; needle electrode; electrodes and lead for EG; ECG; EMG. Transducer for biomedical applications; factors governing the selection of Transducer; pressure; temperature; flow; ultrasonic transducer.
- BIO SIGNAL AMPLIFIERS AND SIGNAL PROCESSING:** Signal conditioner; amplifier used in biomedical instrumentation; requirement of amplifier; input isolation; DC amplifier; power amplifier; differential amplifier carrier amplifier; instrumentation amplifier. Introduction to biomedical digital signal processing and biomedical telemetry.
- ELECTROPHYSIOLOGY AND CELL STRUCTURE:** Bioelectric signal generated by muscles of heart; neuronal activity of brain; muscle activity; block study of ECG; EEG and EMG. Electrodes and leads for ECG; EEG and EMG.
- CARDIOVASCULAR INSTRUMENTATION:** Measurement of blood pressure; blood flow; and heart sound; cardiography; Phonocardiography; vector cardiography; Echocardiography pacemaker; defibrillators; ventilators.
- IMAGING SYSTEMS:** Ultrasonic imaging system; basic pulse – echo system; block study of a mode scan equipment; multidimensional transducer system; X – Ray machine; CT Scanner; nuclear imaging systems.
- PATIENT CARE MONITORING:** Elements of intensive care unit; diagnosis; calibration and reparability of patient monitoring equipment; instrumentation for monitoring patient; pacemakers; detibrillators and computer patient monitoring system.

TEXT BOOK

Cromwell, Leslie, Weibell, Fred and Pfeiffer, Erich A, "Biomedical Instrumentation and Measurement", 3rd Edition, Prentice Hall of India, 2007.

REFERENCE BOOKS

- Khandpur, R.S., "Handbook of Biomedical Instrumentation", 4th edition, Tata McGraw Hill, 2006.
- Dmane, Dean A, and Michaels, David, "Bioelectronic Measurement", 2nd Editon, Prentice Hall of India, 2000.
- Jacobson and Webster, "Edicine and Clinical Engineering", 3rd Editon, Prentice Hall of India, 2005.
- Carr and Brown, "Introduction to Biomedical Equipment Design", 5th editon, John Wiley, 2007.
- Tompkins, "Biomedical Digital Signal Processing", 2nd Edition, Tata McGraw Hill, 2004.

EC-462	NEURAL NETWORKS AND FUZZY LOGIC	L T P	Cr
		5 0 0	3

OBJECTIVE

This course presents an overview of the theory and application of artificial neural network and fuzzy systems to engineering applications with emphasis on control systems.

- NEURAL NETWORKS and FUZZY SYSTEMS:** Neural and fuzzy intelligence; fuzziness as

Multivalence; the dynamical systems to machine intelligence.

2. **NEURAL NETWORKS THEORY:** Neurams as functions; signals monotonically; biological activation and signals; neuron fields; neuron signal functions;
3. **NEURON MODELS:** Types of activation models; neuron dynamical systems; additive neuronals dynamics and additive neuronal feedback.
4. **UNSUPERVISED LEARNING:** Learning as encoding; charge and quantization; four unsupervised learning laws; probability spaces and random processor.
5. **SUPERVISED LEARNING:** Supervised function estimation; supervised learning as operant conditioning; supervised learning as stochastic approximation.
6. **ARCHITECTURES AND EQUILIBRIA:** Neural networks as stockistic gradient systems; global equilibria; aver algorithms; global stability of feedback neural networks; structural stability of unsuperimed learning.
7. **FUZZY ASSOCIATIVE MEMORIES:** Fuzzy systems as between cube mappings; fuzzy and neural function estimators; fuzzy Hebb FAMS; Adeptive FAMS.

TEXT BOOK

Kos, Bart, "Neural Networks and Fuzzy Systems", 6th Edition, Prentice Hall of India, 2008.

REFERENCE BOOKS

1. Satish Kumar "Neural Network", 2nd Edition, Tata McGraw Hill, 2004.
2. Zurada, J.M., "Neural Networks", 2nd Editon, Jaico Pub, 2008.
3. Yegnanarayanan, B., "Artificial Neural Networks", Prentice Hall of India, 2008

EC-481	MAJOR PROJECT PHASE-I	L T P	Cr
		0 0 10	5

OBJECTIVE

The project involves in-depth study on the topic, design, development, analysis fabrication and/or experimental work – Hardware and/or Software. It is intended to give an opportunity to a student to apply his knowledge to solve real-life problem. The student has to select a project work based on a topic of interest.

OPERATION

Major Project shall comprise of Phase-I and Phase-II, spread over Term-XI and Terms-XII respectively. The students may work jointly (small group) or individually.

EC-482	MAJOR PROJECT PHASE-II	L T P	Cr
		0 0 6	3

Refer to EC-481 for details.

EC-483	INTERNSHIP - I	L T P	Cr
		0 0 2	1

OBJECTIVE

The Internship course is a formal method of linking university with the world of work and essentially takes the class room for 20-22 weeks to a professional location where the student and faculty solve real-life problems, of course, with the help of professional experts. Resident University faculty will supervise the education of the students.

OPERATION

The Internship course has two components, namely Internship-I of 6-8 weeks duration (Summer-term following 9th Term) and Internship-II of 13-14 weeks duration (11th Term). After the Internship-II, in 12th term the student will document internship work in detail and deliver colloquium. However, the student may contact industry during this period.

(a) Internship-I:

Internship-I is conducted at large industrial complexes during Summer Term after Term-IX and exposes the students to real-life situations.

(b) Internship-II:

This component is conducted at various production and manufacturing units, Design, Development and Consulting Agencies, National Laboratories, R&D Centers, etc. The students solve real-life problems of interest to the host organizations. The professional expert acts as a consultant while resident University faculty supervises the work.

EC-484	INTERNSHIP - II	L T P	Cr
		0 0 24	12

Refer to EC-483 for details

EC-485	INTERNSHIP DOCUMENTATION	L T P	Cr
		0 0 6	3

OBJECTIVE

The students are required to prepare comprehensive report on the problem(s) solved in industry and suitably extend the work wherever required so as to help the industry implement the solution. For this purpose the student can interact with the industry.

EC-491	COMMUNITY SERVICE ORIENTED PROJECT	L T P	Cr
		0 0 2	1

The student(s), either individually or in groups, are expected to take up a project that uses engineering and/or technological principles related to the field of study and that should be useful for solving real life problems in their neighbourhood.

The student has to go through some process of minimal level of evaluation and also the minimum attendance requirement, as stipulated by the Course Coordinator/Instructor and approved by the corresponding BOS, for getting the 'U' grade awarded in a course, failing which that course will not be listed in the Grade Card.

EC-492	PROJECT (INCLUDING SEMINAR)	L T P	Cr
		0 0 4	2

A student may perform experimental/design task of relatively minor intensity and scope as compare to the major project. The project may be extended to Major Project.

EC-493	INDUSTRIAL TRAINING/FIELD TRAINING	L T P	Cr
		0 0 2	1

OBJECTIVE

To carryout training for a period of two months i.e. Summer Term after Term-IX in industry (private or public)/ research laboratory/organization of repute, on platforms learnt till the completion of 3 years of bachelor degree.

METHODOLOGY

The students shall demonstrate their ability to understand a given problem and to innovatively bring out solution.

Students shall be free to select any operating system, programming language and database tools for accomplishing the given problem successfully.

Marks of this course shall be given in the marks memorandum of next term.

EC-494	SEMINAR –I	L T P	Cr
		0 0 2	1

The seminar is to cover the details regarding Major Project Phase-I/Major Project Phase-II and Internship-II viz. problem definition, literature survey, concepts and methodology employed, analysis, design and development, conclusions and future work.

EC-495	SEMINAR-II	L T P	Cr
		0 0 2	1

Refer to EC-494 for details

EE-306	COMMUNICATION SYSTEMS	L T P	Cr
		5 1 0	4

OBJECTIVE

To give an idea about the basic concepts and fundamental principles involved in the communication of information. Its study involves the elements of communication systems which help to transform, process, and transmit the intelligence from one place to another place. It describes at the receiving end, the principles, methods, and systems required to retrieve the intelligence from the transmitted signal in its original form.

PREREQUISITE

A brief knowledge of mathematics (Trigonometry, Differentiation, and Integration) and basic knowledge of elementary signals.

- 1. INTRODUCTION TO COMMUNICATION SYSTEMS:** Block diagram of basic Communication

system.; elements of basic communication system; modes and media of communication; Fourier analysis of signals; modulation and need for Modulation.

- 2. AMPLITUDE MODULATION:** Linear modulation; amplitude modulation; depth of modulation; bandwidth and power calculations; generation and demodulation of AM, DSBSC, SSB and VSB.
- 3. ANGLE MODULATION:** Frequency and Phase modulation; narrow band and wide band FM; transmission bandwidth of FM; power calculations; direct and indirect methods of FM signal generation; demodulation of FM signals; slope detector; balanced slope detector; Foster-seely discriminator; pre-emphasis and De-emphasis.
- 4. RECEIVERS:** TRF and super heterodyne receiver RF, mixer and IF stages; image frequency; choice of IF AGC; receiver characteristics & measurements; fading and diversity reception; special features of Communication Receivers.
- 5. PULSE ANALOG MODULATION:** Sampling theory; PAM, PWM and PPM-generation and detection; TDM &FDM.
- 6. PULSE DIGITAL MODULATION:** PCM; Signal to quantization noise ratio of a PCM; electrical representation of binary data; on-off, RZ, NRZ, Differential encoding; Manchester coding. DPCM. DM. ADM.
DIGITAL MODULATION: ASK, FSK, BPSK, QPSK.
- 7. NOISE IN COMMUNICATION SYSTEMS:** External noise; internal noise; S/N ratio. noise figure (Qualitative analysis).

TEXT BOOKS

Haykin, Simon, "Communication Systems", 3rd Edition, Wiley, 1995.

REFERENCE BOOKS

- Sharma, Sanjay, "Communication Systems", Kataria & Sons.
- HSU. HWei P, "Analog and Digital Communications", Schaum's Outline Series, Tata McGraw Hill, 2003
- Singh, R.P. and Sapre, S.D., "Communication Systems, Analog and Digital", Tata McGraw Hill, 2002.
- Chakraborty, P, "Analog Communication Systems", Dhanapati Rai & Sons, 2008
- Sam, Shanmugam.K., "Digital and Analog Communication Systems", Wiley, 1998.
- Taub and Shilling, "Principles of Communication Systems", 2nd Edition, Tata McGraw Hill, 2003.
- Carlson, A.B.; Rutledge.J. and Crilly. P., "Communication Systems", 4th Edition, Tata McGraw Hill, 2002.

EE-356	COMMUNICATION SYSTEMS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- Study of Amplitude Modulation and determination of Modulation index.
- Study of Frequency Modulation and determination of Modulation index.
- Study of Phase Modulation.
- Study of Pulse Amplitude Modulation.
- Study of Pulse Width Modulation.

6. Study of Pulse Frequency Modulation.
7. Study of Pulse Code Modulation.
8. Study of frequency Shift Keying.
9. Study of ASK and QASK.
10. Study of PSK and QPSK.
11. Project related to the scope of the course.

EL-101	ELECTRICAL ENGINEERING	L	T	P	Cr
		5	1	0	4

OBJECTIVE

To provide basic knowledge and understanding of fundamental concepts of Electrical Technology, explaining various basic laws governing the circuit configurations and evaluation and its applications to electrical circuits.

1. **DC NETWORKS:** EMF, potential difference; current, resistance; Ohm’s law; effect of temperature on resistance; source conversion; KCL, KVL; mesh analysis, nodal analysis; network theorems – superposition, Thevenin’s, Norton, reciprocity, maximum power transfer theorem; star-delta conversion.
2. **SINGLE PHASE AC CIRCUIT:** Generation of AC voltages, frequency, cycle, period, instantaneous, Peak, RMS and average value, peak factor, form factor, phase and phase difference, polar, rectangular, exponential and trigonometric representation of phasors; R, L and C components, behavior of these components in A.C. circuits, series and parallel A.C. circuits and their phasor diagrams, concept of impedance and admittance, power and power factor, Complex power; resonance-Series and parallel resonance, Q factor; bandwidth.
3. **THREE PHASE CIRCUITS:** Phase and line voltages and currents, balanced star and delta circuits; phasor diagram, power equation, measurement of three phase power by two wattmeter method; comparison of single phase, three phase and DC system and their relative advantages.
4. **MAGNETIC CIRCUITS:** Magnetic effect of electric current; concept of MMF; flux, flux density, reluctance, permeability; B-H curve; hysteresis loop, hysteresis and eddy current loss; comparison of electrical and magnetic circuits.
5. **TRANSFORMER:** Construction, principle, working of ideal and practical transformer; equivalent circuit, phasor diagram; OC and SC tests, regulation and efficiency; autotransformer.
6. **ROTATING ELECTRICAL MACHINES:** DC MACHINES – construction, principle of operation and classification of dc machines, EMF equation and characteristics of dc generator, starting and speed control of dc motor.
INDUCTION MACHINES: Construction and principle of operation of three phase induction motor, concept of slip and its importance.
7. **MEASURING INSTRUMENTS:** Voltmeter; ammeter; wattmeter; energy meter.

TEXT BOOK

Gupta, J.B. “Electrical Technology”, Katson Publication

REFERENCE BOOKS

1. Theraja, B.L. “Electrical Technology Vol I & II”, S. Chand Publications, 2005
2. Kothari and Nagarath, “Basic Electrical Engg.”, 2nd Edition, Tata McGraw Hill
3. Theodore, Wildi “Electrical Machines, Drives and Power Systems”, 2nd Edition, Prentice Hall, 1991.
4. Edward, Hughes (revised by Ian McKenzie Smith), “Electrical Technology”, 7th Edition, English Language Book Society, Publication with Longman, 1995.
5. Del Torro Vincent, “Electrical Engineering Fundamentals”, 2nd Edition, Prentice Hall of India, 1994.
6. Cathey, J.J. and Naser, S.A. “Basic Electrical Engg.”, 2nd Edition, Schaum Series, McGraw Hill Publ.

EL-151	ELECTRICAL ENGINEERING LAB	L	T	P	Cr
		0	0	2	1

LIST OF EXPERIMENTS

1. To verify KCL and KVL.
2. To verify Thevenin’s and Norton’s Theorems.
3. To verify maximum power transfer theorem in D.C Circuit and A.C Circuit.
4. To verify Reciprocity and Superposition theorems.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-Factor for various Values of R, L, C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-Factor for various values of R, L, C.
7. To perform direct load test of a transformer and plot efficiency Vs load characteristic.
8. To perform open circuit and short circuit tests on a single-phase transformer determine the losses and efficiency.
9. To perform direct load test of a DC shunt generator and plot load voltage Vs load current curve.
10. To study various types of meters.
11. Measurement of power by 3 voltmeter / 3 ammeter method.
12. Measurement of power in a 3 phase system by two watt meter method.
13. Connection and testing of a single-phase energy meter (unit power factor load only).

Note: At least ten experiments are to be performed by the students.

REFERENCE BOOKS

1. Theraja, B.L. “Electrical Technology Vol I & II”, S. Chand Publications, 2005
2. Kothari and Nagarath, “Basic Electrical Engg.”, 2nd Edition, Tata McGraw Hill
3. Del Torro Vincent, “Electrical Engineering Fundamentals”, 2nd Edition, Prentice Hall of India, 1994.
4. Cathey, J.J. and Naser, S.A. “Basic Electrical Engg.”, 2nd Edition, Schaum Series, McGraw Hill Publ.

EL-301	CONTROL SYSTEMS	L T P	Cr
		5 1 0	4

OBJECTIVE

Providing sound knowledge about the various control system techniques required for the operation and accurate controls of Industrial processes and other strategies for complicated processes and efficient control.

PRE-REQUISITES

Knowledge of Mathematics and Electrical Engineering

- 1. INTRODUCTION TO CONTROL PROBLEM:** Industrial control examples; Transfer function models of mechanical; electrical; thermal and hydraulic systems; systems with dead- time, system response; control hardware and models: potentiometers; synchros; LVDT; dc and ac servomotors; tacho-generators; electrohydraulic valves; hydraulic servomotors; electropneumatic valves; pneumatic actuators; closed-loop systems. Block diagram and signal flow graph analysis; transfer function.
- 2. BASIC CHARACTERISTICS OF FEEDBACK CONTROL SYSTEM:** Stability; steady-state accuracy; transient accuracy; disturbance rejection; insensitivity and robustness. Basic modes of feedback control: proportional; integral and derivative. Feed-forward and multi-loop control configurations.
- 3. TIME DOMAIN ANALYSIS:** Introduction; standard input signals; response of 1st and 2nd order systems; time domain specifications i.e.; rise time; peak time; delay time; peak overshoot; settling time; steady state error etc.; different types of feedback systems; steady state errors for unit ramp; unit step and unit parabolic inputs; effects of addition of zeros to the system.
- 4. STABILITY ANALYSIS:** Introduction; concept of stability; conditions for stable system; asymptotic; relative and marginal stability; Routh-Hurwitz criterion for stability and various difficulties with Routh-Hurwitz criterion.
- 5. ROOT LOCUS TECHNIQUE:** Introduction; concepts of root locus; construction of root loci and various rules pertaining to locus diagram development.
- 6. FREQUENCY DOMAIN ANALYSIS AND STABILITY:** Introduction; relation between time and frequency response for 2nd order system; Bode plot; construction procedure for bode plot; gain cross over and phase cross over frequency; gain margin and phase margin; Nyquist plot and Nyquist stability criterion.
- 7. STATE-VARIABLE ANALYSIS:** Concept of state; state variable; state model; state models for linear continuous time functions; diagonalization of transfer function; solution of state equations; concept of controllability and Observability.

TEXTBOOK

Nagrath and Gopal, "Control System Engineering", New Age International, 2005

REFERENCE BOOKS

- Ogata .K. "Modern Control Engineering", Pearson Education, 2000

- Gopal Madan "Control System – Principles & Design" Tata McGraw Hill, 1998
- Dorl.R. C. & Bishop "Modern Control Engineering", Addison Wesley, 1999.
- Kuo, B. C. "Automatic control System", John Wiley & Sons, 1998

EL-303	ADVANCED CONTROL SYSTEMS	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing sound knowledge about the various control system techniques required for the operation and accurate controls of Industrial processes and other strategies for complicated processes and efficient control.

PRE-REQUISITES

Knowledge of mathematics and control system-I

- 1. STATE VARIABLE TECHNIQUES:** State variable representation of systems by various methods; Solution of state equations-state transition matrix; Transfer function from state variable model; Controllability and observability of state variable model.
- 2. SECOND ORDER SYSTEMS & STATE PLANE:** Phase portrait of linear second systems; Method of isoclines; phase portrait of second order system with non-linearities; limit cycle; singular points.
- 3. DESCRIBING FUNCTION ANALYSIS:** Definition; limitations; use of describing function for stability analysis; describing function of ideal relay; relay with hysteresis and dead zone; saturation/Coulomb friction and backlash.
- 4. LINEAR APPROXIMATION OF NONLINEAR SYSTEMS:** Taylor series; Liapunov's 2nd method.
- 5. SAMPLED DATA SYSTEMS:** Sampling process; impulse modulation; mathematical analysis of sampling process; application of Laplace transform; Shannon's theorem; reconstruction of sampled signal zero order and first order hold; Z-transform; definition; evaluation of Z-transform; Inverse Z-transform; pulse transfer function; limitations of Z-transform; state variable formulation of discrete time systems; Solution of discrete time state equations; stability; definition; the Schur-Cohn stability criterion; Jury's test of stability of extension of Routh-Hurwitz criterion to discrete time systems.
- 6. OPTIMAL CONTROL:** Introduction; formation of Optimal Control problem; calculus of variation; minimization of function; constrained optimization; performance index; optimality principle; linear quadratic problems.
- 7. ADAPTIVE CONTROL:** Introduction; model reference adaptive controls and systems; controller structure; various adaptive control systems.

TEXT BOOK

Gopal .M. "Digital Control & State Variable Methods", Tata McGraw Hill, 2006

REFERENCE BOOKS

- Gopal.M "Modern Control Theory", Wiley International, 2000

- Slotine .J.E. & Li. W.P. "Applied Non-linear Control" : Prentice Hall, USA, 2001
- Das.S. "Control System Theory" Gupta Khanna Publishing, 1997
- Kuo.B. C. "Digital Control System" – John Wiley and Sons., 1995
- Ogate.K. "Discrete time control system" , Prentice Hall Of India, 1997

- Vocabulary; Use of Words; Synonyms; Homophones; Homonyms; Forms and Functions of Words
- Sentence Structure; Verb patterns; Simple; Complex and Compound Sentences
- Remedial English Grammar; Common Errors and Rules of Concord
- Phonetics; Basic Concepts; Vowels; Consonants; Syllables; Manner of Articulation and Place of Articulation; Speech Sounds; Transcription of Words ; Word Stress and Intonation
- Comprehension; Interpretation of Seen/Unseen Passages
- (A) Oral Communication: Practicing short dialogues; Group Discussions; and Debates
(B) Technical Writing:
 - Business Letters (Format of Business Letters and Business Letter Writing)
 - Email Writing
 - Reports and types of reports and Press reports
- Book Review (for internal assessment)
Language lab: Emphasis will be laid on accent, pronunciation, intonation, reading/ listening comprehension

EL-351	CONTROL SYSTEMS LAB.	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS:

- To study A.C. Servo-motor and to plot its torque-speed characteristics
- To study magnetic amplifier and to plot its load current v/s control current characteristics for (a) Series connected mode (b) Parallel connected mode
- To implement a PID controller for temperature control of a pilot plant
- To study different components of process control simulator kit
- To study A.C. Motor position control through continuous command
- To study Synchro transmitter and receiver and to plot stator voltage v/s rotor angle for synchro transmitter
- To study lead, lag, lead-lag compensator and to draw their magnitude and phase plot
- To study D.C. Servo-motor and to plot its torque-speed characteristics
- To study simple open loop and closed loop control system with disturbance and without disturbance using process control simulator kit
- To study (PD), PI, PID controllers.
- To study a stepper motor and control the speed by 8085 microprocessor kit

ADDITIONAL EXPERIMENTS

- Obtain the unit step response of a second order system with given zeta and W_n using MATLAB.
- Determine the unit step response of a given close loop transfer function using MATLAB.
- Determine the damping ratio, undamped natural frequency of oscillation and percentage overshoot of a unity feedback open loop transfer function to a unit step input using MATLAB.

REFERENCE BOOKS

- Ogata .K. "Modern Control Engineering", Pearson Education, 2000
- Gopal Madan "Control System – Principles & Design" Tata McGraw Hill, 1998
- Dori.R. C. & Bishop "Modern Control Engineering", Addison Wesley, 1999.

TEXT BOOK

Bansal, R.K. and Harrison, J.B., "Spoken English for India", Orient Longman, 2009

REFERENCE BOOKS

- Tickoo, M. L. and Subramanian, A. E., "Intermediate Grammar, Usage and Composition", Orient Longman, 1976
- Thomson and Martinet, "A Practical English Grammar", Oxford University Press, 1986
- Hornby, A. S., "Guide to Patterns and Usage in English", Oxford University Press
- Balasubramanian, T, "A Textbook of English Phonetics for Indian Students", MacMillan
- D.O'Connor, J, "Better English Pronunciation" Cambridge University Press
- McCarthy, "English Vocabulary in Use Foundation Books", Cambridge University Press
- Hashem Abul, "Common Errors in English", Ramesh Publishing House
- Roach P., "English Phonetics & Phonology", Cambridge University Press
- Ramesh M. S. and C.C. Pattanshetti, "Business Communication", R. Chand and Company
- Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975
- Hari Mohan Prasad and Uma Rani Sinha, "Objective English", Tata McGraw Hill Education, 2005

EN-101	COMMUNICATION SKILLS	L T P	Cr
		5 0 0	3

OBJECTIVE

By doing this course the students will be acquiring reasonable level of oral and in writing proficiency in English language ultimately they will be able to communicate with their counter parts in business/industry in the country and abroad effectively.

EN-151	LANGUAGE LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS/EXERCISES

- Word accent based on stress: Cluster of words will be repeated by the students on the basis of recorded voice.
 - 1st syllable stress
 - 2nd syllable stress
 - 3rd syllable stress

- Sentence intonation: Simple day to day sentences will be repeated by the students
- Public speeches and debates: Recorded debates and public speeches will be heard by the students to enhance their knowledge on the pitch and tone.
- Conversation: Regular conversations will be heard and later practiced in the lab.
- Listening comprehension: Students will hear the text and answer the questions that follow.
- Reading comprehension: Text at par with international standard will be read by the students. Questions will than be answered.
- Speaking: Text conversation, debates & lectures will be heard by the students. The students will be used their aptitude and language to give their on them
- Error correction: Grammatically incorrect sentences will be given to the students to correct.
- Listening and speaking exercises will be practiced for the improvement of the language.
- Added exercise on reading comprehension.

IT-202	COMPUTER NETWORKS	L T P	Cr
		5 0 0	3

OBJECTIVE

To have a fundamental understanding of the design, performance and state of the art of wireless communication systems, Topics covered include state of the art wireless standards and research and thus changes substantially form one offering of this course to the next

PRE-REQUISITES

Knowledge of computers hardware and software

- OSI REFERENCE MODEL AND NETWORK ARCHITECTURE:** Introduction to computer networks, example networks: ARPANET, Internet, private networks; network topologies: bus-, star-, ring-, hybrid-, tree-, complete-, irregular –topology
- TYPES OF NETWORKS:** Local area networks, metropolitan area networks, wide area networks; layering architecture of networks, OSI model, Functions of each layer, services and protocols of each layer
- TCP/IP:** Introduction, history of TCP/IP; layers of TCP/IP; Protocols: Internet Protocol, Transmission Control Protocol, User Datagram Protocol; IP Addressing, IP address classes, subnet addressing; Internet control protocols: ARP, RARP, ICMP; application layer, domain name system; Email – SMTP, POP, IMAP; FTP, NNTP, HTTP; Overview of IP version 6.
- LOCAL AREA NETWORKS:** Introduction to LANs, Features of LANs, Components of LANs, Usage of LANs; LAN standards, IEEE 802 standards; Channel Access Methods: Aloha, CSMA, CSMA/CD, Token Passing, Ethernet; Layer 2 & 3 switching; fast Ethernet and gigabit Ethernet, token ring; LAN interconnecting devices: hubs, switches, bridges, routers, gateways.
- WIDE AREA NETWORKS:** Introduction of WANs, routing, congestion control, WAN Technologies; Distributed Queue Dual Bus (DQDB); Synchronous Digital Hierarchy (SDH)/ Synchronous Optical

- Network (SONET); Asynchronous Transfer Mode (ATM); frame relay; wireless links.
- INTRODUCTION TO NETWORK MANAGEMENT:** Remote monitoring techniques: polling, traps, performance management; class of service, quality of service; security management: firewalls, VLANs, proxy servers; introduction to network operating systems: client-server infrastructure, Windows NT/2000.
 - SOCKET PROGRAMMING:** Introduction to socket, Client side and Sever side programming, byte ordering, Implementation of socket, Socket Interface.

TEXT BOOK

Tanenbaum Andrew S, "Computer Networks", 4th Edition, Pearson Education/Prentice Hall of India, 2003.

REFERENCE BOOKS

- Forouzan Behrouz A., "Data Communications and Networking", Tata McGraw Hill 2006.
- Stallings William, "Data and Computer Communication", 5th Edition, Prentice Hall of India, 1997.
- Fred Halsall, "Data Communications, Computer Networks and Open Systems", 4th edition, Addison Wesley, Low Price Edition, 2000
- Fitzgerald Jerry, "Business Data Communications", Wiley, 2009.
- Peterson Larry L. and Davie Bruce S., "Computer Networks – A System Approach", 3rd Edition, Morgan Kaufmann, 2003.
- Tittel E. D., "Computer Networking", Tata McGraw Hill, 2002
- Kurose James F. and Ross Keith W., "Computer Networking: A Top-Down Approach Featuring the Internet", 2nd Edition, Pearson Education, 2003.
- Keshav S., "An Engineering Approach to Computer Networking", Addison-Wesley, 1997.
- Comer D. E., "Internetworking with TCP/IP", Volume 1, 3rd Edition, Prentice Hall of India, 1995.

WEB REFERENCES

- http://en.wikipedia.org/wiki/Computer_network
- <http://www.comsoc.org/dl/pcm/index.html>
- http://compnetworking.about.com/od/basicnetworkingconcepts/Networking_Basics_Key_Concepts_in_Computer_Networking.htm
- <http://www.protocols.com/hot.htm>

MA-101	APPLIED MATHEMATICS-I	L T P	Cr
		5 1 0	4

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- MATRICES & ITS APPLICATIONS:** Rank of a matrix; elementary transformations; elementary matrices; inverse using elementary transformations; normal form of a matrix; linear dependence and independence of vectors; consistency of linear system of equations; linear and orthogonal transformations; Eigen values and

- Eigen vectors; properties of Eigen values; Cayley - Hamilton theorem and its applications.
- INFINITE SERIES:** Convergence and divergence; comparison; D' Alembert's ratio; Integral; Raobes; De Morgan's & Bertrand's; logarithmic and Cauchy root tests; alternating series; absolute and conditional convergence.
 - APPLICATIONS OF DIFFERENTIATION:** Taylor's and Maclaurin's series; asymptotes; curvature.
 - PARTIAL DIFFERENTIATION:** Functions of two or more variables; partial derivatives; total differential and differentiability; derivatives of composite and implicit functions; Jacobian's; higher order partial derivatives.
 - APPLICATION OF PARTIAL DIFFERENTIATION:** Homogeneous functions; Euler's theorem; Taylor's series for functions of two variables (without proof); maxima-minima of function of two variables; Lagrange's method of undetermined multipliers; differentiation under integral sign.
 - FOURIER SERIES:** Euler's formula; conditions for a Fourier expansion; change of interval; Fourier expansion of odd and even function; Fourier expansion of square wave; rectangular wave; saw-toothed wave; half and full rectified wave functions; half range sine and cosine series.
 - ORDINARY DIFFERENTIAL EQUATIONS & ITS APPLICATIONS:** Exact differential equations; equations reducible to exact differential equations; applications of differential equations of first order and first degree to simple electric circuits; Newton's law of cooling; heat flow and orthogonal trajectories.

TEXT BOOK

Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

REFERENCE BOOKS

- Jeffery, "Engineering Mathematics", Academic Press/Elsevier.
- Sastry, S. S., "Engineering Mathematics Part-I", 2nd Edition, Prentice Hall of India
- Jain, R. K. and Iyengar, S. R. K., "Advanced Engineering Mathematics" 3rd Edition, Narosa Publishing House
- Greenberg, D., Michael., "Advanced Engg. Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd.

MA-102	APPLIED MATHEMATICS-II	L T P	Cr
		5 1 0	4

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- DIFFERENTIAL EQUATIONS OF HIGHER ORDER AND ITS APPLICATION:** Linear differential equations of second and higher order; complete solution; complementary function and particular integral; method of variation of parameters to find differential particular integral; Cauchy's and Legendre's linear equations;

- simultaneous linear equations with constant coefficients; applications of linear differential equations to simple pendulum; oscillatory electric circuits.
- LAPLACE TRANSFORMS AND ITS APPLICATIONS:** Laplace transforms of elementary functions; properties of Laplace transforms; existence conditions; transforms of derivatives; transforms of integrals; multiplication by t; division by t.
 - EVALUATION OF INTEGRALS BY LAPLACE TRANSFORMS:** Laplace transform of unit step function; unit impulse function and periodic function; Inverse transforms; convolution theorem; application to linear differential equations and simultaneous linear differential equations with constant coefficients.
 - FOURIER TRANSFORMS:** Fourier integral transforms; shifting theorem (both on time and frequency axes); Fourier transforms of derivatives; Fourier transforms of integrals; convolution theorem; Fourier transform of Dirac-delta function.
 - CURVE TRACING:** Applications of single integration to find volume of solids and surface area of solids of revolution; double integral; change of order of integration; double integral in polar coordinates.
 - APPLICATIONS OF MULTIPLE INTEGRALS:** Applications of double integral to find area enclosed by plane curves and volume of solids of revolution; triple integral; volume of solids; change of variables; beta and gamma functions and relationship between them.
 - VECTOR CALCULUS:** Differentiation of vectors; scalar and vector point functions; gradient of a scalar field and directional derivative; divergence and curl of a vector field and their physical interpretations; integration of vectors; line integral; surface integral; volume integral; Green's, Stoke's and Gauss' theorems (without proof) and their simple applications.

TEXT BOOK

Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

REFERENCE BOOKS

- Ross, S. L., "Differential Equation", Wiley India Publishers
- Piaggio, H. T. H., "Differential Equations", 1st Edition, CBS Publishers and Distributors,
- Jain, R. K. and Iyengar, S. R. K. "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House
- Greenberg, D., Michael "Advanced Engg. Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd.

MA-201	APPLIED MATHEMATICS – III	L T P	Cr
		5 1 0	4

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

PRE-REQUISITES

Knowledge of mathematical operations such as integration, differentiation

- PARTIAL DIFFERENTIAL EQUATIONS:** Formation of partial differential equations; Lagrange's linear partial differential equations; first order non-linear partial differential equation; Charpit's method; method of separation of variables and its applications to wave equation and one dimensional heat equation, two dimensional heat flow, steady state solutions only.
- SPECIAL FUNCTIONS:** Special functions, Bessel's equation and Legendre's equation and its recurrence formulae.
- TESTING OF HYPOTHESIS:** Testing of hypothesis; tests of significance for large formulation; Student's t-distribution (application only); Chi-Square test of goodness of fit.
- LIMIT AND CONTINUITY:** Limit and continuity of a complex function, differentiability and analyticity; Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic; polar form of Cauchy-Riemann equations; harmonic functions; application to flow problems.
- COMPLEX FUNCTIONS:** Integration of complex function; Cauchy-Integral theorem and formula; power series; radius and circle of convergence; Taylor's, Maclaurin's and Laurent's series; zeros and singularities of complex functions.
- RESIDUE THEOREM:** Residue theorem, evaluation of real integrals using residues (around unit and semi circle only); bilinear transformation and conformal mapping.
- LINEAR PROGRAMMING:** Formulation of linear programming problems; solving linear programming problems using (i) graphical method (ii) simplex method (iii) dual simplex method.

TEXT BOOK

Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

REFERENCE BOOKS

- Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005
- Sastry S. S., "Engineering Mathematics Part-I", 2nd Edition, Prentice Hall of India
- Jain R. K. and Iyengar S. R. K., "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House
- Greenberg Michael D., "Advanced Engg. Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd.

MA-202	APPLIED NUMERICAL METHODS	L T P	Cr
		5 1 0	4

OBJECTIVE

To provide a foundation for numerical computing for scientific and engineering applications

PRE-REQUISITE

Knowledge of Basic Mathematics involving differentiation, integration, differential equations, linear equations, etc.

- ERRORS IN NUMERICAL CALCULATIONS:** Introduction; numbers and their accuracy; absolute; relative and percentage errors and their analysis; truncation errors; general formula; error calculation for inverse problem.
- SOLUTION OF NON-LINEAR EQUATIONS:** Bisection method; Regula-Falsi method; Secant method; Newton-Raphson method; fixed point method; initial approximation and convergence criteria.
- SOLUTION OF LINEAR SYSTEMS:** Gauss elimination method; Gauss-Jordan method; UV factorization, Jacobi's method; Gauss-Seidal method.
- INTERPOLATION & CURVE FITTING:** Introduction to interpolation; Newton's forward and backward formula; Sterling formula; Lagrangian polynomials; divided differences; least squares method.
- NUMERICAL DIFFERENTIATION AND INTEGRATION:** Derivatives from differences tables; numerical differentiation formulas, Newton-Cotes integration formulae; trapezoidal rule; Simpson's rule; Bool's rule; Weddle's rule; Romberg's rule.
- SOLUTION OF DIFFERENTIAL EQUATIONS:** Taylor's series method; Euler and modified Euler's method; Runge-Kutta method; Milne's prediction corrector method, Adams-Bashforth method.
- SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:** Finite difference approximation; solution of Laplace equation (standard 5 point formula) one-dimensional heat equation (Schmidt method, Cranck-Nicolson method; Dufort & Frankel method and wave equation.

TEXT BOOK

Grewal B. S., "Numerical Methods in Engineering and Sciences", Khanna Publisher

REFERENCE BOOKS

- Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Addison Wesley
- Balagurusamy E., "Numerical Methods", Tata McGraw Hill
- Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
- Jain M. K., Iyenger S. R. K. and Jain R. K. "Numerical Methods for Scientific and Engg. Computations", Wiley Eastern
- Rao S. S., "The Finite Element Method in Engg.", 2nd Edition, Pregamon Press/McGraw Hill, 1989

MA-252	APPLIED NUMERICAL METHODS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To find the roots of non-linear equation using Bisection method.
- To find the roots of non-linear equation using Secant method.
- To find the roots of non-linear equation using Newton's method.
- To solve the system of linear equations using Gauss-Elimination method.

5. To solve the system of linear equation using Gauss-Seidal iteration method.
6. To find the values of function at a particular point using Newton's forward formula.
7. To find the values of function at a particular point using Newton's backward formula.
8. To find the values of function at a particular point using Lagrange's interpolation formula.
9. To integrate numerically using Trapezoidal rule.
10. To integrate numerically using Simpson's rule.
11. To find the solution of o.d.e (ordinary differential equation) by Euler's method.
12. To find the solution of o.d.e by Runge-Kutta method.
13. To find the numerical solution of Laplace equation.
14. To find the numerical solution of heat equation.
15. To find the numerical solution of wave equation.

REFERENCE BOOKS

1. Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Addison Wesley
2. Balagurusamy E., "Numerical Methods", Tata McGraw Hill
3. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
4. Jain M. K., Iyenger S. R. K. and Jain R. K. "Numerical Methods for Scientific and Engg. Computations", Wiley Eastern

ME-101	ENGINEERING MECHANICS	L	T	P	Cr
		5	1	0	4

OBJECTIVE

Engineering Mechanics is one of the core subjects that introduces the student to analysis of forces and motion and prepares the student for studying strength of materials and theory of machines.

- 1 **FORCE SYSTEMS:** Basic concepts of space, time, mass, force, particle and rigid body; scalars and vectors; conventions for equations and diagrams; external and internal effects of a force; principle of transmissibility; force classification; rectangular components of two and three dimensional force systems; resultant of two and three dimensional and concurrent force systems; moment about a point and about an axis; Varignon's theorem; resultant of non-concurrent force systems; couple; equivalent couples; force couple systems.
- 2 **EQUILIBRIUM:** Equilibrium in two and three dimensions; system isolation and the free-body-diagram; modeling the action of forces; equilibrium conditions; applications including plane trusses; frames and machines.
- 3 **PROPERTIES OF SURFACES/CROSS SECTIONS:** Centre of mass; determining the centre of gravity; centre of mass versus centre of gravity; centroids of lines, areas and volumes including composite sections; moments of inertia; MI of plane figures; MI with respect to axis in its plane and with respect to an axis perpendicular to the plane of figure; parallel axis theorem; moment of inertia of a rigid body – of a lamina and of three dimensional body; MI of composite figures.

- 4 **SIMPLE STRESSES AND STRAINS:** Resistance to deformation; Hook's law and stress-strain diagram; types of stresses; stresses and strains in bars of varying sections; stresses in composite bars; lateral strain and Poisson's ratio; volumetric strain, modulus of rigidity and bulk modulus; relation between elastic constants.
5. **TORSION OF CIRCULAR SHAFTS, TORSION FORMULA POWER TRANSMISSION**
6. **SHEAR FORCE AND BENDING MOMENTS:** Definitions: SF and BM diagrams for cantilevers, simply supported beams with or without overhang and calculation of max. BM and SF and point of contra-flexure under i) concentrated loads, ii) uniformly distributed loads over whole span or part of it iii) combination of concentrated and uniformly distributed loads, iv) uniformly varying loads and application of moments; relationship between rate of loading, shear force and bending moments.
7. **KINEMATICS / KINETICS OF PARTICLES:** Velocity and acceleration under rectilinear and circular motion; Newton's Second Law; D'Alembert principle; Inertial system; Newton's Second Law applied to bodies under rectilinear and circular motion; solutions of problems using D'Alembert Principle and free-body diagrams.

TEXT BOOK

Meriam, J. L. "Engineering Mechanics", John Wiley & Sons.

REFERENCE BOOKS

1. Beer, F.P. and Johnston, E.R. "Mechanics of Materials", Tata McGraw Hill
2. Shames, I.H. "Engineering Mechanics", 4th Edition, Pearson Education, 2003
3. Pytel, A and Kiusalaas, J. Thomsom, "Mechanics of Materials", Brooks & Cole, 2003

WEB REFERENCES

www.eCourses.ou.edu

ME-151	ENGINEERING MECHANICS LAB	L	T	P	Cr
		0	2	0	1

LIST OF EXPERIMENTS

1. To study various forces and moments.
2. Prove polygon law of coplanar forces, experiments with pulley systems.
3. Find support reactions for simply supported beam
4. Find Forces in Truss elements
5. Measuring forces in members of jib crane.
6. Finding C.G. and MOI of various parts like connecting rod. Flywheel using various methods
7. To find mechanical advantage and mechanical efficiency of compound screw jack.
8. To study various simple machines including gear trains e.g. Wedge; clock; sewing machine, etc.
9. To conduct tensile test and determining ultimate tensile strength percentage elongation of steel specimen
10. To conduct compression test and determine compressive strength of specimen
11. To calculate VR, MA and efficiency of single, doubles and triple start worm and worm wheel

12. To study slider crank mechanism of 2 stroke and 4 stroke IC engine models
13. To study and analyze gear trains

ME-152	WORKSHOP PRACTICE	L T P	Cr
		0 0 4	2

OBJECTIVE

To provide an overview of the basic production techniques and allied / supporting techniques used to produce finished products from raw materials. In addition to theory, students will be given practical training on various basic production techniques. After going through this course, the students will be in a position to understand the working of a mechanical workshop.

1. **INTRODUCTION:** Basic manufacturing processes and safety in workshop.
2. **ENGINEERING MATERIALS:** Classification of materials—their general mechanical properties and their selection
3. **CASTING PROCESSES:** Sand casting process; pattern making; types of moulding sands, cores, mould making, melting and pouring of metal; Casting defects.
4. **MACHINING PROCESSES:** Production of components involving turning; facing; taper turning; milling; shaping; planning and drilling operations.
5. **METAL FORMING PROCESSES:** Sheet metal forming operations; shearing, bending, punching and blanking, forging processes as upsetting, drawing down, bending etc.
6. **JOINING PROCESSES:** Metal arc welding; gas welding; resistance welding; soldering and mechanical fastening processes.
7. **FITTING AND MAINTENANCE:** Study of fitting tools, marking tools and measuring instruments like micrometer, vernier calipers and height gauge; introduction to some basic maintenance techniques/processes.

TEXT BOOK

Raghuwanshi, B.S., "A course in Workshop Technology, Vol. I & II", Dhanpatrai & Co.

REFERENCE BOOK

Hazra & Chaudhary, "Workshop Technology Vol. I & II", Asian Book Co.

NOTES

1. In all sections of workshop, students will study about the tools used, different operations performed and main parts of the machine
2. Term final evaluation will be done on the basis of doing a practical job and viva-voce. There will be no theory paper on this subject.

JOBS TO BE DONE**A. Machine Shop**

1. To prepare a job on a lathe involving facing, turning, taper turning, step turning, radius making and parting off.
2. To prepare horizontal surface/ vertical surface / curved surface/ slot or v-grooves on a shaper / planer.

3. To prepare a job involving side and face milling on a milling machine.
4. To prepare a job involving drilling and tapping of holes.

B. Sheet Metal Work

1. To draw layout, do marking and prepare a rectangular tray of sheet metal.
2. To draw layout, do marking and prepare a funnel of sheet metal.

C. Foundry

1. To prepare a single piece pattern mould, put metal in the mould and fettle the casting.
2. To prepare a split piece pattern mould.

D. Welding

1. To prepare joints (Lap and butt) by metal arc welding
2. To prepare welded joint by resistance welding

E. Fitting and Maintenance Jobs

1. Fitting jobs involving, chipping, filing, marking and measuring with precision instruments.
2. Maintenance and repair of common domestic appliances such as desert cooler, LPG stove, room heater, water tap, flush system, electric iron, scooter etc.

ME-153	ENGINEERING GRAPHICS	L T P	Cr
		0 0 6	3

OBJECTIVE

Engineering graphics is the primary medium for development and communicating design concepts. Through this course the students are trained in engineering Graphics concepts through manual drafting. The ISI code of practice is followed. With this course students can improve the visual concepts in all engineering streams.

1. **INTRODUCTION:** Need drawing instruments; geometrical drawing, conventional representation—indicating welds, Joints, surface texture, structural work etc.; various types of projections; first and third angle systems of orthographic projections.
2. **SIMPLE PROJECTS:** Projection of points in different quadrants; projections of, lines parallel to or inclined to one or both reference planes, true length of a line and its inclination with reference planes; traces of a line; concept of auxiliary plane.
3. **PROJECTIONS OF PLANES:** Parallel to one reference plane; inclined to one plane but perpendicular to the other, inclined to both reference planes.
4. **PROJECTIONS OF SOLIDS AND SOLIDS OF REVOLUTION:** In simple positions with axis perpendicular to a plane; with axis parallel to both planes; with axis parallel to one plane and inclined to the other.
5. **SECTIONS OF SOLIDS:** Prisms; pyramids; cylinders and cones; section plane is parallel, perpendicular and inclined to both reference planes; true shape of sections.
6. **DEVELOPMENT OF LATERAL SURFACES OF REGULAR SOLIDS:** Rectangular block; cylinder; cone; pyramid.

7. **ISOMETRIC VIEWS OF PLANES:** circle, square, rectangle; Isometric views of solids-prisms, pyramids and cylinders; principle of perspective projection, perspective of planes and solids.

TEXT BOOK

Bhatt, N.D., and Panchal, V.M., "Engineering Drawing Plane and Solid Geometry", Forty-Fourth Edition, Charotar Publishing House, 2002.

REFERENCE BOOKS

- Gill, P. S., "Engineering Graphics and Drafting", Millennium Edition, S. K. Kataria and Sons
- Mathur, S.B., "A Text Book of Engineering Drawing", Second Revised and Enlarged Edition, Vikas Publishing House, 2000.
- SP 46-1988, Bureau of Indian Standards (BIS), New Delhi

WEB REFERENCES

- www.technologystudent.com
- www.animatedworksheets.co.uk
- www.ider.herts.ac.uk/school/courseware

LIST OF SHEETS TO BE MADE:

Sl. No.	Details of the sheet	No. of sheets
1.	Basic Geometrical Constructions including the curves, ellipse, parabola, Hyperbola, and cycloidal curves.	1
2.	Projection of Lines including traces.	2
3.	Projection of Planes.	1
4.	Projection of Solids.	2
5.	Section of solids.	2
6.	Developments of surfaces	1
7.	Isometric and Perspective views.	2

PH-101	PHYSICS	L T P	Cr
		5 1 0	4

OBJECTIVE

To educate the students with the present day physical sciences through concepts like optics, acoustics, EM theory, etc.

- INTERFERENCE:** Interference by division of wave front; Fresnel's biprism and its application to find wavelength; interference by division of amplitude; Newton's rings and its applications; determination of wavelength and refractive index of liquids; Michelson interferometer and its applications; determination of wavelength; resolution of spectral lines (difference in wavelength); determination of refractive index of thin sheet.
- DIFFRACTION:** Difference between Interference and diffraction; difference between Fraunhofer and Fresnel diffraction; Fraunhofer diffraction through single slit; variation of intensity (analytical); plane transmission diffraction grating; absent spectra; maximum order spectra; dispersive and resolving power of grating.
- POLARIZATION:** Polarised and unpolarized light; double refraction; Nicol prism; quarter and half

wave plates; optical activity; Dextro and Leavo rotatory; specific rotation; biquartz and Laurent's half-shade polarimeters.

- LASER AND FIBRE OPTICS:** Spontaneous and stimulated emissions; laser action (pumping and population inversion); characteristics of laser beam-concepts of coherence; solid state (Ruby) laser; gas (He-Ne) laser; applications; basic principles; fiber construction; propagation of light in fibers; numerical aperture; single mode and multi mode fibers; applications of optical fibers.
- SPECIAL THEORY OF RELATIVITY:** Inertial frames of reference; Galilean transformations; non-inertial frames of reference; Michelson-Morley experiment; postulates of special theory of relativity; Lorentz's transformations; length contraction; time dilation; variation of mass with velocity; mass energy equivalence.
- ELECTRO MAGNETIC THEORY and ELECTROSTATICS :** Review of basic concepts of electrodynamics; Maxwell's modification of Ampere's law, equation of continuity; Maxwell's equations and its simple plane wave solution in free space; Poynting's theorem; dielectric polarization; electric displacement; susceptibility and permittivity and various relations between these; Gauss law in dielectrics; electrostatic energy stored in dielectrics; behaviour of dielectrics in A.C. field: simple concepts; dielectric losses.
- ULTRASONICS:** Production of ultrasonics by magnetostriction and piezoelectric oscillator methods; detection of ultrasonics by Kundt's tube and acoustic grating method.

TEXT BOOK

Avadhunulu and Kshirsagar, "A Text Book of Engineering Physics", S. Chand & Co.

REFERENCE BOOKS

- Sears, F.W., "Electricity and Magnetism", Narosa
- Arthur Beiser, "Perspectives of Modern Physics", Tata McGraw Hill
- Vasudeva, A.S., "Modern Engineering Physics", S. Chand & Co.
- Resnick and Halliday, "Physics Vol. I-II", Wiley Eastern
- Brij Lal and Subramanyam, "A Text Book of Optics" S. Chand & Co.
- Brij Lal and Subramanyam, "A Text Book of Sound" S. Chand & Co.
- Wehr, Richards and Adair, "Physics of the Atom", Narosa

PH-102	APPLIED PHYSICS	L T P	Cr
		5 1 0	4

OBJECTIVE

To educate the students with the present day physical sciences through concepts like nanotechnology, quantum physics, thermal physics, super conductivity, etc.

- CRYSTAL STRUCTURE:** Space lattice; unit cell and translation vector; Miller indices; simple crystal structure(sc; bcc; fcc; hcp); principle of X- ray

- diffraction; Bragg's law; experimental X-ray diffraction methods: Laue method and Powder method; point defects in solids; concentration of Frenkel defects and Schottky defects.
- QUANTUM PHYSICS:** Failure of classical concepts; black body radiation; Planck's radiation law; wave packets; group velocity and phase velocity; Schrödinger wave equations: time dependant and time independent equations; significance of wave function; wave function for a particle in a box.
 - FREE ELECTRON THEORY:** Elements of classical free electron theory and its limitations; Drude's theory of conduction; quantum theory of free electrons; Fermi level; Density of states (3D); average kinetic energy $\left(= \frac{3}{5} E_f \right)$ of free electrons (3D); Fermi-Dirac distribution function; thermionic emission; Richardson's equation.
 - BAND THEORY and NANO TECHNOLOGY:** Origin of energy bands; classification of solids into metals; semiconductors and insulators; Kronig Penney model (Qualitative); E-K diagrams; Brillouin zones; concept of effective mass and holes; hall effect and its application, nanotechnology (basic concept only) and its application.
 - THERMAL PHYSICS:** Gas law; iso-thermal and isentropic process; Rankin cycle; Carnet cycle; principal of equipartition of energy; specific heat of monoatomic gases; Maxwell's velocity distribution; mean velocity; RMS velocity; most probable speed; Joule Thomson's expansion; liquification of He I and He II Stefan Boltzmann's law; Newton's law of cooling.
 - MAGNETIC PROPERTIES OF SOLIDS:** Atomic magnetic moments; orbital diamagnetism; classical Langevin's theory of dia-magnetism and para-magnetism; ferro-magnetic domains; antiferromagnetism; ferrimagnetism (simple ideas).
 - SUPERCONDUCTIVITY:** Introduction (experimental survey); Meissner effect; Type I and Type II superconductor; London equation.

TEXT BOOK

Avadhunulu and Kshirsagar, "A Text Book of Engineering Physics", S. Chand & Co.

REFERENCE BOOKS

- Kittel, Charles "Introduction to Solid State Physics", John Wiley Powell and Crasemann, "Quantum Mechanics", Oxford and IBH
- Aggarwal, R.S., "Thermal Physics and Statistical Physics", MTG Books.
- Saxena, B.S., and Gupta, R.C., "Fundamentals of Solid State Physics", Pragati Prakashan.
- Pillai, "Solid State Physics", New Age
- Ghatak and Loknathan, "Quantum Mechanics", McMillan
- Beiser, Arthur, "Modern Physics", Tata McGraw Hill.

PH-151	PHYSICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

The experiments in 1st term will be based mainly upon optics, electrostatics, wave and oscillations which are the parts of the theory syllabus of 1st term.

- To find the wavelength of sodium light by Newton's rings experiment.
- To find the wavelength of sodium light by Fresnel's biprism experiment.
- To find the wavelength of various colours of white light with the help of a plane transmission diffraction grating.
- To find the refractive index and Cauchy's constants of a prism by using spectrometer.
- To find the wavelength of sodium light by Michelson interferometer.
- To find the resolving power of a telescope.
- To find the pitch of a screw using He-Ne laser.
- To find the specific rotation of sugar solution by using a polarimeter.
- To compare the capacitances of two capacitors by De'Sauty bridge and hence to find the dielectric constant of a medium.
- To find the flashing and quenching potentials of Argon and also to find the capacitance of unknown capacitor.
- To study the photoconducting cell and hence to verify the inverse square law.
- To find the temperature co-efficient of resistance by using platinum resistance thermometer and Callender and Griffith bridge.
- To find the frequency of A.C. mains by using sonometer.
- To find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.

REFERENCE BOOKS

- Worshnop, B. L. and Flint, H. T. "Advanced Practical Physics", KPH
- Gupta, S. L. & Kumar, V. "Practical Physics", Pragati Prakashan
- Chauhan & Singh, "Advanced Practical Physics Vol. I & II", Pragati Prakashan.

PH-152	APPLIED PHYSICS LAB	L T P	Cr
		0 0 2	1

LIST OF EXPERIMENTS

- To find the low resistance by Carey – Foster's bridge.
- To find the resistance of a galvanometer by Thomson's constant deflection method using a post office box.
- To find the value of high resistances by Substitution method.
- To find the value of high resistances by Leakage method.
- To study the characteristics of a solar cell and to find the fill factor.
- To find the value of e/m for electrons by Helical method.
- To find the ionization potential of Argon/Mercury using a thyratron tube .
- To study the variation of magnetic field with distance and to find the radius of coil by Stewart and Gee's apparatus.
- To study the characteristics of (Cu-Fe, Cu-Constantan) thermo couple.
- To find the value of Planck's constant by using a photo electric cell.
- To find the value of co-efficient of self-inductance by using a Raleigh bridge.
- To find the value of Hall co-efficient of semi-conductor.

13. To study the V-I characteristics of a p-n diode.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. To calculate the hysteresis loss by tracing a B-H curve.

REFERENCE BOOKS

1. Worshnop, B.L. and Flint, H.T. "Advanced Practical Physics", KPH
2. Gupta, S.L. and Kumar, V. "Practical Physics", Pragati Prakashan.
3. Chauhan and Singh, "Advanced Practical Physics Vol. I & II", Pragati Prakashan.

ADDITIONAL/BRIDGE COURSES

OBJECTIVE

A student found deficient in any area of knowledge/skill needed for programmes of study e.g. Communication Skill, Mathematics, etc. may be required to do suitable additional course(s) on audit basis which will not be shown on his Grade Card. However if a bridge course(s) is (are) required for those students admitted to second year the same will be shown on the Grade Card as an audit course.

Note: These Courses are made for a specific purpose and are available only for the intended purpose.

EN-291	ESSENTIALS OF COMMUNICATION OBJECTIVE (BRIDGE COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of bridge course is to bring some of the students who are not up to the mark and are not able to pursue the technical education like their counter parts. This course has been devised to bring the students to that level from where they can do justice to the technical education they are going to pursue.

1. Advertisements; notices; formal and integral invitations.
2. Report writing; or factual description based on verbal input provided.
3. Letter writing: business letter; enquires; registering complaints; asking and giving information; placing orders and sending replies; letter to editor.
4. Parts of speech: noun; pronoun; verb; adverb; adjective; proposition; conjunction; exclamation and general English grammar.
5. Verb patterns and sentences structure and tense.
6. Foreign words; one word substitutions and word formation.
7. Group discussion and debate on various current affairs.

TEXT BOOK

Wren & Martin, "A High School Grammar & Composition"

REFERENCE BOOKS

1. Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975
2. Tikku M. C., "An Intermediate Grammar Book"
3. "English for Engineers and Technologists: A Skill Approach", Vol. 2, Orient Longman
4. Ramesh M. S. and Pattanshetti C. C., "Business Communication", R.Chand and Company, Delhi
5. "Group Discussion", Sudha Publications/Ramesh Publishing House, New Delhi.

MA-191	MATHEMATICS (MAKEUP COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

Mathematics is a very essential part of all engineering courses. The students entering in the first year who are some how weak in concepts of Mathematics need up gradation in their level of Mathematics. This course is designed keeping in view such students.

1. **BASIS OF CURVES:** Important equations for different types of curves in plane including Cartesian, Parametric forms; Concept of polar coordinates and important curves in polar coordinates.
2. **SEQUENCE AND SERIES:** Sequences, A.P, G.P., H.P; Special sequences $\sum_{n=1}^n n, \sum_{n=1}^n n^2, \sum_{n=1}^n n^3$; Expansions of important functions.
3. **DIFFERENTIAL CALCULUS:** Definition of derivatives and concepts of partial derivatives, Differentiation of parametric curves up to second order; Successive differentiation including Leibnitz rule; analytical and geometrical significance of differentiation.
4. **INTEGRAL CALCULUS:** Formulae of indefinite integrals; Properties of definite integrals; Integration by parts and continued integration by parts.
5. **THREE DIMENSIONAL GEOMETRY:** Dimensional coordinates and important equation of planes and surfaces (including sphere, cone, cylinder and ellipsoid); cylindrical and spherical coordinates in three dimensions.
6. **VECTORS:** Representation of vectors in two and three dimensions; operations on vectors including dot and cross product of three vectors and four vectors.
7. **PROBABILITY THEORY:** Permutation; Combination; Binomial theorem.

TEXT BOOK

NCERT, "Mathematics for XI and XII", NCERT, New Delhi

REFERENCE BOOKS

1. Sharma R. D., "Text Book of Mathematics for Class XI", 10th Edition, Dhanpat Rai & Sons
2. Sharma R. D., "Text Book of Mathematics for Class XII", 10th Edition, Dhanpat Rai & Sons
3. Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

MA-291	MATHEMATICS (BRIDGE COURSE)	L T P	Cr
		5 0 0	3

OBJECTIVE

The students, who join the University after diploma course, are deficient in mathematics. This course is designed to upgrade and update their knowledge in mathematics so that they are at par with second year students.

1. **PARTIAL DIFFERENTIATION:** Functions of two or more variables; Partial derivatives; Total differential and differentiability; Derivatives of composite and implicit functions; Jacobians; Higher order partial derivatives; Homogeneous functions; Euler's theorem.
2. **MULTIPLE INTEGRALS:** Double integrals; Change of order of integrations; Double integrals in polar co-ordinates; Applications of double integral to find area enclosed by plane curves and volume of solids of revolution; triple integrals; Volume of solids; Change of variables.
3. **SPECIAL INTEGRALS:** Differentiation under integral sign; Beta and gamma functions and relationship between them.
4. **LAPLACE TRANSFORMS:** Laplace transforms and its elementary properties; Inverse transforms; Convolution theorem.
5. **FOURIER SERIES AND FOURIER TRANSFORMS:** Euler's formulae; Change of intervals; Fourier series of odd and even functions; Half range sine and cosines series; Fourier integrals; Fourier transforms; Elementary properties.
6. **DIFFERENTIAL EQUATIONS:** Formations of ordinary differential equations; Solutions of ordinary linear differential equations including solutions by Laplace transform.
7. **PARTIAL DIFFERENTIAL EQUATIONS:** Formations of partial differential equations; Solutions of linear and non-linear partial differential equations.

TEXT BOOK

Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

REFERENCE BOOKS

1. Kreyszig F., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006
2. Jain R. K. and Iyengar S. R. K., "Advanced Engineering Mathematics", 3rd Edition, Narosa Publishing House
3. Greenberg Michael D., "Advanced Engineering Mathematics", 2nd Edition, Dorling Kindersley India Pvt. Ltd., New Delhi

* * * * *

PROFESSIONAL DEVELOPMENT

OBJECTIVE

To meet the corporate requirements bridge the gap between technological skills and soft skills, by improving communication, behavioural, analytical skills, etc.

METHODOLOGY

To enable students become competent professionals and good citizens with moral and ethical values, a set of 14 courses of one credit each will be provided covering

- (i) Value Added Courses,
- (ii) Professional Development Courses, and
- (iii) Co-curricular Activities.

PD-151	BASICS OF COMPUTER FUNDAMENTALS	L T P	Cr
		0 0 2	1

proof-carrying code, hardware protection, other technical attacks.

OBJECTIVE

To understand fundamentals of computer applications, networking and building projects.

1. **MS-WORD:** Introduction to MS-Word: Menus, toolbars, ruler, scroll bars, creating, saving, importing, exporting and inserting files, formation, indents/out dents, lists, tabs, styles, working with frames, columns, pictures, chart/graphs, forms, tools, equations and macros.
2. **MS-EXCEL:** Worksheet overview: rows, columns, cell, menus, creating worksheets; opening and saving worksheet; formatting, printing, charts, window, establishing worksheet links, macros, database, tables, using files with other programs.
3. **MS-POWERPOINT:** Overview of MS-PowerPoint, creating slides and presentations, rehearsing presentation, insert, tools, format, slide-show, Window options.
4. **MS-PROJECT:** Starting a Project, Starting Microsoft Project 2000, planning a project, defining the project scope, outlining and task relationships, outlining the project, developing the schedule, changing task relationships and constraints, adding and assigning resources, developing the project calendar, assigning project resources, determining project costs, adjusting project resources and timelines, analyzing the project, using different views and reports, displaying project data, organizing project information, sorting and filtering project data, creating custom filters.
5. **NETWORKING:** Basics of networking, study of topology: LAN, WAN, MAN, Connecting devices: passive hub, repeater, active hub, bridges, two layer switches, routers, three layer switches, gateway, network attack and defense: most common attacks.
6. **TROUBLESHOOTING:** Ping command, TRACERT or TRACEOUT, IP configuration, NETSTAT, NET, recovery commands DISKPART etc., setting up local security policies, installation of servers.
7. **FUNDAMENTALS OF CYBER LAW:** Overview of computer and web technology, access control: operating system access controls, group and roles, access control lists, Unix operating system security, Windows NT, capabilities, added features in Windows 2000, granularity, sandboxing and

REFERENCE BOOKS:

1. Habraken, "MS-Office 2000 8 in 1", Prentice Hall
2. Taxali R. K., "PC Software for Windows Made Simple", Tata McGraw
3. Sandler, "Teach Yourself MS Office", BPB Publications
4. Bangia R., "Learning MS Office 2000", Khanna Book Co
5. Wang W. and Parker R. C., "MS Office 2000 Windows for Dummies", IDG Books India (P) Ltd
6. Peter Dyson, "Undertaking PC Tools", Sybex / Tech Asian Edition Tech Publications.
7. Bansal S. K., "Cyber Crime"
8. Ahmand Tabrez, "Cyber law , E-commerce & M-Commerce"
9. Carl Chatfield and Timothy Johnson, "Microsoft Office Project 2007 Step by Step"

PD-191	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

OBJECTIVE

To help the students in their all round growth and acquire attributes like team spirit, organizational ability, leadership qualities, etc.

OPERATION

The students are to take part in Co-curricular activities outside contact hours through clubs/ societies spread over all the three terms of the year. They are required to register for this course in each term and their performance will be evaluated in last term of the year.

PD-192	PERSONALITY SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To equip the students with the understanding of human behavior, develop time management skills, and enhance personality.

1. **TRANSACTIONAL ANALYSIS:** Winners and losers; ego states; OK states; positive and negative strokes; life scripts; exercises.
2. **CREATIVE THINKING:** What is creativity; 6 thinking hats; mental blocks; exercises.

3. **SELF DISCOVERY:** Importance of knowing yourself; SWOT analysis; benefits; strengths and weaknesses; exercises.
4. **DEVELOPING POSITIVE ATTITUDE:** Meaning; changing attitudes; power of positive thinking; overcoming negative attitude; exercises.
5. **TIME MANAGEMENT:** Features, time management matrix; tips for time management; effective scheduling; time wasters; time savers; exercises and time bound tasks.
6. **STRESS MANAGEMENT:** What is stress; causes; positive and negative stress; effects; signs; tips to overcome stress; stress busters; exercises
7. **DECISION MAKING:** Definition; models and types; skills and techniques; courses of action; steps involved in decision making; individual decision making and group decision making; exercises

REFERENCE BOOKS

1. Muriel, James and Jongeward, Dorothy, "Born to Win", Signet Publishers, 1978
2. Harris, Thomas Anthony, "I'm OK, You're OK", Galahad Books, 2004
3. Dr. Alex, K., "Soft Skills", 2009, S. Chand, 2009
4. Adams Scott, "Positive Attitude", Andrews Mcbeel Publishing, 2004
5. Newton Tim, "Managing Stress – Emotion and Power at Work", Sage Publications Ltd., 1995
6. Koch Richard, "The 80/20 Principle :The Secret to Success by Achieving with Less", Broadway Business, 1999
7. Covey Stephen R., "The 7 Habits of Highly Effective People", Simon & Schuster UK, 2004

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-193	ENTREPRENEURIAL & PROFESSIONAL SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To empower the students with entrepreneurial skills, behaviour, grooming and effective interaction at the work place.

1. **GOAL SETTING:** Types of goals; setting smart goals; personal goal setting; business goal setting; goal setting techniques.
2. **ENTREPRENEURIAL SKILLS:** Meaning; entrepreneurial competencies; advantages; risks involved, avenues and opportunities; support from Govt.; basic and significant personality traits; venture project planning and entrepreneurship cycles; planning the project; entrepreneurship in daily life; case studies in entrepreneurship; exercises.
3. **CORPORATE DRESSING:** The corporate fit; corporate culture; dress codes; dressing for interviews; clothing do's and don'ts.
4. **CORPORATE GROOMING:** Making a good impression at work; grooming check list; accessories, do's and don'ts for men and women; hygiene and skin care; hands and feet; make up and hair accessories.

5. **ETIQUETTE & MANNERS:** Social etiquette; dining etiquette; party and wedding etiquette; sensitivity towards diverse cultures; respecting religions and traditions.
6. **BUSINESS ETIQUETTE:** Dealing with people at work place (peers, subordinates and superiors); international business; etiquette at meetings and conferences.
7. **COMMUNICATION MEDIA ETIQUETTE:** Telephone etiquette; email etiquette; media etiquette.

REFERENCE BOOKS

1. Miner, B. John, "The 4 Routes to Entrepreneurial Success", Berrett-Koehler, 1996
2. Ellis, Keith, "The Magic Lamp", Three Rivers Press, 1998
3. Blair, Gary Ryan, "The Ten Commandments of Goal Setting", Goalsguy Learning Skills Inc., 2005
4. Gupta, Seema, "Correct Manners and Etiquette", Pustak Mahal, 1992
5. Soundararaj, Francis, "Speaking and Writing for Effective Business Communication", MacMillan, 1995

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-251	MATLAB	L T P	Cr
		0 0 2	1

OBJECTIVE

MATLAB is a powerful language for technical computing. It is widely used in universities and colleges for courses in mathematics, science and especially in engineering. In industry the software is used in research, development and design. This course is intended for students who are using MATLAB for the first time and have little or no experience in computer programming.

1. **BASIC STRUCTURE and FEATURES OF MATLAB:** Command window; figure window; editor window and help window; arithmetic operations with scalars, order of precedence; using MATLAB as a calculator; display formats; elementary math built-in functions; scalar variables, assignment operator; predefined variables; useful commands for managing variables; applications in problem solving.
2. **CREATING ARRAYS** – one dimensional, two-dimensional; array addressing; built-in functions for handling arrays; mathematical operations with matrices; strings and strings as variables; generation of random numbers; examples of MATLAB applications.
3. **SCRIPT FILES:** Creating and saving a script file, current directory; output commands.
4. **TWO – DIMENSIONAL PLOTS:** Plot command; line specifiers plot of a given data; plot of a function; plotting multiple graphs in the same plot.
5. **FUNCTIONS AND FUNCTION FILES:** Creating a function file; input and output arguments; function body; comment lines; saving a function files; using a function file; programming in MATLAB.

TEXT BOOK

Gilat Amos, "MATLAB: An Introduction with Applications", John Wiley & Sons, Inc (Wiley Student Edition), 2008

REFERENCE BOOK

Herniter, E. Marc, "Programming in MATLAB", Brooks/Cole, Thomson Learning

PD-291	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

PD-292	EFFECTIVE COMMUNICATION	L T P	Cr
		0 0 2	1

OBJECTIVE

To acquaint the students with the basics of effective spoken and written English and enhance their reading, listening, and communication skills.

- COMMUNICATION:** Importance; barriers and types of communication; methods to develop effective communication skills.
- GRAMMAR:** Parts of speech; subject/verb agreement; tenses; error correction; business idioms; Indianism in English; frequently mispronounced words; exercises.
- SPOKEN ENGLISH:** Vowel and consonant sounds; syllables and syllabic stress; conversational skills; extempore; JAM.
- READING & LISTENING SKILLS:** Reading with comprehension; story reading; passage reading; newspaper reading; listening and active listening; barriers to listening; effective listening and types of listening; exercises.
- WRITING SKILLS:** Importance of writing skills; how to develop writing skills; writing exercises i.e., essay writing, reviews, reports, etc.
- NON VERBAL COMMUNICATION:** History; kinesics; postures; gestures; functions; importance and challenges of non verbal communication.
- BUSINESS COMMUNICATION:** Business letters and messages; business reports; presentation skills; do's & don'ts; personal journal.

REFERENCE BOOKS

- Wren and Martin, "High School Grammar", Paperback, 2000
- Condrell Jo, & Bough, Bennie, "101 Ways to Improve Your Communication Skills Instantly", 4th Edition, Paperback, 2005
- Rai S. M., Rai Urmila, "Communication Skills", Students Edition, Himalaya, 2007.
- Connor J. D. O, "Better English Pronunciation" Cambridge. 2nd Edition, Paperback, Cambridge University Press, 2008
- Raina Arjun, "Speak Easy Voice And Accent Training Manual", Paperback (Special India Edition, Full Circle
- Guffey Mary Ellen, "Business Communication" 3rd Edition, South – Western College Publishing, 2000

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-293	INTRA & INTER-PERSONAL SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To acquaint the students with the understanding of self development through good inter-personal skills for effective social communication in order to succeed in maintaining relationships in professional and social environments. This module will also help at learning group discussions and interview skills to enable employability and professional fit.

- SELF AWARENESS:** Development of our self image; social comparison; significant others; self esteem; self confidence.
- ASSERTIVENESS & CONFIDENCE:** Assertiveness; being confident; strategies to make assertive NO easier; dealing with emotions; difference between being aggressive and being assertive.
- TEAM BUILDING & TEAM WORK:** The team concept; elements of team work; stages of team formation; effective team; essential building blocks of effective teams; team player's style; team tasks; exercises.
- LEADERSHIP SKILLS:** Leadership skills and styles; motivating people; understanding abilities; delegating tasks; managing people; overcoming hurdles; exercises.
- INTERVIEW SKILLS:** Why an interview; the first step to a successful interview; resumes that make an impact; the interview process; the interview preparation checklist; interviewing skills; putting your best foot forward; common interview mistakes; one on one HR interviews (two for each student).
- GROUP DISCUSSION SKILLS:** Meaning of a GD; types; role of a moderator; do's and don'ts; mock GDs on general, knowledge based and abstract topics.
- THE ART OF CONVERSATION:** Skills to strike a conversation; sustaining conversation; communicating across cultures; conflict management.

REFERENCE BOOKS

- Haddon, F. Peter, "Mastering Personal and Interpersonal Skills", Viva Books Pvt. Ltd., 2003
- Schuller, Robert H., "Tough Times Never Last But Tough People Do", Orient Paperbooks, 1988
- Bolton, Robert, "People Skills", Touchstone Books, 1986
- Jansaz, De Suzanne, "Interpersonal Skills in Organizations", 3rd Edition, McGraw Hill Education (Asia), 2009
- Fontana, David, "Social Skills at Work", Universities Press, 2000
- Burns, James Mac Gregor, "Leadership", Harper Perennial, 1982
- Harris, Godfrey, "Art of Conversation", Jaico Publishing House, 2002
- Ganguly, Anand, "Group Discussions and Interviews", Ramesh Publishing House, 2008

Notes: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-354	EMBEDDED SYSTEM DESIGN (8051 MICROCONTROLLER)	L T P	Cr
		0 0 2	1

OBJECTIVE

The course intends to cover the design issues involved in embedded systems and system-on-chip technologies. The course also deals with the applications and programming languages and processor architectures used for embedded systems. This course introduces the students to standard Embedded System Development tools and gives a hands-on experience in developing various embedded applications.

LIST OF EXPERIMENT

- To study I/O Addresses, software and memory mapping.
- To study serial interface with microcontroller.
- To study various commands for e.g. fill, Move, constant.
- Write a program to move a block of memory from one location to another location.
- Write a program for splitting a byte into two nibble.
- To study details of various connectors.
- Write a program for interfacing of microcontroller with stepper motor.
- To study in detail RISC pipelines in PIC microcontroller.
- Write a program for any microcontroller application.
- Write a program on any real time application using microcontroller.

REFERENCE BOOKS

- Predko, "Programming and Customizing the 8051 Microcontroller", Tata McGraw Hill, 4th edition, 2008.
- John Catsoulis, "Designing Embedded Hardware"; SHROFF PUB. and DISTR, 3rd edition, 2005.
- Michael Barr, "Programming Embedded Systems in C and C++", SHROFF PUB. and DISTR. ND.4th edition, 2006.
- A.J. Ayala, "8051 Architecture and Programming", 2nd edition, 2007.
- Udai Shankar, "8051 Microcontrollers", Tata McGraw Hill, 2nd edition, 2000.

PD-391	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

PD-392	PROBLEM SOLVING SKILLS	L T P	Cr
		0 0 2	1

OBJECTIVE

To train and enhance the students' problem solving skills, reasoning ability, quantitative ability, and reading comprehension skills.

- LOGICAL REASONING:** Logical deductions (Syllogism & Venn Diagrams); logical connectives.

- ANALYTICAL REASONING:** Seating arrangements; combinations; selections; comparisons; blood relations; directions, etc.
- NON-VERBAL REASONING (ALPHA-NUMERIC & VISUAL PUZZLES):** To solve problems on numbers, alphabet, symbols and visuals; problem types are series, analogies, odd man out, coding decoding, and symbols & notations.
- BUSINESS MATHS:** Number system; ratios; averages; time & work; time & distance; percentages; profit & loss; simple & compound interest; **HIGHER MATHS:** Algebra; Mensuration.
- DATA INTERPRETATION & SUFFICIENCY:** Tables, Bar chart, line graph, pie charts; to enable student assess whether the given data is sufficient to solve a question; for both reasoning based and quant based problems.

READING COMPREHENSION: To enable a student comprehend short and long passages from the perspective of solving questions based on the passage.

REFERENCE BOOKS

- Aggarwal R. S., "Verbal & Non-Verbal Reasoning", 2008, S. Chand, 1994
- Aggarwal R. S., "Quantitative Aptitude for Competitive Examinations", S. Chand, 2008
- Gulati, SL, "Quantitative Ability", Bookhive India, 2006
- "GRE Barron's", 13th Edition, Barron's Educational Series, 2009
- Devi Shakuntla, "Book of Numbers", 1984
- Summers George J., "The Great Book of Puzzles & Teasers", Jaico Publishing House, 1989

PD-393	ADVANCED PROFESSIONAL DEVELOPMENT	L T P	Cr
		0 0 2	1

OBJECTIVE

To equip the students with the basics of law, accounting, corporate policies, and ethics; the general awareness useful in leading a well informed life.

- LAW FOR THE LAYMAN:** Indian Judiciary System; Intellectual Property Rights (IPR); labour laws; employee rights; human rights; criminal laws, civil rights.
- BASICS OF ACCOUNTING:** Credit-Debit transactions; balance sheet; ledgers; receipts & vouchers; P & L statement; exercises.
- MONEY MANAGEMENT:** Types of taxes; how to manage taxes; investment options; an overview of stocks & shares; savings options; understanding important terms (depreciation, VAT, education cess).
- CORPORATE RULES & POLICIES:** The need; advantages; illustrations of certain rules & policies followed by selected corporate; code of conduct.
- RIGHTS & DUTIES:** An overview of the Indian constitution; fundamental rights & duties; directive principles of state policy; societal values; ideologies of some famous personalities.
- TECHNOLOGY, POLITICS & RELIGIONS IN INDIA:** various religions and their teachings; political developments in India; history of science & technology.

7. **HUMAN VALUES:** Ethics at work place; human values; morals & ethics; professional ethics; case studies.

REFERENCE BOOKS

1. Anthony M.J, "Law for the Layman", Hind Pocket Books, 2003
2. Mathur Reeta, "Recent Trends in Indian Economy", 3 Vol set, Sublime Publication, 2003
3. Eisen J. Peter, "Accounting - The Easy Way", Barron's Educational Series, 2003
4. Kiyosaki Robert, and Lechter Sharon, "Rich Dad, Poor Dad", Warner Books, 2001
5. Lakhotia R. N, "Income Tax Guide for the Taxpayer", Vision Books, 2009

NOTE: One trainer per lecture and two trainers per practical session. Classroom with board/projector for PPT and video clips will be required.

PD-454	MICROPROCESSOR AND DSP BASED SYSTEMS	L T P	Cr
		0 0 2	1

OBJECTIVE

The course intends to cover the design issues involved in Microprocessor and DSP Based Systems development of microcontroller, DSP and microprocessor based systems. The topics include the hardware configuration for peripheral modules, layered software design and system development environment set up.

PREREQUISITES

C Programming

1. Introduction to Architecture and assembly instruction set of TMS370.
2. C language Review - pointers and Macros, Program development tools – compiler, linker, debugger and emulator.
3. Systems and digital I/O configuration, Serial peripheral interface
4. Interrupts and A/D Converter interfacing

5. Timers, Serial communication interfacing.
6. Programming EPROM and EEPROM and Programming techniques – function pointers, callback functions, file inclusion in multi-module Programs, conditional compilation.
7. Interface C program with assembly program, Debugging techniques, and Timing Considerations, Real-time operating systems, floating point number computation On fixed point processors.
8. Architecture and development environment of DSP, Compare Microcontroller, microprocessor and DSP.
9. Instruction sets and addressing modes of TMS320c50.
10. Arithmetic and logic operations of TMS320c50 , Make file and integrated development environment for TMS320c50.

TOOLS USED

TMS370 microcontroller emulator and training board, EPROM programmer.

TEXT BOOK

TMS370 Family – User's Guide 1996, Texas Instruments,

REFERENCE BOOKS

7. Dennis, M. Ritchie and Brian, W. Kernigham, "The C Programming Language", Prentice Hall of India, 1988.
8. Byron, C. Gottfried, "Theory and Problem of Programming with C", Tata McGraw Hill, 1996.
9. Proakis and Manolakis; "Digital Signal Processing", Prentice Hall of India, 2006.

PD-491	CO-CURRICULAR ACTIVITIES	L T P	Cr
			1

Refer to PD-191 for details.

OPEN ELECTIVE

OBJECTIVE

The idea of open elective is to expand the application horizon of the knowledge acquired beyond the boundaries of one's own discipline

METHODOLOGY

The student may enroll for one course from the list provided in the Scheme of Studies & Syllabus. The course shall strictly be from any other discipline. Selection of course from the same discipline of study is not allowed.

AE-411	TRANSPORT MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

The course has been designed such that the student can own a fleet of buses; trucks etc and manage the same; He also gets familiar with provisions of motor vehicle act and vehicle insurance.

- 1. INTRODUCTION:** Necessity for making acts and rules on motor vehicles; Procedure for enactment and implementation of these acts by central and state Govts; Formats of the acts; rules and titles; Definitions – articulated vehicle; axle weight; certificate of registration; driver; conductor; licence; contract carriage; stage carriage; dealer; educational institution bus; goods; goods carriage; gross vehicle weight; heavy goods vehicle; invalid carriage; learners licence; HMV; LMV; motor cabs etc.
- 2. DRIVING LICENCE:** Necessity; age limit to obtain D.L. learners D.L permanent D.L grant; restrictions; renewal; endorsement; disqualification; suspension; fees; documents; educational qualifications required for driving trucks; buses; oil tankers; missile carriers; driving on hills; Driving schools: requirements; Effectiveness of different DLs; Maintenance of state registers of D;L. conductors licence – necessity; grant; age limit; disqualifications; revocation; disqualification; uniforms.
- 3. VEHICLE REGISTRATION:** Necessity; area of registration; time given for registration; format and documents to be attached and fees; period of registration; renewal; suspension; Temporary and permanent registration; vehicle fitness; refusal; NOC; registration for embassy vehicles; production of vehicle at the time of registration; Migration of vehicle from one state to other; Hire purchase; lease or hypothecation; transfer of registration on sale; removal of hypothecation clause; Transfer of ownership; Change of residence or place of business; death of owner; sale or purchase; Alteration in motor vehicle; age limit of vehicles; attachment of trailers; Maintenance of state registers of motor vehicles;
- 4. PERMITS:** Necessity; route allotments; state Govts; powers; provisions for application of permits; Procedure of R;T;A to grant permits; limits of issuance of permits and rules; documents to be attached; preferences while issuing permits; Types of permits – Private service; all India goods carriage; temporary; national; composite etc; Renewal; duration; cancellation; suspension of permits and transfer of permits; Rules for replacement of vehicles; colour schemes; general

conditions attached; Validation of permits for use in outside region; Issue of permits to state transport undertakings : restrictions

- 5. CONSTRUCTION; EQUIPMENT; MAINTENANCE AND TRAFFIC REGULATION:** General provisions; Central Govt; rules and provisions regarding construction; maintenance of vehicle; emissions and safety provisions; Control of traffic: limits of speed; weight; length and height; power to restrict and erect traffic signs; design of traffic signs and its colour scheme; Signals; driving test; Driving regulations; signaling devices; Definitions– Pass; ticket; removal of vehicle obstructing traffic; Safety measures for drivers and pillion riders; Precautions at unguarded railway crossings; Schemes for investigation of accidents and wayside amenities; Traffic navigation; global positioning system.
- 6. LOGISTICS:** Definition of fleet; types of fleet-luxury cars; buses; trucks; cash vans; fire-fighting vehicles etc; Management; supervisory; training and staffing; Driver; conductor and Mechanics hiring; duties; Vehicle operations-productivity and control; Fleet maintenance programs; tyre maintenance; productivity and control; Budget activity; Fleet management and data processing; Procurement and disposal; labour relations; energy management; Loss prevention management; control and predicting costs; Fitness of vehicles; Stores; definition; management; storing methods; inventory control; Duties and responsibilities of store manager; purchase manager; Storing methods; Bin card; requisition card; Inventory control procedures; Vendor development; Stores-layout; spare parts flow chart; Store documentation; store organization.
- 7. MOTOR INSURANCE:** Types; scope; limitations; liability of insurance Cos; insurance documents-claim form; estimate and bills; Necessity for insurance against third party risk; Requirements and limits of liability of insurance polices; Procedure to be followed for settlement of a claim after an accident; Surveyor and loss assessor; Surveyors report; Certificate of insurance transfer; Compensation to third party deaths; Motor accident claims tribunal (MACT); Transit insurance

TEXT BOOK

The Motor Vehicle Act, 1988; Govt. of India Publication.

REFERENCE BOOKS

1. Patankar P. G., "Road Passenger Transport in India"; CIRT Pune, March 2007.
2. Srivastav S. K., "Economics of Transport", S Chand & Co., 1981.

BA-271	HUMAN RESOURCE MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

The course aims to provide the insights into effective management of human resources to enable the students to meet the HR challenges in the present scenario.

- 1. INTRODUCTION:** Meaning, scope, objective, functions, policies & roles and importance of Human Resource Management; Interaction with other functional areas; HRM & HRD - a comparative analysis, organizing the Human Resource Management department in the organization; Human Resource Management practices in India.
- 2. HUMAN RESOURCE PLANNING:** Definition, objectives; process and importance job analysis; Description, specification and job evaluation.
- 3. DEVELOPING EFFECTIVE HUMAN RESOURCE:** Recruitment; selection; placement and introduction process; human resource development: concept, employee training & development, career planning & development
- 4. PERFORMANCE MANAGEMENT:** concept and process, performance appraisal, Potential appraisal Job Compensation: Wage & salary administration, incentive plans & fringe benefits; Promotions, demotions, transfers, separation, absenteeism and turnover; Quality of work life (QWL): Meaning, origin, development and various approaches and; to QWL, techniques for improving QWL; Quality circles: concept, structure, role of management QC in India
- 5. JOB SATISFACTION AND MORALE:** Health, safety & employee welfare; counseling for effective; enforcing equal employment opportunity legislation; fair employment; fair practice laws,
- 6. HUMAN RESOURCE DEVELOPMENT:** Human Resource: definition, objectives & approaches to human relations; Employee grievances and discipline; participation & empowerment; Introducing to collective bargaining; HR Audit.
- 7. HIGH PERFORMANCE WORK SYSTEM:** Fundamental principles-Principle of shared info; principle of knowledge development; principle of performance reward linkage; principle of Egalitarianism; Testing alignment of the HR system-HR deliverables

TEXT BOOK

Rao V. S. P., "Human Resource Management", Excel Publications

REFERENCE BOOKS

1. C. B. Memoria "Personal Management", Himalaya Publications, New Delhi
2. Edwin B. Flippo, "Personal Management" Tata McGraw Hill
3. Aswathappa K., "Human Resource Management", Tata McGraw Hill
4. Dale Yoder, "Personnel Management & Industrial Relations", Tata McGraw Hill

BA-272	ENTREPRENEURSHIP DEVELOPMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the challenges of starting new ventures and enable them to investigate, understand and internalize the process of setting up a business.

- 1. CONCEPT OF ENTREPRENEURSHIP:** meaning and characteristics of entrepreneurship, entrepreneurial culture, socio-economic origin of entrepreneurship, factors affecting entrepreneurship, conceptual model of entrepreneurship, traits of a good entrepreneur, entrepreneur, intra-preneur and manager
- 2. ENTREPRENEURIAL MOTIVATION:** motivating, compelling and facilitating factors, entrepreneurial ambition, achievement motivation theory and Kakinada experiment
- 3. ESTABLISHMENT OF ENTREPRENEURIAL SYSTEMS:** search, processing and selection of idea, Input requirements
- 4. SMALL SCALE INDUSTRY:** meaning, importance, characteristics, advantages and problems of SSIs. Steps for starting a small industry, guidelines for project report, registration as SSI.
- 5. ASSISTANCE TO SSI:** need for incentives & subsidies, need for institutional support, role of government and other institutions.
- 6. FUNCTIONAL PLANS:** Marketing plan- marketing research for the new venture, steps in preparing marketing plan, contingency planning; Organizational plan- Forms of ownership, designing organizational structure, job design, manpower planning; Financial plan- cash budget, working capital, proforma income statement, Proforma cash flow, proforma balance sheet, break even analysis.
- 7. SOURCES OF FINANCE:** Debt or Equity financing, commercial banks, venture capital; financial institutions supporting entrepreneurs; legal issues- intellectual property rights, patents, trade marks, copy rights, trade secrets, licensing, franchising.

TEXT BOOK

Gupta C. B. and Srinivasan N. P., "Entrepreneurial Development", Sultan Chand & Sons

REFERENCE BOOKS

1. Vasant Desai, "Management of a Small Scale Industry", Himalaya Publishing House

CE-471	ADVANCED TRAFFIC ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce the students about various modern traffic engineering and management problems and their solutions.

- 1. INTRODUCTION AND TRAFFIC CHARACTERISTICS:** Objectives and scope of traffic engg. Organisational set up of traffic engg department in India. Importance of traffic

characteristics. Road user characteristics. Vehicular characteristics. Max dimensions and weights of vehicles allowed in India. Effects of traffic characteristics on various design elements of the road.

2. **TRAFFIC SURVEYS:** Methods of conducting the study and presentation of the data for traffic volume study; speed study and origin and destination study. Speed and delay study. Parking surveys. On street parking; off street parking. Accident surveys. Causes of road accidents and preventive measures. Use of photographic techniques in traffic surveys.
3. **HIGHWAY CAPACITY:** Importance. Space and time headway. Fundamental diagram of traffic flow. Relationship between speed; volume and density. Level of service. PCU. Design service volume. Capacity of non-urban roads. IRC recommendations. Brief review of capacity of urban roads.
4. **TRAFFIC CONTROL:** Types of traffic control devices. Traffic signs; general principles of traffic signing; types of traffic signs. Road markings; types; general principles of pavement markings. Design of rotary. Grade separated intersections. Miscellaneous traffic control aids and street furniture.
5. **Signal Design:** Types of signals. Linked or coordinated signal systems. Design of signal timings by trial cycle method; approximate method; Webster's method and IRC method
6. **Traffic Regulation And Management:** Need and scope of traffic regulations. Regulation of speed; vehicles and drivers. General traffic regulations. Motor vehicle act. Scope of traffic management. Traffic management measures: restrictions on turning movements; one way streets; tidal flow operations; exclusive bus lanes; traffic restraint; road pricing.
7. **TRAFFIC AND ENVIRONMENT COMPUTER APPLICATION; TRAFFIC SIMULATION:** Detrimental effects of traffic. Vehicular air pollution. Situation in India. Vehicular emission norms in India and abroad. Alternate fuels. Factors affecting fuel consumption. Arboriculture. Computer application in traffic engg.; transport planning and public transport. Traffic simulation; advantages. Steps in simulation. Scanning techniques. Introduction to Intelligent vehicle highway system. Various types of IVHS.

TEXT BOOK

Khanna S. K. and Justo C. E. G., "Highway Engineering", Nem Chand Bros., Roorkee

REFERENCE BOOKS

1. Kadiyali L. R., "Traffic Engg. and Transport Planning", Khanna Publishers
2. Matson T. M., Smith W. S. and Hurd F. W., "Traffic Engineering", McGraw Hill, New York.
3. Drew D. R., "Traffic Flow Theory", McGraw Hill, New York.

WEB REFERENCES

1. syllabus.icbse.com/jntu/19-TRANSPORTATION%20ENGINEERING.pdf2.
2. www.nitkkr.ac.in/WebCivil/Civil_syllabus.doc

3. www.uniqueinstitutes.org/kuk/civilengg/38civilf.pdf
4. worldinfo.org/wp-content/uploads/.../Ecology.Enquirer.August.2009.pdf

CE-472	ELEMENTS OF TOWN PLANNING AND ARCHITECTURE	L T P	Cr
		5 0 0	3

OBJECTIVE

To impart knowledge on various aspects of town planning and architecture, historical structures, planning development of habitats.

1. **INTRODUCTION TO ARCHITECTURE:** Origin & definition; factors influencing architecture – climate; topography; materials; socio – cultural conditions; economic and technological factors etc. components of architecture – functional; aesthetic and structural.
2. **BASIC ELEMENTS OF ARCHITECTURE:** Principles of architectural composition - concept of beauty; unity; balance; proportion scale; rhythm; harmony; contrast; symmetry; character; integration etc. aesthetic responses to colour; texture; light & shade; formal and informal organizations of solids and void
3. **INTRODUCTION OF TOWN PLANNING:** General Planning concepts in town planning; ancient town planning Greek; Roman; Medieval & Renaissance towns; history of town planning in India; modern town planning – industrial revaluation and its impact ; garden city concept new town and satellite towns.
4. **TOWN PLANNING LEGISLATIONS:** Urbanisation trends in India ; classification of town; Evolution of planning legislation in India; organizations and administration of planning agencies at National state; regional level and metropolitan level ; building bye laws; provision of building regulation; function of local authorities.
5. **DEVELOPMENT PLANS:** Need; objective; scope and content of master plan; regional plan; structural plan; zonal development plan etc; Planning of land uses – residential; industrial; commercial; principles of planning for traffic & transportation; utility and services ; zoning regulation; sub division regulation; FARs; densities etc.
6. **ELEMENTS OF A TOWN / CITY PLAN:** Planning attributes- physical infrastructure; social infrastructure; commerce; housing etc ; surveys for town planning ; importance of climate; topography; drainage; water supply in selection of site for development; planning standards – UDPFI guidelines.
7. **COMPONENTS OF TOWN PLANNING:** Housing; housing problems in India; National housing policy; housing agencies; housing finance institutions; Dhum housing; transportation planning process; national transportation policy; surveys of transportation planning; urban conservation; National Building Code of India 1983 guidelines; norms for planting of shrubs, trees, etc.

TEXT BOOK

Hiraskar G. K., "Fundamentals of Town Planning", Dhanpat Rai & Co, 2001

REFERENCE BOOKS

1. Rangwala S. C. and Krishnarjun N., "Town Planning", Charotar Publishing House, Anand, 1985.
2. Pramar V. S., "Design Fundamentals in Architecture", Somaiya Publications, New Delhi.

WEB REFERENCES

1. www.jadavpur.edu/academics/.../Architecture/archsyl.htm
2. www.oauiife.edu.ng/faculties/edm/arch/coursedescrip tion.pdf
3. www.unitytempleutr.org/Unity%20Temple%20Tea ches.pdf-
issuu.com/brentallpress/docs/adr3_vol3_1

CH-471	ADVANCED APPLIED CHEMISTRY	L T P	Cr
		5 0 0	3

OBJECTIVE

To make students familiar with the concept of chemistry associated with dairy life, with the general method of analysis and other aspects related to engineering field.

1. **FUELS & PETROCHEMICALS TECHNOLOGY:** Classification of fuels; coal biomass; biogas determination of calorific values using bomb calorimeter; bio- fuels and liquid fuels; general consideration of petrochemicals; an overview of petroleum refining; petroleum transpiration; an elementary ideas of petrochemicals; petroleum refining -catalytic cracking & naptha reforming.
2. **CHEMICALS TOXICOLOGY:** Introduction; kind of toxic pollutants; toxic chemicals in air water and soil; toxic elements in waste water; carcinogenesis, impact of toxic chemicals on enzymes; biochemical effects of As ,Cd, Pg, Hg, CO, NO₂, O₃ CN- Toxic metal pollutants; Toxic minerals and dust; Toxic organic compounds .
3. **ENVIRONMENTAL HAZARDS & POLLUTION:** Cause; Effects; control & measures of water pollution; soil pollution; thermal pollution; Nuclear pollution; solid waste management; industrial waste and bio-medical waste management; cause; effects and control measures of urban and industrial waste.
4. **INDUSTRIAL WASTE MANAGEMENT:** Magnitude of industrial waste generation & their characteristics; effluent standards for disposal into water bodies; waste water characterization & process survey; advanced treatment & sludge handling; combined treatment of raw industrial waste with sewage; common effluent treatment for industrial estates; management of industrial waste from small scale industries; Selection procedure for physical, chemical & biochemical methods of industrial waste water treatment.
5. **CORROSION & ITS CONTROL:** Introduction; dry corrosion; wet corrosion; mechanism of wet corrosion galvanic corrosion; concentration; Cell; corrosion fitting corrosion; inergranular corrosion; waterline corrosion; stress corrosion; galvanic series; factors influencing corrosion; control methods.
6. **POLYMER TECHNOLOGY:** Introduction of natural and synthetic polymers; classification of polymers

on different basis; Natural rubber; Source; Formula; Elasticity of rubber; chemical relativity; properties; isomerism in rubber; vulcanized rubber and its uses .

7. **ADVANCED ANALYTICAL METHODS:** Thermo analytical methods; Thermo gravimetric analysis (TGA); Differential thermal analysis (DTA); Differential scanning calorimetry (DSC); Instrumentation; Flame photometry; spectrophotometry; conductometry; conductometry chromatographic methods; Adsorption; liquid - liquid partition; ion-exchange; paper & thin-layer chromatography; gas chromatography; HPLC & Electrophoresis.

TEXT BOOK

Jain & Jain, "Engineering Chemistry", Dhanpat Rai Publishing Co.

REFERENCE BOOKS

1. Drago, "Physical Methods of Chemistry", 2nd Edition, Saunders College Publishing, 1977.
2. Hutzinger, "Hand Book of Environmental Chemistry", Springer Verlag
3. Fristchen L. J. and Gay L. W., "Environmental Instrumentation", Springer Verlag
4. Bhatia H. S., "Environmental Pollution and Control", Galgotia Publications, 2003
5. Khopkar S. M., "Basic Concept of Analytical Chemistry", 2nd edition, New Age Publications, 1998

CS-303	COMPUTER GRAPHICS	L T P	Cr
		5 0 0	3

OBJECTIVE

Students completing this course are expected to be able to:

- Write programs that utilize the OpenGL graphics environment.
- Use polygonal and other modeling methods to describe scenes.
- Understand and be able to apply geometric transformations.
- Create basic animations.
- Understand scan-line, ray-tracing, and radiosity rendering methods

PRE-REQUISITES

Knowledge of computer programming, 2D and 3D geometry

1. **INTRODUCTION:** What is computer graphics, computer graphics applications, computer graphics hardware and software, two dimensional graphics primitives: points and lines, line drawing algorithms: DDA, Bresenham's; circle drawing algorithms: using polar coordinates, Bresenham's circle drawing, mid point circle drawing algorithm; polygon filling algorithm, boundary filled algorithm, scan-line algorithm, flood fill algorithm.
2. **TWO DIMENSIONAL VIEWING:** The 2-D viewing pipeline, windows, viewports, window to view port mapping; clipping: point, clipping line (algorithms):

- 4 bit code algorithm, Sutherland-Cohen algorithm, parametric line clipping algorithm (Cyrus Beck).
- 3. **POLYGON CLIPPING ALGORITHM:** Sutherland-Hodgeman polygon clipping algorithm, homogeneous coordinates system, two dimensional transformations: transformations, translation, scaling, rotation, reflection, shearing, transformation, composite transformation.
- 4. **THREE DIMENSIONAL GRAPHICS:** Three dimensional graphics concept, matrix representation of 3-D transformations, composition of 3-D transformation; viewing in 3D: projections, types of projections; the mathematics of planner geometric projections; coordinate systems.
- 5. **HIDDEN SURFACE REMOVAL:** Introduction to hidden surface removal; the Z- buffer algorithm, scan-line algorithm, area sub-division algorithm.
- 6. **REPRESENTING CURVES AND SURFACES:** Parametric representation of curves: Bezier curves, B-Spline curves; parametric representation of surfaces; interpolation method.
- 7. **ILLUMINATION, SHADING, IMAGE MANIPULATION:** Illumination models, shading models for polygons, shadows, transparency; what is an image, filtering, image processing, geometric transformation of images.

TEXT BOOK

Foley James D., van Dam Andeies, Feiner Stevan K. and Hughes Johb F., "Computer Graphics Principles and Practices", 2nd Edition, Addison Wesley, 2000

REFERENCE BOOKS

- 1. Hearn Donald and Baker M. Pauline, "Computer Graphics", 2nd Edition, Prentice Hall of India, 1999
- 2. Rogers David F., "Procedural Elements for Computer Graphics", 2nd Edition, Tata McGraw Hill, 2001
- 3. Watt Alan, "Fundamentals of 3-Dimensional Computer Graphics", Addison Wesley, 1999
- 4. John Corrign, "Computer Graphics: Secrets and Solutions", BPB Publications, 1994
- 5. Krishanmurthy N., "Introduction to Computer Graphics", Tata McGraw Hill, 2002

WEB REFERENCES

- 1. http://en.wikipedia.org/wiki/Computer_graphics
- 2. <http://www.cgw.com/ME2/Default.asp>
- 3. <http://www.graphics.cornell.edu/online/tutorial/>
- 4. <http://graphics.stanford.edu/>

CS-402	ARTIFICIAL INTELLIGENCE	L T P	Cr
		5 0 0	3

OBJECTIVE

To introduce about artificial intelligence approaches to problem solving, various issues involved and application areas

PRE-REQUISITES

Knowledge of neural networks, data structures

- 1. **INTRODUCTION TO AI AND SEARCH TECHNIQUES:** Foundation and history of AI; data, information and knowledge; AI problems and techniques – AI programming languages, problem

- space representation with examples; blind search strategies, breadth first search, depth first search, heuristic search techniques: hill climbing: best first search, A * algorithm AO* algorithm, Means-ends analysis.
- 2. **KNOWLEDGE REPRESENTATION ISSUES:** predicate logic; logic programming; constraint propagation; representing knowledge using rules.
- 3. **REASONING UNDER UNCERTAINTY:** Reasoning under uncertainty, non monotonic reasoning; review of probability; Bayes' probabilistic interferences and Dempster Shafer theory; heuristic methods; symbolic reasoning under uncertainty; statistical reasoning, fuzzy reasoning.
- 4. **PLANNING & GAME PLAYING:** Minimax search procedure; goal stack planning; non linear planning, hierarchical planning, planning in situational calculus; representation for planning; partial order planning algorithm
- 5. **LEARNING:** Basic concepts; rote learning, learning by taking advices, learning by problem solving, learning from examples, discovery as learning, learning by analogy; explanation based learning; neural nets; genetic algorithms.
- 6. **OTHER KNOWLEDGE STRUCTURES:** semantic nets, partitioned nets, parallel implementation of semantic nets; frames, common sense reasoning and thematic role frames; architecture of knowledge based system; rule based systems; forward and backward chaining; frame based systems.
- 7. **APPLICATIONS OF ARTIFICIAL INTELLIGENCE:** Principles of natural language processing; rule based systems architecture; expert systems, knowledge acquisition concepts; AI application to robotics, and current trends in intelligent systems; parallel and distributed AI: psychological modeling, parallelism in reasoning systems, distributed reasoning systems and algorithms

TEXT BOOK

Rich Elaine, Knight Kevin and Nair, "Artificial Intelligence", 3rd Edition, Tata McGraw Hill, 2009

REFERENCE BOOKS

- 1. Nilson Nils J., "Artificial Intelligence", New York McGraw-Hill, 1971.
- 2. Russell Stuart and Norvig Peter, "Artificial Intelligence: A Modern Approach", Prentice Hall of India, 1998
- 3. Negnevitsky, "Artificial Intelligence: A Guide to Intelligent System", Pearson Education, 2004.
- 4. Patterson O. W., "Introduction to Artificial Intelligence & Expert Systems", Prentice Hall of India, 1996.
- 5. Winston Patrick Henry, "Artificial Intelligence", 3rd Edition, Addison Wesley, 1992
- 6. Clockson & Mellish, "Programming PROLOG", Narosa Publications, 3rd Edition, 2002.

WEB REFERENCES

- 1. <http://wwwformal.stanford.edu/jmc/whatisai/>
- 2. <http://library.thinkquest.org/2705/>
- 3. www.imdb.com.

CS-422	CRYPTOGRAPHY AND DATA COMPRESSION	L T P	Cr
		5 0 0	3

OBJECTIVE

The course will attempt to dispel some of the many myths that surround the idea of cryptography. Cryptography is (and will continue to be) an increasingly important area of IT and it is important that practitioners are aware of the realities of the subject. The course will provide a down-to-earth overview of cryptographic techniques applicable in an IT environment, and outline the constraints and limitations of realistic secure systems. A running theme is the tradeoff between usability and security of a system. Also covered are a number of compression techniques - data compression and data encryption are, in some respects, closely related. A working knowledge of C is assumed and essential.

PRE-REQUISITES

Knowledge of cryptography, analysis & design algorithms and mathematics

- INTRODUCTION:** Basics of cryptography; history; usefulness of compression techniques
- COMPRESSION:** Packing, Huffman coding, Run length encoding, Lempel-Ziv-Welch, PKZIP, Delta modulation, JPEG; latest compression techniques
- ERROR DETECTION AND CORRECTION:** Parity, 1, 2, n-dimensions, Hamming codes, p-out-of-q codes
- CRYPTOGRAPHY:** vocabulary; history; steganography - visual textual, cipher hiding, false errors; public key cryptography – authentication; signatures; deniability
- MATHEMATICS:** information; confusion; diffusion; modular arithmetic; inverses; Fermats little theorem; Chinese remainder theorem, factoring; prime numbers; discrete logarithms
- ALGORITHMS:** DES, AES (Rijndael), IDEA, One time pad, Secret sharing and splitting, RSA, Elliptic curves, Modes, Random numbers
- ATTACKING SYSTEMS:** Recognition, Destroying data, Cryptanalysis - Differential cryptanalysis - cracking DES

TEXT BOOK

B. Schneier, "Applied Cryptography: Protocols, Algorithms and Source Code in C", 2nd edition, Wiley, 1996.

REFERENCE BOOKS

- Suhas Desai, "Security in Computing", Pearson Education, 2010
- "Integration of Data Compression and Cryptography: Another Way to Increase the Information Security", IEEE Computer Society Volume 2, 2007
- W. Trappe and L. Washington, "Introduction to Cryptography", 2nd edition, Pearson Education, 2006

WEB REFERENCES

- <http://www.data-compression.com/index.shtml>
- http://www.webopedia.com/TERM/D/data_compression.html
- http://en.wikipedia.org/wiki/Data_compression
- <http://www.debugmode.com/imagecmp/>

EC-305	EMBEDDED SYSTEM DESIGN	L T P	Cr
		5 0 0	3

OBJECTIVE

The course intends to cover the design issues involved in embedded systems and system-on-chip technologies. The course also deals with the applications and programming languages and processor architectures used for embedded systems. This course introduces the students to standard Embedded System Development tools and gives a hands-on experience in developing various embedded applications.

- INTRODUCTION:** Different types of microcontrollers: Embedded microcontrollers; External memory microcontrollers; Processor Architectures: Harvard V/S Princeton; CISC V/S RISC; microcontrollers memory types; Introduction to Real Time Operating System.
- 8051 MICROCONTROLLER ARCHITECTURE:** Architecture; memory considerations; Addressing modes; clocking; i/o pins; interrupts; timers; peripherals; serial communication; Instruction set; simple operations.
- PIC MICROCONTROLLER ARCHITECTURE:** Introduction to PIC microcontrollers; Architecture and pipelining; program memory considerations; Addressing modes; CPU registers; Instruction set; simple operations.
- INTERRUPTS AND I/O PORTS:** Interrupt logic; Timer2 scalar initialization; IntService Interrupt service routine; loop time subroutine; External interrupts and timers; synchronous serial port module; serial peripheral device; O/p port Expansion; I/p port expansion; UART.
- SOFTWARE:** Development tools/ environments; Assembly language programming style; Interpreters; High level languages; Intel hex format object files; Debugging.
- PROGRAMMING WITH MICRO-CONTROLLERS:** Arithmetic operations; Bit addressing; Loop control; Stack operation; Subroutines; interfacing of 8051 with LCD; LED; keyboard; motors; seven segment and other interfacing; PIC simple operations.
- DESIGNING USING MICROCONTROLLERS:** Music box; Mouse wheel turning; PWM motor control; aircraft demonstration; ultra sonic distance measuring; temperature sensor; pressure sensor; magnetic field sensor.

TEXT BOOK

John B. Peatman, "Design with PIC Microcontrollers", Pearson Education, 4th edition, 2005.

REFERENCE BOOKS

- Mazidi, "8051 Microcontroller", 2nd Edition, Prentice Hall, 2005
- Predko, "Programming and Customizing the 8051 Microcontroller", 2nd Edition, McGraw Hill, 2002.
- Catsoulis John, "Designing Embedded Hardware", 2nd Edition, O'Media, 2005.
- Barr Michael, "Programming Embedded Systems in C and C++", Shroff Pub. and Distr., 3rd Edition, 2003.
- Ayala A. J., "The 8051 Microcontroller: Architecture, Programming, and Applications", Pap/Dsk edition, West Publishing Company, 1991

6. Udai Shankar, "8051 Microcontrollers", CSVTU Research Journal, Chhattisgarh Swami Vivekanand Technical University, 2010.

EC-401	MOBILE COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

This subject covers the entire concept behind the cellular technology. It covers the different standards like GSM; CDMA and going through these topics will help the students to face telecom sector and software companies.

- MOBILE RADIO SYSTEM:** reference model; frequencies for radio transmission; signals; antennas; signal propagation; multiplexing; modulation
- CHARACTERISTICS OF RADIO WAVES:** Multipath characteristics of radio waves; signal fading; time dispersion; Doppler spread ; coherence time; LCR; fading statistics; diversity techniques
- WIRELESS SYSTEMS:** GSM: architecture; services; frame structure; signal processing Wireless data services :RAM ;CDPD; GPRS
- WI-FI AND THE IEEE STANDARD 802.11:** 802.11 architecture; MAC layer; PHY layer; Bluetooth and the IEEE standard 802.15
- MOBILE NETWORK LAYER: MOBILE IP:** Goals and requirements; IP packet delivery; agent discovery; registration; tunneling and encapsulation; optimization; reverse tunneling; IP-V6; Mobile ad-hoc networks
- MOBILE TRANSPORT LAYER:** Traditional TCP; classical TCP improvement; TCP over 2.5 G/3G wireless networks; performance enhancing proxies
- CDMA IN MOBILE COMMUNICATION SYSTEMS:** Introduction, spreading sequences, basic transmitter and receiver schemes in the CDMA system, RAKE receiver, joint detection of CDMA signals, basic properties of a CDMA mobile system

TEXT BOOK

Rappaport T. S., "Wireless Communication: Principles and Practice", 2nd Edition, Prentice Hall of India, 2001

REFERENCE BOOK

- Schiller Jochen, "Mobile Communication", 2nd Edition, Pearson Education, 2005.
- William C. Y. Lee, "Mobile Cellular Telecommunications", 2nd Edition, McGraw Hill, 1995.

EE-401	PROGRAMMABLE LOGIC CONTROLLERS & SCADA	L T P	Cr
		5 0 0	3

OBJECTIVE

The programmable logic controller represents a key factor in industrial automation. Its use permits flexible adaptation to varying processes as well as rapid fault finding and error elimination. Today, Industrial environment is steered with the latest technological

advancements in computers and communication. Programmable Logic Controllers (PLC) based automation is its outcome. This subject is useful to understand the concept of automation used in industry.

- INTRODUCTION:** Programmable Logic Controller; advantages of PLCs Over Relay System; input output Section – Fixed input output, Modular input output, Discrete input output Modules, Analog input output Modules.
- PROCESSOR UNIT:** Processor; Memory types; Guarding against Electro Static Discharge; Peripherals; Memory Organization.
- PROGRAMMING DEVICES:** Programming Devices; Dedicated Desktop Programmes; Hard Held Programmes; Computer Programmes
- LADDER DIAGRAM & PLC PROGRAMMING:** Ladder Diagram Rules; Writing Diagram; Ladder Diagram; Basic Stop / START Circuit; Digital Logic gates; Sequenced Motor Starting; Relay Type Instruction; Programming a PLC; PLC Peripherals; Network Limitation; Program Scanning
- Program Control Instructions:** Master Control Relay Instructions; Latching Relay instruction; immediate input output instruction; Jump and Label Instruction.
- PROGRAMMING TIMER & COUNTERS:** Pneumatic Timers; Cascading Timers; Allen Bradley PLCs Counters; Combining Timer & Counters.
- SCADA:** Introduction; Concept of Automatic Scada; Architecture of Scada; Hierarchical of Supervisory Control & Data Acquisition System; Technology Available; Data Acquisition Unit; Remote Technical Unit.

TEXT BOOK

Cox Richard A., "Technician's Guide to Programmable Controllers", 4th Edition, Delmar Thomson Learning, 2001

REFERENCE BOOKS

- Hackworth, John. R. and Hackworth, Jr. Frederick D., "Programmable Logic Controllers: Programming Methods and Applications", Pearson Education, 2004.
- Webb, John W., & Reis, Ronal A., "Programmable Logic Controllers: Principles & Applications", Pearson Education / Prentice Hall, 2008.
- Dunning, Gary, "Introduction to Programmable Logic Controllers", Delmar Thomson Learning, 2004.

EE-431	INDUSTRIAL ELECTRONICS	L T P	Cr
		5 0 0	3

OBJECTIVE

Students who enter the job market and become electronic engineers must be prepared to work on industrial electronics in many forms. The job responsibilities for these fields are rapidly changing because electronic devices and circuits have become thoroughly integrated into all aspects of modern industrial control systems during the past ten years. The role of an electronic engineer has changed to the point where he is expected to work on every aspect of industrial system from the simplest electrical

components, such as fuses and motor, to the most complex, such as electronic boards, motor drives, and programmable controllers. This course provides sufficient depth to be a useful resource while working on job.

- INDUSTRIAL LOGIC CIRCUITS:** Relay logic; Types of relays; voltage ratings for coils and contacts; typical logic circuits; relay ladder & its application; solid state devices used for relay logic; solid state logic blocks; solid state relays.
- PROGRAMMABLE LOGIC CONTROLLERS (PLC):** Programmable logic controller systems; PLC operation; input module circuitry; processor; processor operations; memory & its layout; program scanning; programming – assembly language; relay language or logic; programming basics; ladder diagram; timing function; sequencing operations; arithmetic functions; move function, conversion.
- TIMERS:** Functions, types – delay timers; interval times; repeat cycle timers; reset timers; timer classification – thermal timers; electromechanical timers; motor driven delay timers; block diagram of the basic elements of an electronic timer.
- ILLUMINATION:** Nature of light; basic laws of illumination; light sources and their characteristics; light production by excitation and ionization; incandescence; fluorescence; different types of lamps; their construction; operation and characteristic; application, latest light sources; design of illumination system.
- POWER SUPPLIES:** Performance parameters, of power supplies, comparison of rectifier circuit; filters, regulated power supplies; switching regulators; switch mode converter.
- POWER FACTOR CONTROL:** Static reactive power compensation; shunt reactive power compensator; application of static SCR controlled shunt compensators for load compensation; power Factor improvement and harmonic Control of Converter fed systems; methods employing natural and forced commutation schemes; implementation of forced commutation.
- MOTOR CONTROL:** Voltage control at constant frequency; PWM control; phase control of dc motor; PLC control of a DC motor.

TEXT BOOK

Dubey G. K., "Power Semiconductor Controlled Drives", Prentice Hall Inc. New York.

REFERENCE BOOKS

- Thomas Kissel E., "Industrial Electronics", 3rd Edition, Prentice Hall of India.
- Date Patrick R. & Stephen Fardo W., "Industrial Electronics: Devices and Systems" 2nd Ed., Marcel Dekker, Inc. New York.

LABORATORY: Performance parameter of various power converters, sequence control of AC-DC power converter, Comparison of AC-DC converters with and without filters, Project on illumination, simulation of power converters using MATLAB, relay network programming, programming PLC.

EL-421	RENEWABLE ENERGY SOURCES & ENERGY CONSERVATION	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing the knowledge to the students about various types of conventional and non-conventional electrical power plants and explain the concepts regarding their layout and their operations at different load conditions.

PRE-REQUISITES

Knowledge of electrical technology and circuits.

- INTRODUCTION:** Energy classification; sources; utilization; economics; power generation terminology; energy conversion matrix; and review of various principal fuels for energy conversion such as solar; biogas; wind ; tidal etc.
- SOLAR ENERGY:** Solar radiation and its measurement; solar energy collectors; storage and applications.
- WIND ENERGY:** Basic principles of wind energy conversion; site selection considerations; wind data and energy estimation; classification of WEC systems; Magnus effect; wind energy collectors; storage and applications of wind energy; safety systems.
- ENERGY FROM BIOMASS:** Introduction; biomass conversion technologies; biogas generation; classification of biogas plants; details of construction of some main digesters; methods for maintaining biogas production; problems related to bio-gas plants etc.
- ENERGY FROM THE OCEANS:** OTEC; open cycle; closed cycle OTEC systems; energy utilization; hybrid cycle etc. operation methods of utilization of tidal energy; prospects in India.
- PRODUCTION OF THERMAL ENERGY:** Introduction; conversion of mechanical energy; conversion of electrical energy; conversion of electromagnetic energy; conversion of chemical energy; conversion of nuclear energy etc. Study of typical energy converters such as high performance motors; special generators driven by biogas engines; wind turbines etc; mini-hydro generators; energy efficient motors; magneto hydro dynamics power generation; thermionic generation.
- ENVIRONMENTAL IMPACT OF POWER PLANT OPERATION:** Introduction; particulate emissions; gaseous pollutants; thermal pollution; solid-waste pollution.

TEXT BOOK

Mukund R., "Non-conventional Energy Sources", Khanna Publishers, 2002

REFERENCE BOOKS

- Domkundwar and Arora, "Power Plant Engineering", Dhanpat Rai & Sons 2002.
- Rai R. C., "Power Plant Engineering", Dhanpat Rai Publication, 2005
- Cul A. W., "Energy converters", McGraw Hill, 2000.
- Nag, P. K., "Power Plant Engineering", Tata McGraw Hill, 1995
- Subir, R., "Electrical Power System", Prentice Hall India, 2007

EL-422	HVDC TRANSMISSION	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing a basic knowledge and understanding of the fundamental concepts of high voltage engineering, explaining various methods of HVDC power transmission, converter techniques and HVDC control and protection, and the method of measurement and testing of HVDC.

PRE-REQUISITES

Knowledge of electromagnetic field theory and power systems.

- DC POWER TRANSMISSION TECHNOLOGY:** Introduction; comparison of AC and DC transmission; application of DC transmission; description of DC transmission system; planning for HVDC transmission; modern trends in DC transmission.
- THYRISTOR VALVE & ANALYSIS OF HVDC CONVERTERS:** Introduction; thyristor device; thyristor valve; valve tests; recent trends; pulse number; choice of converter configuration; simplified analysis of Graetz circuit; converter bridge characteristics; characteristics of twelve pulse converter; detailed analysis of converters.
- CONVERTER AND HVDC SYSTEM CONTROL:** General; principles of DC link control; converter control characteristics; system control hierarchy; firing angle control; current and extinction angle control; starting and stopping of dc link; power control; higher level controllers; telecommunication requirements.
- CONVERTER FAULTS AND PROTECTION:** introduction; converter faults; protection against over currents; overvoltages in a converter station; surge arresters; protection against overvoltages introduction of multiterminal DC systems; potential applications of MTDC systems; types of MTDC systems; control and protection of MTDC systems; study of MTDC systems
- SMOOTHING REACTOR AND DC LINE:** Introduction; smoothing reactors; DC line; transient over voltages in DC line; protection of DC line; DC breakers; monopolar operation; effects of proximity of AC and DC transmission lines.
- REACTIVE POWER CONTROL, HARMONIC AND FILTERS:** Introduction; reactive power requirement in steady state; sources of reactive power; static var systems; reactive power control during transients; introduction of harmonic and filters; generation of harmonics; design of AC filters; DC filters; carrier frequency and RI noise
- MEASUREMENTS & TESTING OF HVDC:** Measurement of high direct voltage; electrostatic voltmeters; generating voltmeter; sphere-gap; measurement of ripple voltages; types tests and routine tests of equipment; dielectric testing of HVDC equipments; power frequency voltage withstand tests; impulse voltage withstand test; measurement by sphere gaps; application of test voltage to the equipments under test.

TEXT BOOK

Arrillaga, J., "High voltage D.C. Transmission", Peter Peregrinus Ltd, 1996

REFERENCE BOOKS

- Padiyar K. R., "HVDC Power Transmissions Systems", New Age International Pvt. Ltd., 2001
- Rao S., "EHV-AC, HVDC Transmission & Distribution Engineering", Khanna Publishers, 1999
- Tagare, D. M., "Reactive Power Management", Tata McGraw Hill, 1996
- Dubey, G. K., "Power Semi-conductor Controlled Drives", Prentice Hall, 1999.
- Subrahmaniyam V., "Electric Drives: Concepts and Applications", Tata McGraw Hill, 2005.

EL-423	HIGH VOLTAGE ENGINEERING	L T P	Cr
		5 0 0	3

OBJECTIVE

Providing a basic knowledge and understanding of the fundamental concepts of high voltage engineering, explaining various basic laws governing the conduction and breakdown, voltage gradients on conductors, phenomenon of corona and lightning discharges and high voltage testing arrangements.

PRE-REQUISITES

Knowledge of Electromagnetic field theory and power systems.

- INTRODUCTION:** Recent trends in high voltage transmission.
- CONDUCTION AND BREAKDOWN:** Conduction and breakdown in gases; liquids and solid dielectrics; insulator breakdown; insulation characteristics of long air gaps.
- VOLTAGE GRADIENTS ON CONDUCTORS:** Electrostatic fields of sphere gaps; fields of line charges and their properties; charge-potential relations for multi-conductor lines; surface voltage gradients on conductors; distribution of voltage gradient on sub conductors of bundle.
- CORONA:** Corona and corona loss; corona loss formula; attenuation of traveling waves due to corona; audible noise-generation and characteristics; corona pulses--their generation and properties; properties of pulse; radio interference.
- LIGHTENING:** Lightning phenomenon; lightning stroke mechanism; principle of lightning protection; tower foot resistance; insulator flash over and withstand voltage; lightning arresters and their characteristics.
- H. V. TESTING AND LAB EQUIPMENTS:** Standard wave-shapes for testing; wave-shaping circuits; principles and theory; impulse generator; generation of ac high voltage for testing; generation of direct voltage; measurement of high voltage; general layout of H.V.laboratory.
- MEASUREMENT OF HIGH ALTERNATING VOLTAGES:** Peak voltage measurement with sphere-gaps; peak voltage measurement using measuring capacitors; peak voltage measurement with capacitor voltage divider; measurement of rms values by electrostatic voltmeters; capacitance voltage transformer; digital recording.

TEXT BOOK

Begamudre, R. D., "E.H.V. AC Transmission", Wiley Eastern Ltd. 1992

REFERENCE BOOKS

1. Wadhwa C. L., "High Voltage Engineering", New Age international Ltd. 1995
2. Arrillaga J., "High voltage D.C. Transmission", Peter Peregrinus Ltd. 1996
3. Kamaraju V. and Naidu, M. S., "High Voltage Engineering", Tata McGraw Hill, 1996
4. Naidu M. S., "High Voltage Engineering", Tata Mc Graw Hill, 4 Edition, 2001
5. Ray Subir, "An Introduction to High Voltage Engineering, Prentice Hall of India, 2008

6. Cambridge University Press, London.
7. McCarthy, "English Vocabulary in Use Foundation Books", Cambridge University Press
8. Hashem Abul, "Common Errors in English", Ramesh Publishing House
9. Roach P, "English Phonetics & Phonology", Cambridge University Press
10. Ramesh M. S. and Pattanshetti C. C., "Business Communication", R. Chand and Company
11. Wood F. T., "Remedial English Grammar for Foreign Students", The Macmillan Press Ltd., 1975

EN-471	PROFESSIONAL COMMUNICATION	L T P	Cr
		5 0 0	3

EN-472	BUSINESS COMMUNICATION	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of devising this course is to prepare the students of this University to be ready to take up their professional job on the completion of this course. Professional communication is essential for the pass outs of this University to help them prove their abilities in the interviews and to utilize their knowledge in active job.

1. **PRACTICAL ENGLISH:** Parts of speech; noun; pronouns; adjective; verb, adverb, propulSION, conjUNCTIONAL interjection; conjUNCTIONAL interjection; use of articles.
2. **ADVANCED ENGLISH:** Phrasal verbs; reported speech; conditional clauses; concord; correct the sentences; question tags; idioms.
3. **VOCABULARY:** Word formation; one word substitution; foreign words; words often confused; homophones; antonyms; synonyms.
4. **BUSINESS ENGLISH:** Importance: business phrases; emphatic expression; e-mail writing; resume writing; interview techniques; business letter; covering letter; application job; resignation letter, effective telephone handling.
5. **PHONETICS:** Basic concepts; vowels, consonants; phonemes; syllabus; articulation of speech; transcription of words; word stress; Intonation.
6. **BOOK REVIEW**
7. **MOVIE REVIEW**

TEXT BOOK

Roy A. and Sharma P. L., "English for Students of Engineering", Orient Longman, 2007

The following four lessons are prescribes for textual study:

1. The Year 2050
2. Human Environment
3. The Discovery
4. Grief.

REFERENCE BOOKS

1. Tickoo M. L. and Subramanian A. E., "Intermediate Grammar, Usage ad Composition", Orient Longman.
2. Thomson and Martinet, "A Practical English Grammar", Oxford University Press
3. Hornby, "A.S. Guide to patterns and Usage in English", Oxford University Press
4. Balasubramanian T., "A Textbook of English Phonetics for Indian Students", MacMillan
5. D. O' Connor J, "Better English Pronunciation",

OBJECTIVE

The course proposes to help students develop competence in business and technical communication. It focuses on writing skills and strategies for specific purposes. The inevitability of introducing this course to Engineering students is embodied in that it has comparatively a high concentration of certain complex writing techniques and procedures.

1. **BUSINESS CORRESPONDENCE:** Characteristics and formats of business letter; quotations, orders, tenders, sales letters, complaints, claim and adjustment letters; credit and collection letters; application; letters for vacant situations with emphasis on resumes and curriculum vitae; e-mail and netiquette- format, style and tone
2. **BUSINESS REPORTS AND PROPOSALS:** Importance; function; pattern and formats of reports, typical business reports; report presentation, and formal reports: proposal formats, writing problem- solving proposals; executive summery proposals and project proposals
3. **MEETINGS:** Writing of memoranda; notes; agenda and minutes of the meeting.
4. **PUBLIC RELATIONS AND ADVERTISING DOCUMENTS:** Press releases; public service announcements, advertising strategy and its objectives; designing of classified and display advertising copies.
5. **PHONETICS:** Vowels; consonants; syllables; transcription; word stress & intonation.
6. **ESSAY WRITING ON BUSINESS TOPICS- TRADITIONAL & CONTEMPORARY**
7. **BOOK REVIEW/MOVIE REVIEW**

TEXT BOOK

Bansal R. K. and Harrison J. B., "Spoken English for India", Orient Longman

REFERENCE BOOKS

1. Mary Ellen Guffey, "Business Communication: Process & Product", 4th Edition, South-Western College Publishing, Cincinnati.
2. Sharma R. C. and Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill
3. Ramesh M. S. and Pattanshetti C. C., "Effective Business English and Correspondence", R. Chand & Co.
4. Shruter C., "Effective Letters in Business by Robert", Tata McGraw Hill

- 5 Wing F. W. and Anncreed D., "English Business Letters", Orient Longman.
- 6 Sarah Freeman, "Written Communication in English", Orient Longman.
- 7 Leo Jones and Riched Alexander, "International Business English", Cambridge University Press
- 8 Sweet Stephen, "General and Business English", Sir Issac Pitman & Sons Ltd., London.
- 9 Charles Fl. Sides, "How to Write and Present Technical Information", Cambridge University Press
- 10 Susan Stevenson/Stave Whitmore, "Strategies for Engineering Communication", John Wiley and Sons/Replika Press. Pvt. Ltd. Delhi.

6. **ERP - INFORMATION SYSTEM PERSPECTIVE:** Introduction to OLAP (Online Analysis and Processing), TP, OAS, KBS, MRP, BPR, SCM, REP, CRM, Information Communication Technology.
7. **ERP-KEY MANAGERIAL ISSUES:** Concept Selling; IT infrastructure; implication of ERP systems on business organization; critical success factors in ERP System; ERP Culture implementation issues; resistance to change; ERP selection issues; return on investment; pre and post implementation issues.

TEXT BOOK

Ravi Kalakota and Whinston Andrew, "Frontiers of Electronic Commerce", Addison Wesley, 1996

REFERENCE BOOKS

1. V. K. Garg and N. K. Venkita Krishna, "Enterprise Resource Planning – Concepts and Practice", Prentice Hall of India, 1998,
2. Motiwala, "Enterprise Resource & Planning", 1st edition, Pearson Education
3. John Antonio, Fernandez, "The SAP/3 Handbook", Tata McGraw Hill
4. Denial Amor, "The E-Business Revolution", Addison Wesley
5. Sokol, "From EDI to E-Commerce: A Business Initiative", Tata McGraw Hill
6. Greenstein and Feinman, "E Commerce", Tata McGraw Hill
7. Rajan and Nag, "E Commerce: The Cutting Edge of Business", Tata McGraw Hill
8. Jaffrey F. Rayport , Bernard J. Jaworski, "E-Commerces", Tata McGraw Hill, 2002
9. Greenstein and Feinman, "Electronic Commerce – Security, Risk Management and Control", Tata McGraw Hill, 2002
10. Hendry Chan, Raymond Lee, Tharam Dillon and Ellizabeth Cang, "E-Commerce Fundamentals and Applications", John Wiley.
11. Efraim Turbon, Jee Lee, David King, H. Michael Chang, "E-Commerce" Wiley VCH, 2004

WEB REFERENCES

1. www.exforsys.com/tutorials/erp/erp-and-e-commerce.html
2. www.bizautomation.com
3. itmanagement.earthweb.com/erp
4. www.e2-llc.com/e2_ecommerce_erp.aspx
5. e-comm.webopedia.com/TERM/e/ERP.html

IT-423	INTRODUCTION TO E-COMMERCE & ERP	L T P	Cr
		5 0 0	3

OBJECTIVE

To provide knowledge about the protocols, methods, security issues in electronic commerce as well as about enterprise resource planning tools, models and techniques

PRE-REQUISITES

Knowledge of internet and web development, data mining, computer networks, software engineering

PART A

1. **INTRODUCTION AND CONCEPTS:** Networks and commercial transactions – Internet and other novelties, networks and electronic transactions today; model for commercial transactions; Internet environment – internet advantage; world wide web and other internet sales venues; online commerce solutions.
2. **ELECTRONIC PAYMENT METHODS:** Updating traditional transactions, secure online transaction models; online commercial environments; digital currencies and payment systems; offline secure processing; private data networks; security protocols; electronic payment systems: digital payment systems
3. **DIGITAL CURRENCIES:** Operational process of Digicash; Ecash Trail; Using Ecash; Smart cards; Electronic Data Interchange: basics, EDI versus Internet and EDI over Internet; Strategies, Techniques and Tools; Shopping techniques and online selling techniques.

PART B

4. **ERP- AN ENTERPRISE PERSPECTIVE:** Production Finance, Personnel disciplines and their relationship, Transiting environment, MIS Integration for disciplines, Information/Workflow, Network Structure, Client Server Integrator System, Virtual Enterprise.
5. **ERP – RESOURCE MANAGEMENT PERSPECTIVE:** Functional and Process of Resource; Management; Introduction to basic modules of ERP System: HRD, Personnel management, training and development; skill inventory, material planning and control, inventory; forecasting; manufacturing; production planning; production scheduling; production control; sales and distribution; finance; resource management in global scenario.

IT-443	INFORMATION STORAGE & MANAGEMENT	L T P	Cr
		5 0 0	3

OBJECTIVE

Using a "building block" approach, the ISM curriculum provides a core understanding of storage technologies and progresses into system architectures, introduction to networked storage, and introduction to information availability. The course provides a comprehensive introduction to data storage technology fundamentals. Students will gain knowledge of the core logical and physical components that make up a storage systems infrastructure.

PRE-REQUISITES

Knowledge of Computer Networks at B Tech level

- 1. INTRODUCTION:** Meeting today's data storage needs - data creation; data creation: individuals, business; categories of data; data storage models; common data storage media and solutions - tape storage systems, optical data storage, disk based storage
- 2. DATA CENTER INFRASTRUCTURE:** Example; key requirements of storage systems management activities
- 3. STORAGE SYSTEMS ARCHITECTURE:** Storage system environment; components of a host; connectivity; physical disks; RAID array; disk storage systems; data flow exercise
- 4. NETWORKED STORAGE:** Direct Attached Storage (DAS), Network Attached Storage (NAS), Fiber Channel Storage Area Network (FC SAN), IP Storage Area Network (IP SAN), Content Addressed Storage (CAS)
- 5. BUSINESS CONTINUITY:** Introduction, overview, backup and recovery, local replication, remote replication.
- 6. MONITORING AND MANAGING THE DATA CENTER:** Areas of the data center to monitor; considerations for monitoring the data center; techniques for managing the data center.
- 7. SECURING STORAGE AND STORAGE VIRTUALIZATION:** Securing the storage infrastructure; virtualization technologies.

TEXT BOOK

Osborne Marc Farley, "Building Storage Networks", Tata McGraw Hill

REFERENCE BOOKS

1. Spalding Robert, "Storage Networks: The Complete Reference", Tata McGraw Hill
2. Gupta Meeta, "Storage Area Network Fundamentals", Pearson Education Limited
3. Kowalski Gerald J. and Maybury Mark T., "Information Storage & Retrieval Systems Theory & Implementation", BS Publications
4. Thejendra B. S., "Disaster Recovery & Business Continuity", Shroff Publishers & Distributors, EMC – Students Kit

WEB REFERENCES

1. <http://www.cs.cmu.edu/~fp/courses/03-312/handouts/18-storage.pdf>
2. http://www.freedownloadcenter.com/Information_Management/

MA-471	DISCRETE MATHEMATICS	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of computer field.

- 1. SET THEORY:** Different types of sets; Set operations; Classes of sets; Relation; Types of relation; Functions; Types of functions and composition of functions and relation; Cardinality and inverse

relations; Fuzzy sets; Basic operations of fuzzy sets.

- 2. BOOLEAN ALGEBRA & LATTICES:** Definition of Boolean algebra; Basic operations of Boolean algebra; Partially ordered sets; Lattices; Sub Lattices; Different types of Lattices; Operations on Lattices.
- 3. NUMBER THEORY:** Basic properties; Divisibility theory; Congruences; Chinese remainder theorem; Fermat's little theorem; τ & μ functions.
- 4. COMBINATORICS:** Fundamental principal of counting; Pigeonhole principal; Multinomial coefficients; Recurrence relation; Generating functions.
- 5. ALGEBRAIC STRUCTURES:** Binary operations; Group; Subgroup; Normal subgroup and their elementary properties; Order of element and group; Lagrange's theorem; Rings; Sub ring; Ideal; Integral domain; Field only definition and examples.
- 6. GRAPH THEORY:** Introduction to graphs; Type of graphs; Sub graphs and isomorphic graphs; Representation of graphs; Properties of graphs; Euler's formula for planar graph; Eulerian and Hamiltonian graph; Ore's theorem.
- 7. TREES:** Trees and their properties; Spanning trees; Kruskal's algorithm; Prim's algorithm; Binary tree.

TEXT BOOK

Sarkar S. K., "A Textbook of Discrete Mathematics" 5th Edition, S. Chand Publications

REFERENCE BOOK

8. Liu C. L., "Element of Discrete Mathematics" McGraw Hill.
9. Sengadir, "Discrete Mathematics and Combinatorics", Pearson Education.
10. Deo, "Graph Theory", Prentice Hall of India.
11. Bough R. Johnson, "Discrete Mathematics", Pearson Education.

MA-472	ADVANCED HIGHER ENGINEERING MATHEMATICS	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

- 1. SERIES SOLUTION OF DIFFERENTIAL EQUATION:** Series solution and its validity; General method; Forms of series solution.
- 2 & 3. CALCULUS OF VARIATIONS:** Introduction; Functionals; Euler's equation; solutions of Euler's equation; Geodesies; Isoperimetric problems; Several dependent variables; Functionals involving higher order derivative; Approximate solution of boundary value problems- Rayleigh-Ritz methods; Hamilton's principle; Lagrange's equations.
- 4 & 5. TENSOR ANALYSIS:** Introduction; Summation convention; Transformation of co-ordinates; Tensor of order zero; Kronecker Delta; Contravariant and Co-variant tensors; Quotient law; Riemannian space; Conjugate

tensor; Christoffel symbols; Transformation of Christoffel symbol; Covariant differentiation of a covariant tensors; Covariant differentiation of a contravariant tensors.

- 6 & 7. **INTEGRAL EQUATIONS:** Definition and classification of integral equations; Conversion of a linear differential equation to an integral equation and vice versa; Volterra Integral equations, solution of integral equation by resolvent Kernel, Method of successive approximation, Euler integrals, Volterra Integral equation of the first kind, Fredholm equation of second kind.

TEXT BOOK

Grewal B. S., "Higher Engineering Mathematics", 38th Edition, Khanna Publisher, 2005

REFERENCE BOOKS

1. Wylie C. Ray and Barrett Louis.C., "Advanced Engg. Mathematics", McGraw Hill
2. Sastry S. S., "Engineering Mathematics", 11th Edition, Prentice Hall of India, 1994
3. Jerri Abdul J., "Introduction of Integral Equation with Application", Wiley-Interscience; 2nd Edition, 1999
4. Debnath Lokenath, "Integral Transforms and their Applications", 2nd Edition, Chapman & Hall, 2007
5. Weatherburn, "Tensor Calculus", Cambridge University Press, 2008
6. Kreyszig E., "Advanced Engineering Mathematics", 9th Edition, John Wiley, 2006

MA-473	ADVANCED NUMERICAL TECHNIQUES	L T P	Cr
		5 0 0	3

OBJECTIVE

To acquaint the students with the various concepts and tools of applied mathematics which will be very basic and the very soul and guide of various engineering subjects.

1. **EIGEN VALUE PROBLEMS:** Eigen values and eigen vectors; Power methods: Jacobi's methods; Given's methods; House-holder's methods.
- 2 & 3. **DIFFERENCE EQUATIONS:** Introduction; formation of difference equations; complementary function; particular integral; difference equations reducible to linear form; simultaneous difference equations and its applications.
4. **PARABOLIC PARTIAL DIFFERENTIAL EQUATION:** Transient heat flow equation; the explicit method; Crank-Nicolson method; parabolic equation in two or three dimension; finite elements for heat flow.
5. **HYPERBOLIC PARTIAL DIFFERENTIAL EQUATION:** The wave equation; solving the wave equation by finite differences; comparison to the d'Alembert solution; method of characteristics; the wave equation in 2-D; finite elements and the wave equation.
6. **APPROXIMATION OF FUNCTION:** Chebyshev polynomials; economized power series; approximation with rational functions;

Fourier series; getting Fourier coefficients numerically and fast Fourier transform.

7. **APPLICATION IN ENGINEERING FIELD:** Application of Gaussian quadrature in evaluating stiffness and stress matrices for 2D and 3D elements.

TEXT BOOK

Curtis F, Gerald and Patrick, "Applied Numerical Analysis", 7th Edition, Wheatley Solution

REFERENCE BOOKS

1. Balagurusamy E., "Numerical Methods", Tata McGraw Hill
2. Sastry S. S., "Introductory Methods of Numerical Analysis", Prentice Hall of India
3. Jain M. K., Iyenger S. R. K. and Jain R. K., "Numerical Methods for Scientific and Engg. Computations" by - Wiley Eastire Ltd.
4. Rao S. S., "The Finite Element Method in Engg.", Pregamon Press/McGraw Hill, 1989

MA-474	OPERATION RESEARCH	L T P	Cr
		5 0 0	3

OBJECTIVE

The aim of the topic is to provide a common platform for the Engineers, Scientists along with people from management, industry & defence sector. This topic also provides how to get optimal solution in above said branch.

1. **LINEAR PROGRAMMING:** Linear programming modeling and examples; resolution of degeneracy; duality theory; dual-simplex and primal-dual algorithms; transportation; assignment problems; sensitivity analysis; industrial applications of linear programming like product mix problems; blending problems; optimal allocation of resources, etc.
2. **INTEGER PROGRAMMING, GOEL PROGRAMMING & MULTICRITERIA DECISION MAKING:** Formulation of various industrial problems as integer and mixed integer programming problems; branch and bound algorithm; cutting plane methods for pure and mixed integer programming problems; Knap-sack; travelling salesman and shortest route problems. multicriteria decision; multicriteria decision making models; determination of set of feasible alternatives; solution techniques; goal programming approach; goal programming models; ranking and weighting of multiple goals; simplex method in goal programming.
3. **NON-LINEAR PROGRAMMING:** Constraint qualification and Kuhn-Tucker necessary conditions; sufficiency of Kuhn-Tucker necessary conditions and convex programs; Linear Complementarity Problem (LCP); Quadratic programming and use of LCP for solving quadratic programming problems.
4. **SEQUENCING MODEL:** Two machine and n jobs (no passing) problem and three machine and n jobs (no passing) problems; different routing; 2 jobs and m machines; n jobs and m machines; branch and bound algorithms.
5. **QUEING THEORY & INVENTORY CONTROL:** Introduction to waiting line models? steady state

- behavior of M/M/1 and M/M/C queues-the problem of machine interference and use of finite queuing tables- introduction to M/G/1, and G/M/1 .inventory control problem; Concept of inventory and various costs; EQQ formula newspaper boy problems.
- PERT/CPM:** Introduction to network analysis; Definition of a project; job and events; drawing of arrow diagrams; determination of critical paths and calculation o floats; resource allocation and least cost planning; use of network flows for least cost planning; uncertain duration and PERT.
 - STOCHASTIC PROGRAMMING:** Stochastic programming with one objective function; stochastic linear programming; two stage programming technique; chance constrained programming technique.

TEXT BOOK

Taha H. A., "Operations Research: An Introduction", Macmillan, N.Y.

REFERENCE BOOK

- Hitter F. S. and Lieberman G. J., "Introduction to Operations Research", Addison Wesley.
- Hadley G., "Linear Programming", Addison Wesley.
- Dantzig G., "Linear Programming and Extensions", Princeton, N.J.
- Fletcher R., "Practical Methods of Constrained Optimization", John Wiley.
- Bazaraa M. S., Jarvis J. J. and Sherali H. D., "Linear Programming & Network Flows", John Wiley.

ME-442	ERGONOMICS	L T P	Cr
		5 0 0	3

OBJECTIVE

The course provides knowledge of ergonomics principles so that the students are able to visualize factors which affect the efficiency of human beings. After the study of the subject, the students will be able to select a proper design of display controls, equipment, work plan and environment

- INTRODUCTION:** Definition of ergonomics and ergonomist; social and economic values of ergonomics; general and individual ergonomics.
- POSTURE AND MOVEMENT:** Biomechanical; physiological and anthropometric background; postures; sitting and standing; Movement – lifting; carrying; pulling and pushing; Workplace design and assessment.
- INFORMATION AND OPERATION:** User; information – visual; hearing and other senses; Control for operation – fixed and others diagues user friendliness; different forms and help; Website design; mobile interaction; virtual reality.
- ENVIRONMENTAL FACTORS:** Noise reduction; hearing conservation; Vibration prevention; illumination – light intensity; brightness differences; colour of light; Climate – heat and cold; Chemical substances – measures; ventilation.
- WORK ORGANISATION JOBS & TASKS:** Tasks; jobs; work organization – flexible; autonomous groups; coaching measurement styles.
- ERGONOMIC APPROACH:** Project management – initiative phase; problem identification phase;

selection of solution phase; implementation phase; evaluation phase.

- CASE STUDIES:** A set of case studies will be used to demonstrate how ergonomics had lead to changes in work activity; safety and product design; Case studies will include advanced computer application; work place assessment; accidents; analysis and industrial inspection.

TEXT BOOK

Jan Dul and Bernard Weerdancester, "Ergonomics for Beginners", CRC Press/Taylor and Francis Group

REFERENCE BOOKS

- Knoz Stephana, Johnson Steven, Halconts "Work Design - Industrial Ergonomics", Hathway, Scottsdagta, AZ
- Sanders M. S. and McCormic E. J., "Human Factors in Engineering and Design", McGraw Hill New York
- Verma A. P., "Industrial Engineering", S. K. Kataria and Sons

ME-443	FINITE ELEMENT ANALYSIS	L T P	Cr
		5 0 0	3

OBJECTIVE

The objective of the course is to teach the fundamentals of finite element method of solids; structures and fluids with emphasis on the underlying theory, assumptions, and modeling issues as well as providing hands on experience using finite element software to model, analyze and design systems of relevance to mechanical engineering. This includes the theoretical foundations and appropriate use of finite element methods.

- INTRODUCTION - VARIATIONAL FORMULATION:** General field problems in Engineering; Modeling; Discrete and Continuous models; Characteristics; Difficulties involved in solution; The relevance and place of finite element method; Historical comments; Basic concept of FEM; Boundary and initial value problems; Gradient and divergence theorems; Functional; Variational calculus; Variational formulation of VBPS; The method of weighted residuals; The Ritz method.
- FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS:** 1D second order equations; discretisation of domain into elements; Generalised coordinates approach; derivation of elements equations; assembly of element equations; imposition of boundary conditions; solution of equations; Cholesky method; Post processing.
- EXTENSION OF THE METHOD TO FOURTH ORDER EQUATIONS AND THEIR SOLUTIONS:** time dependant problems and their solutions; example from heat transfer; fluid flow and solid mechanics.
- FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS:** Second order equations involving a scalar; valued function; model equation; Variational formulation – Finite element formulation through generalised

coordinates approach; Triangular elements and quadrilateral elements ; convergence criteria for chosen models; Interpolation functions; Elements matrices and vectors; Assembly of element matrices; boundary conditions; solution techniques.

5. **ISOPARAMETRIC ELEMENTS AND FORMULATION:** Natural coordinates in 1, 2 and 3 dimensions; use of area coordinates for triangular elements in; 2 dimensional problems; Isoparametric elements in 1, 2 and 3 dimensions; Lagrangean and serendipity elements; Formulation of element equations in one and two dimensions ; Numerical integration.
6. **APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONS:** Equations of elasticity; plane elasticity problems; axisymmetric problems in elasticity; Bending of elastic plates; Time dependent problems in elasticity; Heat transfer in two dimensions; Incompressible fluid flow and related problems.
7. **INTRODUCTION TO ADVANCED TOPICS (NOT FOR EXAMINATION PURPOSES);** Three dimensional problems; Mixed formulation; use of software packages.

TEXT BOOK

Reddy J. N., "An Introduction to Finite Element Method", McGraw Hill, Intl Student Edition

REFERENCE BOOKS

- 1 Zienkiewitch, "The Finite Element Method; Basic Formulation and Linear Problems", Vol 1, 4th Edition, McGraw Hill
- 2 Desai C. S. and Abel J. F., "Introduction to the Finite Element Method", Affiliated East west Press, 1972
- 3 Rao S. S., "The Finite Element Method in Engineering", Pergaman Press, 1989

ME-461	RENEWABLE SOURCES OF ENERGY	L T P	Cr
		5 0 0	3

OBJECTIVE

This gives the knowledge of estimation; conversion and utilization of non conventional sources of energy. With the depletion of fossil fuel sources, the importance of non-conventional renewable sources of energy has gained tremendous importance. This course introduces the students to these sources and how these can be utilized for power production.

1. **INTRODUCTION:** Trends of energy consumption; sources of energy; conventional and Renewable; fossil fuel; availability and limitations; need to develop new energy sources.
2. **SOLAR ENERGY:** Solar radiation characteristics and estimation; Solar Collectors; Flat Plate and concentrating types; Their comparative study; design and material selection; Efficiency; Selective paints and surfaces; Heating of air and water for building and other Uses; Thermal storages; Solar Ponds; Solar pumps; solar Power; Solar Cookers etc; Direct Conversion of Solar energy to electricity and its various uses; materials; limitations and Costs.

3. **BIO-CONVERSION:** Generation of bio-gas; digesters and their design; selection of material; feed to digester; paralytic gasification; production of hydrogen; Algae production and their uses.
4. **WIND ENERGY:** Types of rotors; horizontal axis and vertical axis systems; system design and site selection.
5. **GEO-THERMAL ENERGY:** Sites; potentiality and limitation; study of different conversion systems.
6. **TIDAL ENERGY:** Sites; potentiality and possibility of harnessing from site; limitations; Ocean Thermal Energy: Principle of utilization and its limitations; description of various systems.
7. **OTHER NON-CONVENTIONAL ENERGY SOURCES:** Fluidized bed combustions; heat from waste and other sources.

TEXT BOOK

Tiwari G. N. and Ghosal M. K., "Renewable Energy Resources", Narosa Publishing House

REFERENCE BOOKS

1. Rai G. D., "Solar Energy Utilization", Khanna Publishers, 1995
2. Duffie J. A. and Beckman, "Solar Heating and Cooling"
3. Wakil M. M, EL, "Power Plant Technology", McGraw Hill
4. Sharma P. C., "Power Plant Engineering", S. K. Kataria and Sons

PH-471	NON DESTRUCTIVE TESTING TECHNIQUES	L T P	Cr
		5 0 0	3

OBJECTIVE

To give a general overview of novel non destructive testing methods, the principles behind them, their uses, the advantages and limitations, both in application and defect detection capability.

1. **NON-DESTRUCTIVE TESTING:** Non-destructive testing (NDT): role, components and advantages; common NDT techniques.
2. **ULTRASONIC TESTING:** ultrasonic flaw detection: principle, working and applications, advantages and limitations.
3. **RADIOGRAPHY:** X-ray radiography, Gamma my radiography and Neutron radiography; principle, working and applications, advantages and limitations.
4. **EDDY CURRENT TESTING:** Principle, working and applications of eddy current testing; probes and sensors; testing procedures, applications, advantages and imitations.
5. **MAGNETIC TESTING:** Magnetic testing: particle, flux leakage testing; magnetization methods; detectables. applications and imitations,
6. **DYE PENETRANT TESTING:** Principle, working and applications of dye penetrant testing, advantages and limitations.
7. **VISUAL AND OPTICAL TESTING:** Principle, workgh and applications of holography, optical interference techniques, advantages and limitations.

TEXT BOOK

Baldev Raj, Jayakumar T., and Thavasimuthu M., "Practical Non-Destructive Testing", Narosa Publishing, 1997

REFERENCE BOOKS

1. Suryanarayana C., "Testing of Metallic Materials", Prentice Hall of India, 1979
2. American Society for Metals, "Metals Hand Book (Mechanical Testing)", Volume VIII, American Society for Metals, 1988
3. Rolfe T. and Barson J., "Fracture and Fatigue Control and Structure - Application of Fracture Mechanics", Prentice Hall, 1977
4. Halmshaw R, "Non-Destructive Testing", Edward Arnold, 1989
5. Hull, "Non-Destructive Testing", ELBS Edition, 1991.
6. Das A. K., "Metallurgy of Failure Analysis", JMH, 1992.

PH-472	NANO TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

The goal is to teach students some basic nanoscience/nanotechnology. Students are expected to learn both some basic science and technology. Students from all branches are encouraged to take (his course. In addition, students are expected to assist each other in teaming and discussing the content and die context, and to maintain respect for the scientific approach.

1. **NANOMATERIALS:** Introduction to nano-materials; nano-scale in one dimension: thin films, layers and surfaces, nanoscale in two dimensions: carbon nano-tubes; inorganic nano-tubes, nano-wires, biopolymers; nano-scale in three dimensions: nano-particles, fullerenes (Carbon 60), dendrimers, quantum dots
2. **NANOMETROLOGY:** Introduction to nanometrology; length measurement; force measurement; measurement of single molecules; applications of metrology.
3. **ELECTRONICS, OPTOELECTRONICS AND INFORMATION AND COMMUNICATION TECHNOLOGY:** Introduction to electronics; optoelectronics and information and communication technology; nanoscience in electronics, opto-electronics and information and communication technology; current applications: computer chips, information storage, opto-electronics; applications anticipated in the future: sensors.
4. **NANO-BIOTECHNOLOGY AND NANOMEDICINE:** introduction to nano-biotechnology and nano-medicine, nano-science in nano-biotechnology and nano-medicine, current and future applications array technologies, drug delivery, drug discovery, medical imaging, nano-technologies and cancer treatment, implants and Prosthetics.
5. **NANOFABRICATION:** Lithographic techniques for nano-printing; nano-manipulation techniques, self assembly.
6. **SYNTHESIS AND CHARACTERIZATION:** Metallic, semiconducting, magnetic and carbon based nano structures, nanocomposites and biological nanomaterials.

7. APPLICATIONS OF NANOMATERIALS:

Sunscreens and cosmetics, composites, clays. coatings and surfaces, tougher and harder cutting toots, paints; remediation, fuel ceils; displays, batteries, fuel additives, catalysts; carbon nanotube composites; lubricants, magnetic materials; medical implants; machinable ceramics, water purification, military battle suits.

TEXT BOOK

Poole Charles P. and Owens Frank J., "Introduction to Nanotechnology", Wiley Interscience, 2003

REFERENCE BOOKS

1. Rainer Waser, "Nanoelectronics and Information Technology: Advanced Electronic Materials and Novel Devices", Wiley VCH, 2003
2. Wang Z. L., "Characterization of Nanophase Materials", Wiley-VCH, 2001
3. Edelstein A. S. and Cammam R. C., "Nanomaterials: Synthesis, Properties and Applications", IOP (UK), 1996
4. Heinzl T., "Mesoscopic Electronics in Solid State Nanostructures", Wiley-VCH, 2003

PH-473	LASER TECHNOLOGY	L T P	Cr
		5 0 0	3

OBJECTIVE

To give a general overview of fundamentals of Laser, Laser production techniques and applications.

CONDITIONS: Conditions for producing laser, concept of coherence - spatial and temporal, population inversions

GROWTH FACTOR: Einstein coefficients, gain and gain saturation, saturation intensity, development and growth of a laser beam, exponential growth factor, threshold requirement for a laser.

NORMAL INVERSION: Inversions and two level systems, steady state inversions,

POPULATION INVERSION: Three and four level systems, transient population inversions, factors effecting population inversion, laser Amplifiers.

EXCITATION AND PUMPING: Excitation or pumping threshold requirements, pumping pathway and specific excitation parameters associated with optical and particle pumping.

TYPES OF LASERS: Helium-Neon Laser, CO₂ Laser, Ruby Laser, Semiconductor diode laser.

LASER SPECTROSCOPY: Introduction and applications

TEXT BOOK

Silfvast William T., "Laser Fundamentals", Cambridge University Press

REFERENCE BOOKS

1. Beynon John, "Introductory University Optics", Prentice Hall of India.
2. Ghatak A. K., "Optics", Tata McGraw Hill.

Lingaya's Group of Institutions:

- **Lingaya's University (Faridabad)**
- **Lingaya's Institute of Health Sciences**
 - **Lingaya's Public School**
- **Lingaya's Lalita Devi Institute of Management & Sciences, New Delhi (I.P. University)**
- **Sri Viveka Institute of Technology, Vijayawada**



**LINGAYA'S
UNIVERSITY**

choose to know

(u/s 3 of UGC Act 1956)

CAMPUS

Nachauli, Old Faridabad - Jasana Road, Faridabad-121002

Ph: 91-129-3064500-505, Fax: 91-129-2202615

ADMIN. OFFICE

C-72, Shivalik, Malviya Nagar, New Delhi-110017

Ph: 91-11-40719000, Fax: 91-11-40719023

E-mail: lu@lingayasuniversity.edu.in

Website: lingayasuniversity.edu.in