ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRONICS AND COMMUNICATION ENGINEERING

For

5 YEAR INTEGRATED DUAL DEGREE PROGRAM (I.D.P)

Leading to

(B.TECH. & M.Tech. / MBA)

(Applicable for the batches admitted from 2015-2016)

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(Autonomous)
Kukatpally, Hyderabad – 500085
Telangana, India

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ACADEMIC REGULATIONS 2015
for CBCS Based 5 YEAR INTEGRATED DUAL DEGREE PROGRAM (B.Tech. & M.Tech/MBA)

(Effective for the students admitted into I year from the Academic Year **2015-16** and onwards)

1.0 5 Year Integrated Dual Degree Program in Engineering & Technology (IDP)

JNTUH offers 5 Year (10 Semesters) Integrated Dual Degree (IDP) Programme, under Choice Based Credit System (CBCS) at its Constituent Autonomous College - JNTUH College of Engineering Hyderabad, with effect from the Academic Year 2015 - 16 onwards, in the following Branches of Engineering

S.No.	UG Program	PG Program	
		M.Tech. (Specialization)	***MBA (Specialization)****
1)	B.Tech. in Electronics & Communication Engineering	M.Tech. (Communications & Signal Processing)	MBA (Human Resources / Finance/ Marketing/ Systems)
2)	B.Tech. in Computer Science & Engineering	M.Tech. (Computer Science)	MBA (Human Resources / Finance/ Marketing/ Systems)
3)	B.Tech. in Electrical & Electronics Engineering	M.Tech. (Power Electronics)	MBA (Human Resources / Finance/ Marketing/ Systems)
4)	B.Tech. in Mechanical Engineering	M.Tech. (Manufacturing Systems)	MBA (Human Resources / Finance/ Marketing/ Systems)
5)	B.Tech. in Civil Engineering	M.Tech. (Structural Engineering)	MBA (Human Resources / Finance/ Marketing/ Systems)

(* A Minimum of 15 students is necessary for any specialization to be offered.)
A student would be conferred the B.Tech Degree and M.Tech or MBA Degree in this IDP, after the successful completion of all the requirements for th 10 semesters of study and earning the appropriate credits.

2.0 Eligibility for Admission

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

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

2.3 Students opting for the 5 year integrated IDP must specify their choice for M.Tech. (with in the specializations given above) or MBA as the case may be, after choosing the appropriate Branch of Engineering, at the time of Admissions only. Option thus exercised is final, and cannot be changed during the study period.

2.4 Students opting for 5 years integrated IDP have to study for the specified period, to earn the relevant credits for the award of both the B.Tech. and M.Tech. / MBA Degrees, and they will not be permitted to have a choice for B.Tech. Degree alone after 4 years study.

3.0 IDP Structure

3.1 The IDP Programmes of JNTUH-CEH are of Semester Pattern, with 10 Semesters constituting 5 Academic Years, each Academic Year having TWO Semesters (First/Odd and Second/Even Semesters). Each Semester shall be of 22 Weeks duration (inclusive of Examinations), with a minimum of 90 Instructional Days per Semester.

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

3.3 Semester Scheme:
Each Semester having - 'Continuous Internal Evaluation (CIE)' and 'Semester End Examination (SEE)'. Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as denoted by UGC.

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

- One Credit - for One hour/ Week/ Semester for Theory/ Lecture (L) Courses; and,
- One Credit - for Two hours/ Week/ Semester for Laboratory/ Practical (P) Courses or Tutorials (T).
  Other student activities like NCC, NSS, NSO, Study Tour, Guest Lecture etc., and identified Mandatory Courses will not carry Credits.

3.5 Subject/ Course Classification:
All Subjects/ Courses offered for the UGP are broadly classified as : (a) Foundation Courses (FnC), (b) Core Courses (CoC), and (c) Elective Courses (EℓC).

- Foundation Courses (FnC) are further categorized as : (i) HS (Humanities and Social Sciences), (ii) BS (Basic Sciences), and (iii) ES (Engineering Sciences);
- Core Courses (CoC) and Elective Courses (EℓC) are categorized as PS (Professional Subjects), which are further subdivided as – (i) PC (Professional/ Departmental Core) Subjects, (ii) PE (Professional/ Departmental Electives) , (iii) OE (Open Electives); and (iv) Project Works (PW);
- Minor Courses (1 or 2 Credit Courses, belonging to HS/ BS/ ES/ PC as per relevance); and
- Mandatory Courses (MC - non-credit oriented).

3.6 Course Nomenclature:
The Curriculum Nomenclature or Course-Structure Grouping for the each of the IDP E&T is as listed below :

S.No.	UG/PG Program	*Group/Category/Component*	*Description*
1)	UG	BS – Basic Sciences	Includes - Mathematics, Physics and Chemistry Subjects
2)	UG	ES - Engineering Arts and Sciences	Include fundamental engineering subjects

3)	UG	HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management
4)	UG	PC – Professional Core	Includes core subjects related to the parent discipline, department or branch of engineering
5)	UG	PE – Professional Electives	Includes Elective subjects related to the parent discipline, department or branch of engineering
6)	UG	OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline, department or branch of engineering
7)	UG	Project	B.Tech. Project or UG Project or UG Major Project
8)	UG	Industrial Training/ Mini Project	Industrial Training/ Internship/ UG Mini Project/ Mini Project
9)	PG	PGC	PG Core Subjects related to the M.Tech. Specialization / MBA
10)	PG	PGE	PG Elective Subjects related to the M.Tech. Specialization / MBA
11)	PG	Project	PG Project M.Tech. / MBA
12)	PG	Seminar	Seminar / Colloquium at PG level, in M.Tech. / MBA
13)	PG	Comprehensive Viva	Comprehensive Viva based on all Subjects
		Total	**254**

4.0 Course Work

4.1 A student, after securing admission, shall pursue the IDP (B.Tech+M.Tech or MBA) in a minimum period of 5 Academic Years, and a maximum period of 10 Academic Years (starting from the Date of Commencement of I Year).
The entire course of study is of five academic years, comprising of 10 semesters. **All the I, II, III, IV and V years are on two-semester pattern.**

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

4.3 The student must secure a total of 260 credits for the IDP - 174 credits for the B.Tech. Degree Program, plus 86 credits for the M.Tech./ MBA Program.

4.4 The course work and curriculum for first 3 years (6 Semesters) would be same as that the Regular B.Tech (4 year) in the relevant branch of Engineering.

5.0 Course Registration

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

5.2 Academic Section of the College invites 'Registration Forms' from students before the beginning of the Semester, through 'ON-LINE SUBMISSIONS', ensuring 'DATE and TIME Stamping'. The ON-LINE Registration Requests for any 'CURRENT SEMESTER' shall be completed BEFORE the commencement of SEEs (Semester End Examiantions) of the 'PRECEDING SEMESTER'.

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

5.4 A Student may be permitted to Register for his Subjects/ Course of CHOICE upto III year II semester with a typical total of 24 Credits per Semester (Minimum being 20 C and Maximum being 28 C, permitted deviation being ± 17%), based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 20 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

A Student may be permitted to Register for his Subjects/ Course of CHOICE in IV year I semester and V year I semester with a typical total of 30 Credits per Semester (Minimum being 26 C and Maximum being 34 C, permitted deviation being ± 14%), based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 26 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

A Student may be permitted to Register for his Subjects/ Course of CHOICE in IV year II semester with a typical total of 28 Credits per Semester (Minimum being 24 C and Maximum being 32 C, permitted deviation being ± 14%), based on his PROGRESS and SGPA/ CGPA, and completion of the 'PRE-REQUISITES' as indicated for various Subjects/ Courses, in the Department Course Structure and Syllabus contents. However, a MINIMUM of 24 Credits per Semester must be registered to ensure the 'STUDENTSHIP' in any Semester.

A Student must Register for his Subjects/ Course in V year II semester with a total of 22 Credits per Semester.

5.5 Open Electives: Students are to register One Open Elective (OE-I) during III Year I Semester, one (OE-II) during III Year II Semester , from the list of Open Electives given. However, Students can not opt for an Open Elective Subject offered by their own (parent) Department, if it is already listed under any category of the Subjects offered by parent Department in any Semester.

5.6 There shall be an Industry oriented Mini-Project, in collaboration with an Industry of the relevant specialization, to be registered immediately after III year II semester examinations, and taken up during the summer vacation for about eight weeks duration.

5.7 Each Student shall Register the UG Project Work during the IV Year II Semester, as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of Department.

5.8 The PG Project shall start immediately after the completion of the IV Year II Semester, and shall continue through V Year I and II Semesters as per the instructions of the Project Guide/ Project Supervisor assigned by the Head of Department and registered after approval from PRC.

5.9 Choice for 'additional Subjects/ Courses' to reach the Maximum Permissible Limit of 28/32/34 Credits (above the typical 24/28/30 Credit norm) must be clearly indicated, which needs the specific approval and signature of the Faculty Advisor/ Counselor.

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

5.11 Subject/ Course Options exercised through ON-LINE Registration are final and CAN NOT be changed, and CAN NOT be inter-changed; further, alternate choices will also not be considered. However, if the Subject/ Course that has already been listed for Registration (by the Head of Department) in a Semester could not be offered due to

any unforeseen or unexpected reasons, then the Student shall be allowed to have alternate choice - either for a new Subject (subject to offering of such a Subject), or for another existing Subject (subject to availability of seats), which may be considered. Such alternate arrangements will be made by the Head of Department, with due notification and time-framed schedule, within the FIRST WEEK from the commencement of Class-work for that Semester.

5.12 Cancelation of Registration of Subjects/ Courses may be permitted, ONLY AFTER obtaining prior approval from the Faculty Advisor (subject to retaining a minimum of required credits) 'within 15 Days of Time' from the beginning of the current Semester.

6.0 Subjects/ Courses to be offered

6.1 A Subject/ Course may be offered to the Students, ONLY IF a Minimum of 1/3 of the class Strength opt for the same. The Maximum Strength of a class is limited to 80 (60 + 1/3 of the class Strength).

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

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

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

7.0 Attendance Requirements

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

A student shall be eligible to appear for the End Semester Examinations in IV and V year , I Semester and II Semester, if he acquires a minimum of 75% of attendance in that subject.

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

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

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

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

7.6 Students from IV year I semester onwards, whose shortage of attendance is not condoned in any Subjecr, are not eligible to take their End Examinations of that Subject, they get detained and their registration for that Subject shall stand cancelled. They may seek re-registration for all those Subjects registered in which they got detained, by seeking re-regiter for that Subjects as and when offered.

8.0 Academic Requirements

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

8.1 (a) **UG Part**

A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 35% marks (25 out of 70 marks) in the End Semester Examination, and a minimum of 40% of marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing P Grade or above in that Subject/ Course.

A student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to - Industry oriented Mini-Project/ Seminar, if he secures not less than 40% of the total marks (40 marks) to be awarded for each. The student would be treated as failed, if he - (i) does not submit a report on his Industry oriented Mini-Project, or does not make a presentation of the same before the Evaluation Committee as per schedule, or (ii) does not present the Seminar as required in the IV year II Semester, or (iii) secures less than 40% of marks (40 marks) in Industry oriented Mini-Project/ Seminar evaluations.
He may reappear once for each of the above evaluations, when they are scheduled again; if he fails in such 'one reappearance' evaluation also, he has to reappear for the same in the next subsequent Semester, as and when it is scheduled.

(b) **PG Part**

A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to each Subject/ Course, if he secures not less than 40% Marks (28 out of 70 Marks) in the End Semester Examination, and a minimum of 50% of Marks in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together; in terms of Letter Grades, this implies securing B Grade or above in that Subject.

A Student shall be deemed to have satisfied the Academic Requirements and earned the Credits allotted to - Seminar, and Comprehensive Viva-voce, if he secures not less than 50% of the total Marks to be awarded for each. The Student would be treated as failed, if he - (i) does not attend the Comprehensive Viva-voce as per the schedule given, or (ii) does not present the Seminar as required, or (ii) secures less than 50% of Marks (< 50 Marks) in –Seminar/ Comprehensive Viva-voce evaluations.
He may reappear for comprehensive viva where it is scheduled again; For seminar, he has to reappear in the next subsequent Semesters, as and when scheduled.

8.2 A Student will not be promoted from I Year to II Year, unless he fulfils the Attendance and Academic Requirements and secures a total of 24 Credits out of 48 Credits of I Year, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.3 A Student will not be promoted from II Year to III Year, unless he fulfils the Attendance and Academic Requirements and secures a total of 43 Credits out of 72 Credits upto II Year I Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

8.4 A Student will not be promoted from III Year to IV Year, unless he fulfils the Attendance and Academic Requirements and secures a total of 72 Credits out of 120 Credits upto III Year I Semester, from all the relevant regular and supplementary examinations, whether he takes those examinations or not.

A student shall be promoted from IV Year to V Year, if the student completes the UG Project satisfactorily and earns the prescribed number of credits for UG Project by the end of IV Year II Semester.

8.5 A Student shall - register for all Subjects covering 254 Credits as specified and listed (with the relevant Course/ Subject Classifications as mentioned) in the Course Structure, put up all the Attendance and Academic requirements for 254 Credits securing a minimum of P /**B** Grade (Pass Grade) or above in each Subject, and 'earn ALL 254 Credits securing SGPA $\geq$ 5.0 / 6.0(in each Semester), and CGPA (at the end of each successive Semester) $\geq$ 5.0/ 6.0 , to successfully complete the UGP and PGP.

8.6 If a Student registers for some more 'extra Subjects' (in the parent Department or other Departments/Branches of Engg.) other than those listed Subjects totaling to 254 Credits as specified in the Course Structure of his Department, the performances in those 'extra Subjects' (although evaluated and graded using the same procedure as that of the required 254 Credits) will not be taken into account while calculating the SGPA and CGPA. For such 'extra Subjects' registered, % marks and Letter Grade alone will be indicated in the Grade Card, as a performance measure, subject to completion of the Attendance and Academic Requirements as stated in Items 7 and 8.1 – 8.4 above.

8.7 Students who fail to earn 254 Credits as per the Course Structure, and as indicated above, within 10 Academic Years from the Date of Commencement of their I Year shall forfeit their seats in IDP Programme and their admissions shall stand cancelled.

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

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

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

9.0 Evaluation - Distribution and Weightage of Marks

(a) UG Part

9.1 The performance of a student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 marks for Theory or Practicals or Seminar or Drawing/Design or Industry oriented Mini-Project or Minor Course, etc; For all Subjects/ Courses as mentioned above, the distribution shall be 30 marks for CIE, and 70 marks for the SEE. However, the UG Project Work (Major Project) will be evaluated for 200 Marks. These evaluations shall be based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination), and a Letter Grade corresponding to the % marks obtained shall be given.

9.2 a) For Theory Subjects (inclusive of Minor Courses), during the Semester, there shall be 2 mid-term examinations for 25 marks each. Each mid-term examination consists of one objective paper for 10 marks, plus one subjective paper for 15 marks, with a duration of 120 minutes (20 minutes for objective and 100 minutes for subjective papers). Further, there will be an allocation of 5 marks for Assignment. Objective paper may be set with multiple choice questions, True/ False, fill-in the blanks, matching type questions, etc. Subjective paper shall contain 5 questions, out of which the Student has to answer 3 questions, each for 5 marks.

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

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

d) The first mid-term examination Marks and first Assignment Marks shall make one set of CIE Marks , and the second mid-term examination Marks and second Assignment Marks shall make second set of CIE Marks; and the better of these two sets of marks shall be taken as the final marks secured by the Student towards Continuous Internal Evaluation in that Theory Subject.

9.3 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 internal marks, and 70 marks are assigned for Lab./Practical End Semester Examination (SEE). Out of the 30 marks for internals, day-to-day work in the laboratory shall be evaluated for 20 marks; and for the remaining 10 marks - two internal practical tests (each of 10 marks) shall be conducted by the concerned laboratory teacher and the better of these two tests is taken into account. The SEE for Practicals shall be conducted at the end of the Semester by Two Examiners appointed by Head of the Department.

9.4 For the Subjects having Design and/or Drawing, (such as Engineering Graphics, Engineering Drawing, Machine Drawing, Production Drawing Practice, and Estimation), the distribution shall be 30 marks for CIE (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for SEE. There shall be two internal tests in a Semester and the better of the two shall be considered for the award of marks for internal tests.

9.5 The Industry oriented Mini-Project shall be submitted in a Report form, and a presentation of the same shall be made before a Committee, which evaluates it for 100 marks. The Committee shall consist of Head of the Department, the supervisor of Mini-Project, and a Senior Faculty Member of the Department. There shall be no internal marks for Industry oriented Mini-Project. The Mini-Project shall be evaluated in the IV Year I Semester.

9.6 Out of a total 200 marks allotted for the Project Work, 60 marks shall be for CIE (Continuous Internal Evaluation and 140 marks for the SEE (End Semester Viva-voce Examination). The Project Viva-voce shall be conducted by a Committee comprising of an External Examiner, Head of the Department, Senior faculty and Project Supervisor. Out of 60 marks allocated for CIE, 30 marks shall be awarded by the Project Supervisor (based on the continuous evaluation of student's performance throughout the Project Work period), and the other 30 marks shall be awarded by a Departmental Committee consisting of Head of the Department and Project Supervisor, based on the work carried out and the presentation made by the Student at the time of Viva-voce Examination.

9.7 For NCC/ NSS/ NSO types of Courses, and/or any other Mandatory Non-Credit Course offered in a Semester, a 'Satisfactory Participation Certificate' shall be issued to the Student from the concerned authorities, only after securing ≥ 65% attendance in such a Course. No marks or Letter Grade shall be allotted for these activities.

(b) PG Part (M.Tech.)

9.8 The performance of a Student in each Semester shall be evaluated Subject-wise (irrespective of Credits assigned) with a maximum of 100 Marks for Theory or Practicals or Seminar or Drawing/Design or Comprehensive Viva-voce etc; These evaluations shall be based on 30% CIE (Continuous Internal Evaluation) and 70% SEE (Semester End Examination), and a Letter Grade corresponding to the % Marks obtained shall be given.

i) For Theory Subjects, CIE Marks shall comprise of - Mid-Term Examination Marks (for 25 Marks), and Assignment Marks (for 5 Marks).

ii) During the Semester, there shall be 2 Mid-Term examinations. Each Mid-Term examination shall be for 25 Marks (120 minutes duration). The better performance out of these two Mid-Term Examinations shall be considered for the award of 25 Marks.

9.9 For Practical Subjects, there shall be a Continuous Internal Evaluation (CIE) during the Semester for 30 Internal Marks, and 70 Marks are assigned for Lab./Practicals End Semester Examination (SEE). Out of the 30 Marks for Internals, day-to-day work assessment in the laboratory shall be evaluated for 20 Marks; and the performance in an internal Lab./Practical Test shall be evaluated for 10 marks. The SEE for Lab./ Practicals shall be conducted at the end of the Semester by the concerned Laboratory Teacher and another faculty member of the same Department as assigned by the Head of the Department.

9.10 There shall be a Seminar Presentation in V Year I Semester. For the Seminar, the Student shall collect the information on a specialized topic, prepare a Technical Report and submit to the Department at the time of Seminar Presentation. The Seminar Presentation (along with the Technical Report) shall be evaluated by Two Faculty Members assigned by Head of the Department, for 100 Marks. There shall be no SEE or External Examination for Seminar.

9.11 Each Student shall appear for a Comprehensive Viva-Voce at the end of the V Year II Semester. The Comprehensive Viva-Voce shall be conducted by a Committee, consisting of three senior faculty members of Department nominated by the Head of the Department, and the performance evaluation shall be for 100 Marks. There are no Internal Marks for the Comprehensive Viva-voce.

9.12 i) The PGP Project shall start immediately after the completion of the IV Year II Semester, and shall continue through V Year I and II Semesters after approval of PRC. The Student shall carry out the literature survey, select an appropriate topic and submit a Project Proposal within 6 weeks (immediately after his IV Year II Semester End Examinations), for approval by the Project Review Committee (PRC). The PRC shall be constituted by the Head of Department, and shall consist of the Head of Department, Project Supervisor, and a Senior Faculty Member of the Department. The Student shall present his Project Work Proposal to the PRC (PRC-I Presentation), on whose approval he can 'REGISTER for the PG Project'. After Registration, the Student shall carry out his work, and continually submit 'a fortnightly progress report' to his Supervisor throughout the Project period. The PRC will monitor the progress of the Project Work and review, through PRC-II and PRC-III Presentations – one at the end of the V Year I Semester, and one before the submission of M.Tech. Project Work Report/ Dissertation.

ii) After PRC-III presentation, the PRC shall evaluate the entire performance of the Student and declare the Project Report as 'Satisfactory' or 'Unsatisfactory'. Every Project Work Report/ Dissertation (that has been declared 'satisfactory') shall undergo 'Plagiarism Check' as per the University/ College norms to ensure content plagiarism below a specified level of 30%, and to become acceptable for submission. In case of

unacceptable plagiarism levels, the student shall resubmit the Project Work Report, after carrying out the necessary modifications/ additions to his Project Work/ Report as per his Supervisor's advice, within the specified time, as suggested by the PRC.

iii) If any Student could not be present for PRC-II at the scheduled time (after approval and registration of his Project Work at PRC-I), his submission and presentation at the PRC-III time (or at any other PRC specified dates) may be treated as PRC-II peformance evaluation, and delayed PRC-III dates for him may be considered as per PRC recommendations. Any Student is allowed to submit his M.Tech. Project Dissertation 'only after completion of 40 weeks from the date of approval/registration' of his Project, and after obtaining all approvals from the PRC.

iv) A total of 200 Marks are allotted for the M.Tech. Project Work, (out of which 100 Marks are allotted for internal evaluation and 100 Marks for external evaluation). For internal Evaluation of 100 marks, Project Supervisor shall evaluate for 60 marks based on the continuous Internal Evaluation(CIE) of the student's performance and combined PRC-I, II & III performance evaluation will be for 40 marks (to be awarded by PRC, as SEE).

9.13 i) The Student shall be allowed to submit his Project Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Labs.), Seminar, Comprehensive Viva-voce etc. (securing B Grade or above), and after obtaining all approvals from PRC. In such cases, the M.Tech. Dissertations will be sent to an External Examiner nominated by the Principal of the College, on whose 'approval', the Student can appear for the M.Tech. Project Viva-voce Examination, which shall be conducted by a Board, consisting of the PG Project Supervisor, Head of the Department, and the External Examiner who adjudicate the M.Tech. Project Work and Dissertation. The Board shall jointly declare the Project Work Performance as 'satisfactory', or 'unsatisfactory'; and in successful cases, the External Examiner shall evaluate the Student's Project Work presentation and performance for 100 Marks (SEE).

ii) If the adjudication report of the External Examiner is 'not favourable' , then the Student shall revise and resubmit his Dissertation after one Semester, or as per the time specified by the External Examiner and/ or the PRC. If the resubmitted report is again evaluated by the External Examiner as 'not favourable', then that Dissertation will be summarily rejected. Subsequent actions for such Dissertations may be considered, only on the specific recommendations of the External Examiner and/ or PRC.

iii) In cases, where the Board declared the Project Work Performance as 'unsatisfactory', the Student is deemed to have failed in the Project Viva-voce Examination, and he has to reappear for the Viva-voce Examination as per the Board recommendations. If he fails in the second Viva-voce Examination also, he will not be considered eligible for the Award of the Degree, unless he is asked to revise and resubmit his Project Work by the Board within a specified time period (within 5 years from the date of commencement of his I Year I Semester).

(c) PG Part (MBA)

10.1 Theory Subjects are evaluated for 100 marks, and Practicals / Lab. Subjects are also evaluated for 100 marks.

10.2 PG Summer Internship, Seminar and Comprehensive Viva-voce shall be evaluated for100 marks each.

10.3. There shall be a PG Summer Internship, preferably in an industry, to be taken up during the vacation, immediately after the IV year II Semester End Examinations. The Internship Activity shall be submitted in a Report form, and the student shall also deliver a Seminar (based on the PG Summer Internship) before the MBA Project Evaluation Committee (PEC); both the Report and the Seminar shall be evaluated for 100 marks each by the PEC, at the beginning

of the V Year I Semester. The PEC shall be constituted by the Head of Dept. or Principal/Director of the College/School, and shall consist of the Head of the Department, the Supervisor of PG Summer Internship Program/Seminar/PG Project and a Senior Faculty Member of the Department. There shall be no internal marks for this PG Summer Internship Program.

10.4 For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination. For the award of the 30 Internal (sessional) marks for theory subjects, there shall be 2 internal examinations during the Semester, one at the middle of the Semester and the other immediately after the completion of instructions; each of which shall be evaluated for 25 marks, and the **better** of these two internals shall be considered for awarding the 25 sessional marks. The remaining 5 sessional marks, will be awarded based on the student's performance in the Assignments.

10.5 i) Every PGP Student shall be required to execute his MBA Project, under the guidance of the Supervisor assigned to him by the Head of Department. The PGP Project shall start immediately after the completion of the V Year I Semester, and shall continue through V Year II Semesters. The Student shall carry out the literature survey, select an appropriate topic and submit a Project Proposal within 6 weeks (immediately after his V Year I Semester End Examinations), for approval by the Project Review Committee (PRC). The PRC shall be constituted by the Head of Department, and shall consist of the Head of Department, Project Supervisor, and a Senior Faculty Member of the Department. The Student shall present his Project Work Proposal to the PRC (PRC-I Presentation), on whose approval he can 'REGISTER for the PG Project'. Every Student must compulsorily register for his MBA Project Work, within the 6 weeks of time-frame as specified above. After Registration, the Student shall carry out his work, and continually submit 'a fortnightly progress report' to his Supervisor throughout the Project period. The PRC will monitor the progress of the Project Work and review, through PRC-II and PRC-III Presentations – one at the end of the V Year II Semester, and one before the submission of MBA Project Work Report/ Dissertation.

ii) After PRC-III presentation, the PRC shall evaluate the entire performance of the Student and declare the Project Report as 'Satisfactory' or 'Unsatisfactory'. Every Project Work Report/ Dissertation (that has been declared 'satisfactory') shall undergo 'Plagiarism Check' as per the University/ College norms to ensure content plagiarism below a specified level of 30%, and to become acceptable for submission. In case of unacceptable plagiarism levels, the student shall resubmit the Project Work Report, after carrying out the necessary modifications/ additions to his Project Work/ Report as per his Supervisor's advice, within the specified time, as suggested by the PRC.

iii) If any Student could not be present for PRC-II at the scheduled time (after approval and registration of his Project Work at PRC-I), his submission and presentation at the PRC-III time (or at any other PRC specified dates) may be treated as PRC-II peformance evaluation, and delayed PRC-III dates for him may be considered as per PRC recommendations. Any Student is allowed to submit his MBA Project Dissertation 'only after completion of **24 weeks** from the date of approval/registration' of his Project, and after obtaining all approvals from the PRC.

iv) A total of 200 Marks are allotted for the MBA Project Work, (out of which 100 Marks are allotted for internal evaluation and 100 Marks for external evaluation). For internal Evaluation of 100 marks, Project Supervisor shall evaluate for 60 marks based on the continuous Internal Evaluation(CIE) of the student's performance and combined PRC-I, II & III performance evaluation will be for 40 marks (to be awarded by PRC, as SEE).

10.6 i) The Student shall be allowed to submit his Project Dissertation, only on the successful completion of all the prescribed PG Subjects (Theory and Labs.), Seminar, Comprehensive Viva-voce etc. (securing B Grade or above), and after obtaining all approvals from PRC. In such cases, the MBA. Dissertations will be sent to an External Examiner nominated by the Principal of the College, on whose 'approval', the

Student can appear for the MBA. Project Viva-voce Examination, which shall be conducted by a Board, consisting of the PG Project Supervisor, Head of the Department, and the External Examiner who adjudicated the MBA Project Work and Dissertation. The Board shall jointly declare the Project Work Performance as 'satisfactory', or 'unsatisfactory'; and in successful cases, the External Examiner shall evaluate the Student's Project Work presentation and performance for 100 Marks (SEE).

ii) If the adjudication report of the External Examiner is 'not favourable' , then the Student shall revise and resubmit his Dissertation after one Semester, or as per the time specified by the External Examiner and/ or the PRC. If the resubmitted report is again evaluated by the External Examiner as 'not favourable', then that Dissertation will be summarily rejected. Subsequent actions for such Dissertations may be considered, only on the specific recommendations of the External Examiner and/ or PRC.

iii) In cases, where the Board declared the Project Work Performance as 'unsatisfactory', the Student is deemed to have failed in the Project Viva-voce Examination, and he has to reappear for the Viva-voce Examination as per the Board recommendations. If he fails in the second Viva-voce Examination also, he will not be considered eligible for the Award of the Degree, unless he is asked to revise and resubmit his Project Work by the Board within a specified time period (within 5 years from the date of commencement of his I Year I Semester).

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10.7 There shall be a Comprehensive Viva at the end of the V year II Semester, for the award of 100 marks. The Comprehensive Viva-Voce shall be conducted by the PRC, with the addition of one more Senior Faculty Member of the Department/School. The Comprehensive Viva is aimed to assess the student's understanding in various subjects studied during the PG part of Dual Degree Program. There are no internal marks for the Comprehensive Viva.

11.0 Grading Procedure

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

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

(a) For UG

% of Marks Secured (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
80% and above (≥ 80% , ≤ 100%)	O (Outstanding)	10
Below 80% but not less than 70% (≥ 70% , < 80%)	A^+ (Excellent)	9
Below 70% but not less than 60% (≥ 60% , < 70%)	A (Very Good)	8
Below 60% but not less than 55% (≥ 55% , < 60%)	B^+ (Good)	7
Below 55% but not less than 50% (≥ 50% , < 55%)	B (above Average)	6
Below 50% but not less than 45% (≥ 45% , < 50%)	C (Average)	5
Below 45% but not less than 40% (≥ 40% , < 45%)	P (Pass)	4
Below 40% (< 40%)	F (FAIL)	0
Absent	Ab	0

(b) For PG

% of Marks Secured (Class Intervals)	*Letter Grade (UGC Guidelines)*	*Grade Points*
80% and above (≥ 80% , ≤ 100%)	O (Outstanding)	10
Below 80% but not less than 70% (≥ 70% , < 80%)	A^+ (Excellent)	9
Below 70% but not less than 60% (≥ 60% , < 70%)	A (Very Good)	8
Below 60% but not less than 55% (≥ 55% , < 60%)	B^+ (Good)	7
Below 55% but not less than 50% (≥ 50% , < 55%)	B (above Average)	6
Below 50% (< 50%)	F (FAIL)	0
Absent	Ab	0

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

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

11.5 In general, a student shall not be permitted to repeat any Subject/ Course (s) only for the sake of 'Grade Improvement' or 'SGPA/ CGPA Improvement'. However, he has to repeat all the Subjects/ Courses pertaining to that Semester, when he is detained (as listed in Items 8.8- 8.9).

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

11.7 The Student passes the Subject/ Course only when he gets GP ≥ 4/6 (P Grade or above).

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

$$\text{SGPA} = \{ \sum_{i=1}^{N} C_i G_i \} / \{ \sum_{i=1}^{N} C_i \} \text{ .... For each Semester,}$$

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

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

$$\text{CGPA} = \{ \sum_{j=1}^{M} C_j G_j \} / \{ \sum_{j=1}^{M} C_j \} \text{ ... for all S Semesters registered}$$
$$\text{(ie., upto and inclusive of S Semesters, } S \geq 2 \text{)},$$

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

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

11.11 For Calculations listed in Item 11.6 – 11.10, performance in failed Subjects/ Courses (securing F Grade) will also be taken into account, and the Credits of such Subjects/ Courses will also be included in the multiplications and summations. However, Mandatory Courses will not be taken into consideration.

11.12 Passing Standards:

i) A student shall be declared successful or 'passed' in a Semester, only when he gets a SGPA ≥ 5.00/ 6.00 (at the end of that particular Semester); and a student shall be declared successful or 'passed' in the entire UGP, only when gets a CGPA ≥ 5.00/ 6.00; subject to the condition that he secures a GP ≥ 4/6 (P Grade or above) in every registered Subject/ Course in each Semester (during the entire UGP/PGP) for the Degree Award, as required.

ii) In spite of securing P Grade or above in some (or all) Subjects/ Courses in any Semester, if a Student receives a SGPA < 5.00 / 6.00 and/ or CGPA < 5.00/ 6.00 at the end of such a Semester, then he 'may be allowed' (on the 'specific recommendations' of the Head of the Department and subsequent approval from the Principal) -

(a) to go into the next subsequent Semester (subject to fulfilling all other attendance and academic requirements as listed under Items 7-8);

(b) to 'improve his SGPA of such a Semester (and hence CGPA) to 5.00/ 6.00 or above', by reappearing for ONE or MORE (as per Student's choice) of the same Subject(s) / Course(s) in which he has secured P Grade(s) in that Semester, at the Supplementary Examinations to be held in the next subsequent Semester(s). In such cases, his Internal Marks (CIE Marks) in those Subject(s) will remain same as those he obtained earlier.

In these considerations, the newly secured Letter Grades will be recorded and taken into account for calculation of SGPA and CGPA, only if there is an improvement.

(iii) A Student shall be declared successful or 'passed' in any Non-Credit Subject/ Course, if he secures a 'Satisfactory Participation Certificate' for that Mandatory Course.

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

12.0 Declaration of Results

12.1 Computation of SGPA and CGPA are done using the procedure listed in 11.6 – 11.10.

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

% of Marks = (final CGPA – 0.5) x 10

13.0 Award of Degree

13.1 A Student who registers for all the specified Subjects/ Courses as listed in the Course Structure, satisfies all the Course Requirements, and passes all the examinations prescribed in the entire IDP E&T Programme and secures the required number of 174 for UGP and 80 Credits for PGP (with CGPA ≥ 5.0/ 6.0), within 10 Academic Years from the Date of Commencement of the First Academic Year, shall be declared to have 'QUALIFIED' for the Award of the B.Tech.+M.Tech /MBA Degree(UGP and PGP) in the chosen Branch of Engineering as selected at the time of Admission.

13.2 A Student who qualifies for the Award of UG + PG Degree as listed in Item 13.1 shall be placed in the following Classes …

13.3 Students with final CGPA (at the end of the IDP) for both UGP/ PGP ≥ 8.00/ 7.75, and fulfilling the following conditions -

(i) should have passed all the Subjects/Courses in 'FIRST APPEARANCE' within the first 5 Academic Years (or 10 Sequential Semesters) from the Date of Commencement of his First Academic Year,

(ii) should have secured a CGPA ≥ 8.00/ 7.75, at the end of each of the 10 Sequential Semesters, starting from the I Year I Semester onwards,

(iii) should not have been detained or prevented from writing the End Semester Examinations in any Semester due to shortage of attendance or any other reason, shall be placed in 'FIRST CLASS with DISTINCTION'.

Students having final CGPA (at the end of IDP) for both UGP/ PGP ≥ 8.00/ 7.75, but not fulfilling the above conditions shall be placed in 'FIRST CLASS'.

13.4 Students with final CGPA (at the end of the IDP) for UGP/ PGP ≥ 6.50/ 6.75 but < 8.00/ 7.75, shall be placed in 'FIRST CLASS'.

13.5 Students with final CGPA (at the end of the IDP) for both UGP/ PGP ≥ 5.50/ 6.00 but < 6.50/ 6.75, shall be placed in 'SECOND CLASS'.

13.6 All other Students who qualify for the Award of the Degree (as per Item 13.1), with final CGPA (at the end of the IDP) for UGP ≥ 5.00 but < 5.50, shall be placed in 'PASS CLASS'.

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

13.8 A student with final CGPA (at the end of the IDP) for PGP < 6.00 will not be eligible for the Award of the M. Tech / MBA Degree.

13.9 Students fulfilling the conditions listed under Item 13.1 alone will be eligible candidates for - 'University Rank' and 'Gold Medal' considerations.

14.0 Withholding of Results

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

15.0 Transitory Regulations

15.1 Student who has discontinued for any reason, or has been detained for want of attendance or lack of required credits as specified, or who has failed after having undergone the Degree Programme, may be considered eligible for readmission to the same Subjects/ Courses (or equivalent Subjects/ Courses, as the case may be), and same Professional Electives/ Open Electives (or from set/category of Electives or equivalents suggested, as the case may be) as and when they are offered (within the time-frame of 10 years from the Date of Commencement of his I Year I Semester).

16.0 Student Transfers

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

16.2 There shall be no transfer among the Constituent Colleges and Units of Jawaharlal Nehru Technological University Hyderabad.

17.0 Scope

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

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

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

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

v) The College may change or amend the Academic Regulations, Course Structure or Syllabi at any time, and the changes or amendments made shall be applicable to all Students with effect from the dates notified by the College Authorities.

MALPRACTICE RULES

The following Malpractice rules are applicable to both Internal Examinations/SEE/Supplementory Examinations:

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

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

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)

5 Year Integrated Dual Degree Program (IDP)
(B.Tech. + M.Tech.)

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE STRUCTURE

(Applicable from the batch admitted from the Academic Year 2015-16 and onwards)

I YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics - I	4	1	0	4
2	HS	English	3	0	0	3
3	ES	Computer Programming and Data Structures	4	1	0	4
4	ES	Engineering Graphics	3	0	3	4
5	ES	Environmental Science	3	0	0	3
6	ES	Computer Programming and Data Structures Lab	0	0	3	2
7	HS	English Language Communication Skills Lab	0	0	3	2
8	ES	Engineering Workshop	0	0	3	2
		NSS/NCC/NSO				
		Total Credits	**17**	**2**	**12**	**24**

I YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics–II	3	1	0	3
2	ES	Basic Electrical and Electronics Engineering	4	0	0	4
3	BS	Applied Physics	3	1	0	3
4	BS	Engineering Chemistry	3	1	0	3
5	ES	Engineering Mechanics	3	1	0	3
6	BS	Computational Mathematics	2	0	0	2
7	ES	Basic Electrical and Electronics Engineering Lab	0	0	3	2
8	HS	Applied Physics Lab	0	0	3	2
9	BS	Computational Mathematics Lab	0	0	3	2
		NSS/NCC/NSO				
		Total Credits	**18**	**4**	**9**	**24**

II YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics - III	4	0	0	4
2	PC	Signals and Systems	4	1	0	4
3	PC	Electrical Technology	4	0	0	4
4	PC	Analog Electronics	4	0	0	4
5	ES	Network Analysis	4	1	0	4
6	HS	Gender Sensitization Lab	-	-	-	-
7	PC	Analog Electronics Lab-I	0	0	3	1
8	PC	Electrical Technology Lab	0	0	3	2
9	ES	Basic Simulation Lab	0	0	3	1
		Total Credits	**20**	**2**	**9**	**24**

II YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Switching Theory and Logic Design	3	1	0	3
2	PC	Pulse and Digital Circuits	3	1	0	3
3	PC	Electromagnetic Theory and Transmission Lines	4	0	0	4
4	PC	Analog Communications	3	1	0	3
5	PC	Control Systems	3	1	0	3
6	PC	Analog Communications Lab	0	0	3	2
7	PC	Pulse and Digital Circuits Lab	0	0	3	2
8	PC	Analog Electronics Lab-II	0	0	3	2
9	HS	Human Values and Professional Ethics	2	0	0	2
		Total Credits	**18**	**4**	**9**	**24**

III YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Linear and Digital IC Applications	4	0	0	4
2	PC	Antennas and Wave Propagation	4	0	0	4
3	PC	Digital Communications	3	1	0	3
4	OE - I	Open Elective –I	3	0	0	3
5	HS	Managerial Economics and Financial Analysis	4	0	0	4
6	PC	Linear IC Applications Lab	0	0	3	2
7	PC	Digital Communications Lab	0	0	3	2
8	PC	Design Lab	0	0	3	2
		Total Credits	**18**	**1**	**9**	**24**

III YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	OE-II	Open Elective-II	3	0	0	3
2	PE-I	Professional Elective-I	4	0	0	4
3	PE-II	Professional Elective-II	4	0	0	4
4	PC	Microprocessors and Microcontrollers	4	0	0	4
5	PC	Digital Signal Processing	4	0	0	4
6	HS	Advanced English Language and Communication Skills Lab	0	0	3	1
7	PC	Digital Signal Processing Lab	0	0	3	2
8	PC	Microprocessors and Microcontrollers Lab	0	0	3	2
		Total Credits	**19**	**0**	**9**	**24**

During Summer Vacation between III and IV Years: Industry Oriented Mini Project

IV YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Microwave Engineering	4	0	0	4
2	PE-III (UG)	Professional Elective - III	4	0	0	4
3	PGC -I	Advanced Digital Signal Processing	4	0	0	4
4	PGE - I	PG Elective - I	4	0	0	4
5	PGE - II	PG Elective - II	4	0	0	4
6	PGE - III	PG Elective - III	4	0	0	4
7	PC (UG) Lab	Microwave Engineering Lab	0	0	3	2
8	PGC Lab	Advanced Digital Signal Processing Lab	0	0	4	2
9	CoC(UG)	Industrial Training / Mini Project Evaluation				2
		Total Credits	**24**	**0**	**7**	**30**

IV YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	HS (UG)	Management Science	4	0	0	4
2	PGC - II	Advanced Computer Networks	4	0	0	4
3	PGE – IV	PG Elective - IV	4	0	0	4
4	PGC Lab	Advanced Computer Networks Lab	0	0	4	2
5	DC(UG)	Major Project				14
		Total Credits	**12**	**0**	**4**	**28**

V YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PGC - III	Wireless Communications and Networks	4	0	0	4
2	PGE - V	PG Elective - V	4	0	0	4
3	PGE - VI	PG Elective - VI	4	0	0	4
4	PGE - VII	PG Elective - VII	4	0	0	4
5	PG	PG Project Stage - I	4	0	0	12
6	PG	Seminar	0	0	3	2
		Total Credits	**20**	**0**	**3**	**30**

V YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PG	PG Project Stage - II	-	-	-	18
2	PG	Comprehensive Viva	-	-	-	4
		Total Credits				**22**

OPEN ELECTIVE- I		
S.No.	**Subject**	**Offering Department**
1	Disaster Management	Civil Engineering
2	Non – Conventional Power Generation	Electrical and Electronics Engineering
3	Electrical Engineering Materials	
4	Nano-Technology	
5	Operations Research	Mechanical Engineering
6	Basics of Thermodynamics	
7	Fabrication Processes	
8	Electronic Measuring Instruments	Electronics and Communication Engineering
9	OOPS through JAVA	Computer Science and Engineering
10	Computer Graphics	
11	Engineering Materials	Metallurgical Engineering
12	Metallurgy for Non Metallurgists	
13	Industrial Pollution Control Engineering	Chemical Engineering

OPEN ELECTIVE- II		
S.No.	**Subject**	**Offering Department**
1	Estimation, Quantity Survey and Valuation	Civil Engineering
2	Design Estimation and Costing of Electrical Systems	Electrical and Electronics Engineering
3	Energy Storage Systems	
4	Mechatronics	
5	Jet propulsion and Rocket Engineering	Mechanical Engineering
6	Ergonomics	
7	Mechatronics	
8	Principles of Electronic Communications	Electronics and Communication Engineering
9	Cyber Security	Computer Science and Engineering
10	Database Management Systems	
11	Corrosion Engineering	Metallurgical Engineering
12	Testing of Materials	
13	Solid Waste Management	Chemical Engineering

Professional Elective (PE) Subjects Lists

PE-I
1. Cellular and Mobile Communications
2. Computer Organization and Operating Systems
3. Digital Image Processing
4. Television Engineering

PE-II
1. Computer Networks
2. Digital System Design
3. Electronic Measurements and Instrumentation
4. Scripting Languages

PE-III
1. Radar Systems
2. Optical Communications
3. Satellite Communications
4. Artificial Neural Networks

PG Elective (PG E) Subjects List

PG E – I
1. Transform Techniques
2. Bio-Medical Signal Processing.
3. RF Circuit Design

PG E – II
1. VLSI Technology and Design
2. Advanced Data Communications
3. Detection and Estimation Theory

PG E – III
1. Adhoc Wireless and Sensor Networks
2. Random Processes and Queuing Theory
3. TCP / IP and ATM Networks

PG E – IV
1. Adaptive Signal Processing
2. Embedded System Design
3. Network Security and Cryptography

PG E – V
1. Image and Video Processing
2. 4G Technologies
3. Multimedia and Signal Coding

PG E – VI
1. Coding Theory and Techniques
2. Software Defined Radio
3. Spread Spectrum Communications

PG E –VII
1. Digital Signal Processors and Architectures
2. Speech and Audio Signal Processing
3. Radar Signal Processing

JNTUH COLLEGE OF ENGINEERING HYDERABAD
(AUTONOMOUS)
5 Year Integrated Dual Degree Program (IDP)
(B.Tech. + M.Tech. / MBA)

ELECTRONICS & COMMUNICATION ENGINEERING

COURSE STRUCTURE FOR MBA

(Applicable from the batch admitted from the Academic Year 2015-16 and onwards)

IV YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Microwave Engineering	4	0	0	4
2	PE-III (UG)	Professional Elective - III	4	0	0	4
3	HS (UG)	Management Science	4	0	0	4
4	PGC-I	Marketing Management	4	0	0	4
5	PGC-II	Human Resource Management	4	0	0	4
6	PGE-I	PG Elective-I	4	0	0	4
7	PC (UG) Lab	Microwave Engineering Lab	0	0	3	2
8	PGC Lab	Soft Skills Lab	0	0	4	2
9	EAC (UG)	Industrial Training / Mini Project Evaluation (Summer Program)				2
		Total Credits				**30**

IV YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PGC-III	Research Methodology and Statistical Analysis	4	0	0	4
2	PGC-IV	Business Law and Regulation	4	0	0	4
3	PGE-II	PG Elective-II	4	0	0	4
4	PGC Lab	Statistical Analysis Lab using SPSS / Excel	0	0	4	2
5	PC (UG)	Major Project				14
		Total Credits				**28**

V YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PGC-V	Strategic Management	4	0	0	4
2	PGE-III	PG Elective-III	4	0	0	4
3	PGE-IV	PG Elective-IV	4	0	0	4
4	PGE-V	PG Elective-V	4	0	0	4
5	PG	PG Project Stage – I				12
6	PG	Seminar	0	0	3	2
		Total Credits				**30**

V YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PG	PG Project Stage-II				18
2	PG	Comprehensive Viva				4
		Total Credits				**22**

Core & Electives:

Group	Marketing/HR/Finance/Systems
PGC-I	Marketing Management
PGC-II	Human Resource Management
PGE-I	Sales and Distribution / Training and Development / Financial Management / Management Information System
PGC Lab	Soft Skills Lab
PGC-III core	Research Methodology & Statistical Analysis
PGC-IV core	Business Law & Regulation
PGE-II	Integrated Marketing Communications / Management of Industrial Relations / Security Analysis and Portfolio Management / Enterprise Resource Planning
PGC Lab	Statistical Analysis Lab using SPSS / Excel
PGC –V Core	Strategic Management
PGE-III	Retailing Management / Compensation & Reward Management / Strategic Investment and Financing Decisions/E-Business
PGE-IV	Services Marketing / Management of Change / International Financial Management/Cyber Security
PGE-V	International Marketing / Performance Management / Derivatives / Information System Control and Audit

- ***Students are advised to take prior approval from the Mentor of the Department of H&SS before selecting and finalizing the Electives.***

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. ECE & M.Tech. /MBA) I Year I-Sem

L	T	P	C
4	1	0	4

MATHEMATICS – I
(Common to all Branches)

Pre Requisites: NIL

Course Objectives:
- To train the students thoroughly in mathematical concepts of ordinary differential equations and their applications.
- To prepare students for lifelong learning and successful careers using mathematical Concepts of differential and integral calculus, ordinary differential equations and vector calculus.
- To develop the skill pertinent to the practice of the mathematical concepts including the students abilities to formulate and modeling the problems, to think creatively and to synthesize information.

Course Outcomes:
At the end of the course, the student will be able to:
- Become familiar with the application of differential and integral calculus, ordinary differential equations and vector calculus to engineering problems.
- Attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

UNIT–I: Differential calculus (12 lectures)
Rolle's Mean value Theorem – Lagrange's Mean Value Theorem – Cauchy's mean value Theorem – (all theorems without proof but with geometrical interpretations), verification of the Theorems and testing the applicability of these theorem to the given function.
Curve tracing – Equations given in Cartesian, polar and parametric forms.
Functions of several variables – Functional dependence- Jacobian- Maxima and Minima of functions of two variables with constraints and without constraints-Method of Lagrange multipliers.

UNIT–II: Improper Integrals, Multiple Integration (12 lectures)
Gamma and Beta Functions –Relation between them, their properties – evaluation of improper integrals using Gamma / Beta functions.
Multiple integrals – double and triple integrals – change of order of integration- change of variables (polar, cylindrical and spherical) . Finding the area of a region using Double integration and volume of a region in space using triple integration.

UNIT–III: Vector Calculus (12 lectures)
Vector Calculus: Scalar point function and vector point function, Gradient- Divergence- Curl and their related properties, - Laplacian operator, Line integral – Work done – Surface integrals –Volume integral. Green's Theorem, Stoke's theorem and Gauss's Divergence Theorems (Statement & their Verification). Solenoidal and irrotational vectors, Finding potential function.

UNIT–IV: First Order Ordinary Differential Equations (10 lectures)
Linear and exact differential equations
Applications of first order differential equations – Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories and electrical circuits

UNIT-V: Higher Order Ordinary Differential Equations (10 lectures)
Linear, homogeneous and non- homogeneous differential equations of second and higher order with constant coefficients. Non-homogeneous term of the type e^{ax}, Sin ax, Cos ax, and x^n, $e^{ax}V(x)$, $x^n V(x)$. Method of variation of parameters. Applications: Bending of beams, Electrical circuits and simple harmonic motion.

Text books:

1) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL, KHANNA PUBLICATIONS.
2) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, WIELY PUBLICATIONS.
3) VECTER ANALYSIS BY GHOSG & MAITY, NEW CENTRAL BOOK AGENCY.

References:

1) Engineering Mathematics By Srimantapal & Subodh C. Bhunia, Oxford University Press.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING.

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. ECE & M.Tech. /MBA) I Year I-Sem

L	T	P	C
3	0	0	3

ENGLISH

1. INTRODUCTION:

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire communicative competence, the syllabus has been designed to develop linguistic and communicative competencies of Engineering students. The prescribed books and the exercises are meant to serve broadly as students' handbooks.

In the English classes, the focus should be on the skills of reading, writing, listening and speaking and for this the teachers should use the text prescribed for detailed study. For example, the students should be encouraged to read the texts/selected paragraphs silently. The teachers can ask comprehension questions to stimulate discussion and based on the discussions students can be made to write short paragraphs/essays etc.

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

2. OBJECTIVES:

- To improve the language proficiency of the students in English with emphasis on LSRW skills.
- To equip the students to study academic subjects more effectively using the theoretical and practical components of the English syllabus.
- To develop the study skills and communication skills in formal and informal situations.
- To enable students to develop their listening skill so that they may appreciate its role in the LSWR skills approach to language and improve their pronunciation
- To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions.
- To make students aware of the role of speaking in English and its contribution to their success.
- To enable students to express themselves fluently and appropriately in social and professional contexts.
- To develop an awareness in the students about the significance of silent reading and comprehension.
- To develop the ability of studnts to guess the meanings of words from context and grasp the overall messages of the text, draw inferences etc.
- To develop an awareness in the students about writing a an exact and formal skill.
- To equip them with the components of different forms of writing, beginning with the lower order ones.

LEARNING OUTCOMES:

1. Use of English Language - written and spoken.
2. Enrichment of comprehension and fluency
3. Gaining confidence in using language in verbal situations.

SYLLABUS:

Listening Skills:

Objectives

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

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

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

Speaking Skills:

Objectives

1. To make students aware of the role of speaking in English and its contribution to their success.
2. To enable students express themselves fluently and appropriately in social and professional contexts.
   - Oral practice
   - Describing objects/situations/people
   - Role play – Individual/Group activities (Using exercises from the five units of the prescribed text: ***Skills Annexe–Functional English for Success)***
   - Just A Minute (JAM) Sessions.

Reading Skills:

Objectives

1. To develop an awareness in the students about the significance of silent reading and comprehension.
2. To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences, etc.
   - Skimming the text
   - Understanding the gist of an argument
   - Identifying the topic sentence
   - Scanning
   - Inferring lexical and contextual meaning
   - Understanding discourse features
   - Recognizing coherence/sequencing of sentences

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

Writing Skills:

Objectives

1. To develop an awareness in the students about writing as an exact and formal skill
2. To equip them with the components of different forms of writing, beginning with the lower order ones.
   - Writing sentences
   - Use of appropriate vocabulary
   - Paragraph writing
   - Coherence and cohesiveness

- Narration / description
- Note Making
- Formal and informal letter writing
- Describing graphs using expressions of comparison

TEXTBOOKS PRESCRIBED:

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

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

For Non-detailed study

Second Textbook ***"Epitome of Wisdom",*** Published by Maruthi Publications, Hyderabad.

- The course content and study material is divided into **Five Units.**

Unit –I

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

L - Listening for Sounds, Stress and Intonation
S - Greeting and Taking Leave, Introducing Oneself and Others (Formal and Informal Situations)
R - Reading for Subject/ Theme- ***The Palm Islands*** from Epitome of Wisdom is for **Reading Comprehension**
W - Writing Paragraphs
G - Types of Nouns and Pronouns
V - Homonyms, Homophones & Homographs

Unit –II

1. Chapter entitled "***Cyber Age"*** from "***Skills Annexe -Functional English for Success***" Published by Orient Black Swan, Hyderabad.
2. **Report Writing (First & Second Textbooks)**

L - Listening for themes and facts
S - Apologizing, interrupting, requesting and making polite conversation
R- Reading for theme and gist- The 1 Thing Every Business Executive Must Understand about Social Media by Dave Kerpen from Skills Annexe is for **Reading Comprehension**
W - Describing people, places, objects, events
G - Verb forms
V - Noun, Verb, Adjective and Adverb

Unit –III

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

L - Listening for main points and sub-points for note taking
S - Giving instructions and directions; Speaking of hypothetical situations
R - Reading for details- *Sivakasi: Who to Blame for the Frequent Fire Accidents in India's Largest Fireworks Industry Hub?* by Amrutha Gayathri from Skills Annexe & *Forensic Science* from Epitome of Wisdom are for **Reading Comprehension**
W - Note-making, Information transfer, Punctuation
G - Present tense
V - Synonyms and Antonyms

Unit –IV

1. **Letter Writing – Writing formal letters, letter of application along with curriculum vitae (First & Second Textbooks)**
2. Chapter entitled ***'The Last Leaf'*** from ***"Epitome of Wisdom"***, Published by Maruthi Publications, Hyderabad

L - Listening for specific details and information
S - Narrating, expressing opinions and telephone interactions
L - Reading for specific details and information- *What I Cherish Most* by V. S. Srinivasa Sastri from Skills Annexe & *Choose How to Start Your Day* from Epitome of Wisdom are for **Reading Comprehension**
W - Writing e-mails
G - Past and Future tenses
V - Vocabulary - Idioms and Phrasal verbs

Unit –V

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

L - Critical Listening and Listening for speaker's tone/ attitude
S - Group discussion and Making presentations
R - Critical reading, reading for reference - *Benefits of Physical Activity* from Skills Annexe & *What is meant by Entrepreneurship?* from Epitome of Wisdom are for **Reading Comprehension**
W - Project proposals; Project Reports and Research Papers
G - Adjectives, Prepositions and Concord
V - Collocations and Technical vocabulary, Using words appropriately

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

REFERENCES:

1. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw –Hill.
2. Murphy's English Grammar with CD, Murphy, Cambridge University Press.
3. Contemporary English Grammar Structures and Composition by David Green, MacMillan Publishers, New Delhi. 2010.
4. Technical Communication, Meenakshi Raman, Oxford University Press
5. Practical English Usage, Michael Swan, Oxford University Press
6. Innovate with English: A Course in English for Engineering Students, edited by T Samson, Foundation Books.
7. English Grammar Practice, Raj N Bakshi, Orient Longman.
8. Technical Communication by Daniel Riordan. 2011. Cengage Publications. New Delhi.
9. Handbook of English Grammar& Usage, Mark Lester and Larry Beason, Tata Mc Graw –Hill.
10. Spoken English, R.K. Bansal & JB Harrison, Orient Longman.
11. Grammar Games, Renuvolcuri Mario, Cambridge University Press.
12. Everyday Dialogues in English, Robert J. Dixson, Prentice Hall India Pvt Ltd.,
13. ABC of Common Errors Nigel D Turton, Mac Millan Publishers.
14. Basic Vocabulary Edgar Thorpe & Showick Thorpe, Pearson Education
15. An Interactive Grammar of Modern English, Shivendra K. Verma and Hemlatha Nagarajan , Frank Bros & CO

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. ECE & M.Tech. /MBA) I Year I-Sem

L	T	P	C
4	1	0	4

COMPUTER PROGRAMMING AND DATA STRUCTURES

Prerequisites:
There are no prerequisites for this course, except that anyone who wants to learn C should have analytical skills and logical reasoning.

Course Objectives:
- This course starts from the basics of computers and program development.
- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:
At the end of the course, the student will be able to:
- Develop C programs for computing and real life applications using basic elements like control statements, arrays, functions, pointers and strings; and data structures like stacks, queues and linked lists.
- Implement searching and sorting algorithms

UNIT - I
Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.
Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associatively, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

UNIT – II
Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.
Designing Structured Programs- Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

UNIT – III
Arrays and Strings – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

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

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

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

UNIT – V

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

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

TEXT BOOKS:

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

REFERENCES:

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

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. ECE & M.Tech. /MBA) I Year I-Sem

L	T	P	C
3	0	3	4

ENGINEERING GRAPHICS

Pre-requisites: Nil

Course objectives:

- To provide basic concepts in engineering drawing.
- To impart knowledge about standard principles of orthographic projection of objects.
- To draw sectional views and pictorial views of solids.

Course Outcomes:

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

- Preparing working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

UNIT – I

INTRODUCTION TO ENGINEERING DRAWING :

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid,
Involute. Scales – Plain, Diagonal and Vernier Scales.

UNIT- II

ORTHOGRAPHIC PROJECTIONS:

Principles of Orthographic Projections – Conventions – Projections of Points and Lines
Projections of Plane regular geometric figures.—Auxiliary Planes.

UNIT – III

Projections of Regular Solids – Auxiliary Views.

UNIT – IV

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere.
Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT – V

ISOMETRIC PROJECTIONS :

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts.
Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions
Auto CAD: Basic principles only

TEXT BOOKS:

1. Engineering Drawing N.D. Bhatt / Charotar
2. Engineering Drawing and Graphics Rane and Shah/ Pearson Edu.

REFERENCE BOOKS:

1. A Text Book of Engineering Drawing / Dhawan R K / S. Chand
2. Engineering Graphics With Auto CAD / James D Bethune / Pearson Edu.
3. Engineering Graphics / K R Mohan / Dhanpat Rai.
4. Text book on Engineering Drawing / KL Narayana/ P Kannaih/ Scitech

JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. ECE & M.Tech. /MBA) I Year I-Sem

L	T	P	C
3	0	0	3

ENVIRONMENTAL SCIENCE

Prerequisites : NIL

Objectives:
- Creating the awareness about environmental problems among students.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating students to participate in environment protection and environment improvement.

Outcomes:
At the end of the course, it is expected that students will be able to:
- Identify and analyze environmental problems as well as the risks associated with these problems
- Understand what it is to be a steward in the environment
- Studying how to live their lives in a more sustainable manner

UNIT- I
MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES:
Definition, Scope and Importance – Need for Public Awareness.

NATURAL RESOURCES : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people – Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems - Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. - Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. - Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT - II
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. - Introduction, types, characteristic features, structure and function of the following ecosystem:
a. Forest ecosystem
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

UNIT - III
BIODIVERSITY AND ITS CONSERVATION : Introduction - Definition: genetic, species andecosystem diversity. - Bio-geographical classification of India - Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values - . Biodiversity at global, National and local levels. - . India as a mega-diversity nation - Hot-sports of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT - IV
ENVIRONMENTAL POLLUTION: Definition, Cause, effects and control measures of:
a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution

e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

SOLID WASTE MANAGEMENT: Causes, effects and control measures of urban and industrial wastes. - Role of an individual in prevention of pollution. - Pollution case studies. - Disaster management: floods, earthquake, cyclone and landslides.

UNIT - V

SOCIAL ISSUES AND THE ENVIRONMENT : From Unsustainable to Sustainable development -Urban problems related to energy -Water conservation, rain water harvesting, watershed management -Resettlement and rehabilitation of people; its problems and concerns. Case Studies -Environmental ethics: Issues and possible solutions. -Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. -Wasteland reclamation. –Consumerism and waste products. -Environment Protection Act. -Air (Prevention and Control of Pollution) Act. -Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act -Issues involved in enforcement of environmental legislation. -Public awareness.

HUMAN POPULATION AND THE ENVIRONMENT: Population growth, variation among nations. Population explosion - Family Welfare Programme. -Environment and human health. -Human Rights. -Value Education. -HIV/AIDS. -Women and Child Welfare. -Role of information Technology in Environment and human health. –Case Studies.

FIELD WORK : Visit to a local area to document environmental assets River /forest grassland/hill/mountain -Visit to a local polluted site-Urban/Rural/industrial/ Agricultural Study of common plants, insects, birds. -Study of simple cosystemspond, river, hill slopes, etc.

TEXT BOOK:

1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.,UniversitiesPress
2 Environmental Studies by R. Rajagopalan, Oxford University Press.

REFERENCE:

1. Textbook of Environmental Sciences and Technology by M. Anji Reddy, BS Publication.

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COMPUTER PROGRAMMING AND DATA STRUCTURES LAB

Week 1:

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

Week 2:

5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)

Week 3:

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

Week 4:

11. Write a C program that uses functions to perform the following operations:
    i) To insert a sub-string in to a given main string from a given position.
    ii) To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T begins, or –1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.

Week 5:

15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:

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

For example: if n is 3 and x is 5, then the program computes 1+5+25+125.
Print x, n, the sum
Perform error checking. For example, the formula does not make sense for negative exponents – if n is less than 0. Have your program print an error message if n<0, then go back and read in the next pair of numbers of without computing the sum. Are any values of x also illegal ? If so, test for them too.

Week 6:

18. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
19. Write a C program to convert a Roman numeral to its decimal equivalent.

Week 7:

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

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

(Note: represent complex number using a structure.)

Week 8:

21. i) Write a C program which copies one file to another.
ii) Write a C program to reverse the first n characters in a file.
(Note: The file name and n are specified on the command line.)
22. i) Write a C program to display the contents of a file.
ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

Week 9:

23. Write a C program that uses functions to perform the following operations on singly linked list.:
i) Creation ii) Insertion iii) Deletion iv) Traversal

Week 10:

24. Write C programs that implement stack (its operations) using
i) Arrays ii) Pointers
25. Write C programs that implement Queue (its operations) using
i) Arrays ii) Pointers

Week 11:

26. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
i) Bubble sort ii) Selection sort

Week 12:

27. Write C programs that use both recursive and non recursive functions to perform the following searching operations for a Key value in a given list of integers:
i) Linear search ii) Binary search

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ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

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

Objectives

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

Learning Outcomes

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

SYLLABUS

English Language Communication Skills Lab shall have two parts:

a. **Computer Assisted Language Learning (CALL) Lab**
b. **Interactive Communication Skills (ICS) Lab**

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

Exercise – I
CALL Lab: Introduction to Phonetics – Speech Sounds – Vowels and Consonants
ICS Lab: Ice-Breaking activity and JAM session
Articles, Prepositions, Word formation- Prefixes & Suffixes, Synonyms & Antonyms

Exercise – II
CALL Lab: Structure of Syllables - Past Tense Marker and Plural Marker – Weak Forms and Strong Forms - Consonant Clusters.
ICS Lab: Situational Dialogues – Role-Play- Expressions in Various Situations – Self-introduction and Introducing Others – Greetings – Apologies – Requests – Social and Professional Etiquette - Telephone Etiquette.
Concord (Subject in agreement with verb) and Words often misspelt- confused/misused

Exercise - III
CALL Lab: Minimal Pairs- Word accent and Stress Shifts- Listening Comprehension.
ICS Lab: Descriptions- Narrations- Giving Directions and guidelines.
Sequence of Tenses, Question Tags and One word substitutes.

Exercise – IV
CALL Lab: Intonation and Common errors in Pronunciation.
ICS Lab: Extempore- Public Speaking
Active and Passive Voice, –Common Errors in English, Idioms and Phrases

Exercise – V
CALL Lab: Neutralization of Mother Tongue Influence and Conversation Practice
ICS Lab: Information Transfer- Oral Presentation Skills
Reading Comprehension and Job Application with Resume preparation.

Minimum Requirement of infrastructural facilities for ELCS Lab:

1. Computer Assisted Language Learning (CALL) Lab:
The Computer aided Language Lab for 40 students with 40 systems, one master console, LAN facility and English language software for self- study by learners.

System Requirement (Hardware component):
Computer network with Lan with minimum 60 multimedia systems with the following specifications:

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

2. Interactive Communication Skills (ICS) Lab :
The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V., a digital stereo –audio & video system and camcorder etc.

Suggested Software:

- **Cambridge Advanced Learners' English Dictionary with CD.**
- **Grammar Made Easy by Darling Kindersley**
- **Punctuation Made Easy by Darling Kindersley**
- Clarity Pronunciation Power – Part I
- Clarity Pronunciation Power – part II
- **Oxford Advanced Learner's Compass, 8th Edition**
- ***DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.***
- Lingua TOEFL CBT Insider, by Dreamtech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge**
- **English Pronunciation in Use** (Elementary, Intermediate, Advanced) Cambridge University Press
- Raman, M & Sharma, S. 2011. Technical Communication, OUP
- Sanjay Kumar & Pushp Lata. 2011. Communication Skills, OUP

SUGGESTED READING:

1. Rama Krishna Rao, A. *et al. English Language Communication Skills – A Reader cum Lab Manual Course Content and Practice.* Chennai: Anuradha Publishers
2. Suresh Kumar, E. & Sreehari, P. 2009. *A Handbook for English Language Laboratories.* New Delhi: Foundation
3. *Speaking English Effectively* 2nd Edition by Krishna Mohan and N. P. Singh, 2011. Macmillan Publishers India Ltd. Delhi.
4. Sasi Kumar, V & Dhamija, P.V. *How to Prepare for Group Discussion and Interviews.* Tata McGraw Hill
5. Spoken English: A Manual of Speech and Phonetics by R. K. Bansal & J. B. Harrison. 2013. Orient Blackswan. Hyderabad.
6. *English Pronunciation in Use. (Elementary, Intermediate & Advance).* Cambridge: CUP
7. Chris Redston, Gillie Cunningham, Jan Bell. *Face to Face* (2nd Edition). Cambridge University Press
8. Nambiar, K.C. 2011. *Speaking Accurately. A Course in International Communication.* New Delhi : Foundation

9. Soundararaj, Francis. 2012. *Basics of Communication in English. New Delhi: Macmillan*
10. A textbook of English Phonetics for Indian Students by T. Balasubramanian (Macmillan)

DISTRIBUTION AND WEIGHTAGE OF MARKS

English Language Laboratory Practical Examination:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for 30 sessional marks and 70 semester-end Examination marks. Of the 30 marks, 20 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

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ENGINEERING WORKSHOP

Pre-requisites: **Practical skill**

Objectives:

- To Study of different hand operated power tools, uses and their demonstration.
- To gain a good basic working knowledge required for the production of various engineering products.
- To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.
- To develop a right attitude, team working, precision and safety at work place.
- It explains the construction, function, use and application of different working tools, equipment and machines.
- To study commonly used carpentry joints.
- To have practical exposure to various welding and joining processes.
- Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.
- To understanding the computer hardware and practice the Assembly of computer parts.
- To practice the process of Installation of operating system windows.

Outcomes:

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

- Better understanding the process of assembly of computer parts and installation of different software's.
- Study and practice on machine tools and their operations
- Practice on manufacturing of components using workshop trades including pluming, fitting, carpentry, foundry, house wiring and welding.
- Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
- Apply basic electrical engineering knowledge for house wiring practice.

I. TRADES FOR EXERCISES :

(Any **six** trades from the following with minimum of **two** exercises in each trade)

1. Carpentry
2. Fitting
3. Tin-Smithy
4. Black Smithy
5. House-wiring
6. Foundry
7. Plumbing

II. Trades for Demonstration & Exposure

1. Demonstration of power tools & wiring
2. Welding
3. Machine Shop

III. **IT Workshop I:** Computer hardware, identification of parts, Disassembly, Assembly of computer to working condition, simple diagnostic exercises.

IT Workshop II: Installation of operating system windows and linux simple diagnostic exercises.

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MATHEMATICS – II
(Common to all Branches)

Pre Requisites: NIL

Course Objectives:

- Our emphasis will be more on conceptual understanding and application of Fourier series, Fourier, Z and Laplace transforms and solution of partial differential equations.

Course Outcomes:

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

- gains the knowledge to tackle the engineering problems using the concepts of Fourier series, various transforms and partial differential equations.

UNIT–I: Linear ODE with variable coefficients and series solutions (8 lectures)

Equations reducible to constant coefficients-Cauchy's and Legendre's differential equations. Motivation for series solutions, Ordinary point and Regular singular point of a differential equation, Transformation of non-zero singular point to zero singular point. Series solutions to differential equations around zero, Frobenius Method about zero.

Unit-II: Special Functions (8 lectures)

Bessel's Differential equation, Bessel functions properties: – Recurrence relations, Orthogonality, Generating function, Trigonometric expansions involving Bessel functions.

UNIT–III: Laplace Transform (8 lectures)

Definition of Integral transform. Domain of the function and Kernel for the Laplace transforms, Laplace transform of standard functions, first shifting Theorem, Laplace transform of functions when they are multiplied or divided by "t". Laplace transforms of derivatives and integrals of functions. – Unit step function – second shifting theorem – Dirac's delta function, Periodic function – Inverse Laplace transform by Partial fractions(Heaviside method) Inverse Laplace transforms of functions when they are multiplied or divided by "s", Inverse Laplace Transforms of derivatives and integrals of functions, Convolution theorem-solving differential equations by Laplace transforms

UNIT – IV: Fourier series and Fourier Transforms (8 lectures)

Definition of periodic function. Fourier expansion of periodic functions in a given interval of length, 2π,
Determination of Fourier coefficients – Fourier series of even and odd functions – Fourier series in an arbitrary interval – even and odd periodic continuation – Half-range Fourier sine and cosine expansions.

Fourier integral theorem – Fourier sine and cosine integrals. Fourier transforms – Fourier sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT-V: Partial Differential Equations (10 lectures)

Introduction and Formation of partial differential equation by elimination of arbitrary constants and arbitrary functions, solutions of first order linear (Lagrange) equation and non-linear equations (Charpit's method).

Method of separation of variables for second order equations. Applications of Partial differential equations- one dimensional wave equation., Heat equation.

Text books:

1) HIGHER ENGINEERING MATHEMATICS BY B S GREWAL, KHANNA PUBLICATIONS.
2) ENGINEERING MATHEMATICS BY ERWIN KREYSZIG, WIELY PUBLICATIONS

References:

1) ENGINEERING MATHEMATICS BY SRIMANTAPAL & SUBODH C. BHUNIA, OXFORD UNIVERSITY PRESS.
2) ADVANCED ENGINEERING MATHEMATICS BY PETER V O'NEIL, CENGAGE LEARNING

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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Pre-requisite: Nil

Course Objectives:
- To introduce the concept of electrical circuits and its components.
- To introduce the characteristics of various electronic devices.
- To impart the knowledge of various configurations, characteristics and applications of electrical & electronic components.

Course Outcomes:
At the end of the course, the student will be able to:
- To analyze and solve electrical circuits using network laws and theorems.
- To design & analyse various circuits using electronic components viz. diodes, transistors & other special purpose devices.

UNIT- I ELECTRICAL and SINGLE PHASE AC CIRCUITS
Electrical Circuits: R-L-C Parameters, Voltage and Current, Independent and Dependent Sources, Source Transformation – V-I relationship for passive elements, Kirchoff's Laws, Network reduction techniques – series, parallel, series-parallel, star-to-delta, delta-to-star transformation, Nodal Analysis,
Single Phase AC Circuits: R.M.S. and Average values, Form Factor, steady state analysis of series, parallel and series-parallel combinations of R, L and C with sinusoidal excitation, concept of reactance, impedance, susceptance and admittance – phase and phase difference, Concept of power factor, j-notation, complex and polar forms of representation.

UNIT- II RESONANCE and NETWORK THEOREMS
Resonance: Series resonance and Parallel resonance circuits, concept of bandwidth and Q factor, Locus Diagrams for RL, RC and RLC Combinations for Various Parameters.
Network Theorems: Thevenin's, Norton's, Maximum Power Transfer, Superposition, Reciprocity, Tellegen's, Millman's and Compensation theorems for DC and AC excitations.

UNIT- III P-N JUNCTION DIODE & DIODE CIRCUITS
P-N Junction Diode: Diode equation, Energy Band diagram, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances.
Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT- IV BIPOLAR JUNCTION TRANSISTOR
Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Symbol, Amplifying Action, Common Emitter, Common Base and Common Collector configurations.
Transistor Biasing And Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Emitter Feedback Bias, Collector to Emitter feedback bias, Voltage divider bias, Bias stability, Stabilization against variations in V_{BE} and β, Bias Compensation using Diodes and Transistors.
Transistor Configurations: BJT modeling, Hybrid model, Determination of h-parameters from transistor characteristics, Analysis of CE, CB and CC configurations using h-parameters, Comparison of CE, CB and CC configurations.

UNIT- V JUNCTION FIELD EFFECT TRANSISTOR & SPECIAL PURPOSE DEVICES
Junction Field Effect Transistor: Construction, Principle of Operation, Symbol, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Small Signal Model, Biasing FET.

Special Purpose Devices: Breakdown Mechanisms in Semi-Conductor Diodes, Zener diode characteristics, Use of Zener diode as simple regulator, Principle of operation and Characteristics of Tunnel Diode (With help of Energy band diagram) and Varactor Diode, Principle of Operation of SCR.

TEXT BOOKS:

1. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J.Millman and C.C.Halkias, Satyabratajit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.

REFERENCES:

1. Introduction to Electronic Devices and Circuits-Rober T. Paynter, Pearson Education.
2. Electronic Devices and Circuits - K. Lal Kishore, B.S. Publications, 2nd Edition, 2005.
3. Electronic Devices and Circuits – Anil K. Maini, Varsha Agarwal –
4. Wiley India Pvt. Ltd. 1/e 2009.
5. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
6. Network Theory by N.C.Jagan & C.Lakshminarayana, B.S. Publications.
7. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
8. Electronic Devices and Circuits – 2nd Edition by Muhammad H.Rashid, Cengage Learning.

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APPLIED PHYSICS

Prerequisites: Nil

Course Objectives:

The course primarily aims at understanding the behavior of matter in the condensed state and tries to explore the causes with reference to micro level mechanism of the solid matter. The objective of the first chapter is to study the micro level behavior of the quantum particles of the matter and their nature as wave and particle and hence to estimate the statistics of the phenomenon arising out of their nature of existence. The second chapter aims at to assess the draw backs of the free electron theory leading to the introduction of the Band Theory of Solids. In the third, fourth, fifth, sixth, seventh and tenth chapters the different natures of the solid matter are taken as the main task discuss. In the eighth chapter, it is expected to understand the basic principles behind the coherent artificial light source (LASER) with reference to their construction, mechanism, operation and classification etc. The nineth chapter is explicitly aimed at to study an advanced communication system presently ruling the world throughout i.e. Fiber Optic communication system.

Course Outcomes:

The understanding of properties of matter is an essential part to utilize them in various applications in different walks of life. In most of the cases, the behavior of matter as solid material body purely depends upon the internal micro level nature, structure and characters. By studying first few chapters the students as graduates can acquire the knowledge of the connection between the micro level behavior of the matter as fundamental particles and the macro level real time characters of the material bodies. The quantum mechanism in phenomena can best be understood and analyzed by estimating the statistics of the phenomena. The study of chapters on Laser and fiber optics forms basis for understanding an advanced communication system. Other chapters establish a strong foundation on the different kinds of characters of several materials and pave a way for them to use in at various technical and engineering applications.

UNIT-I

1.Principles of Quantum & Statistical Mechanics: Waves and Particles, De Broglie Hypothesis, Matter Waves, Davisson and Germer's Experiment, G.P. Thomson Experiment, Heisenberg's Uncertainty principle, Schrodinger's Time -Independent Wave Equation, Physical Significance of the Wave Function, Particle in One Dimensional Potential Box. Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics (Qualitative).

2. Electron theory of Metals: Introduction, Classical Free Electron Theory of metals, Root Mean Square (RMS)velocity, Mean Free Path, Mean collision Time, Drift Velocity, Relaxation Time, Electrical Resistivity, Draw backs of Classical Free Electron Theory, Density of States, Calculation of Fermi energy, Quantum Free Electron Theory, Electron in a periodic Potential, Kronig-Penny Model (Qualitative Treatment), Origin of Energy Band Formation in Solids, Classification of Materials into Conductors, Semiconductors and insulators, Concept of Effective Mass of an Electron.

UNIT-II

3. Semiconductor Physics: Position of Fermi Level, Estimation of Carrier concentration in Intrinsic and Extrinsic (p-type & n-type) Semiconductors, Equation of Continuity, Direct and Indirect Band gap Semiconductors, Hall Effect.

4. Physics of Semiconductor Devices: Formation of PN Junction, Energy band Diagram and I-V Characteristics of PN Junction Diode, Diode Equation, LED, LCD and Photo Diodes, Solar Cells.

UNIT-III

5. Dielectric Properties: Basic definitions, Electronic, Ionic (Quantitative) and Orientation Polarizations(Qualitative) and Calculation of Polarizabilities - Internal Fields in Solids, Clausius - Mossotti Equation, Piezo-electricity, Pyro- electricity and Ferro - electricity.

6. Magnetic Properties: Basic definitions , Origin of Magnetic Moment, Bohr Magneton, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Domain Theory of Ferro magnetism on the basis of Hysteresis Curve , Soft and Hard Magnetic Materials, Properties of Anti – Ferro and Ferri Magnetic Materials.
7. Superconductivity: Introduction to Superconductivity, Properties of Superconductors, Meissner Effect, BCS theory, Type-I and Type –II Superconductors, Magnetic Levitation and Applications of Superconductors.

UNIT-IV
8. Lasers: Characteristics of Lasers, Spontaneous and stimulated Emission of Radiation, Meta-Stable state, Population Inversion, Lasing Action, Einstein's Coefficients and Relation between them, Ruby Laser, Helium- Neon Laser, Semiconductor Diode Laser and Applications of Lasers.
9. Fiber Optics: Principle & construction (structure) of an Optical Fiber, Acceptance Angle, Numerical Aperture, Types of Optical Fibers, Losses in Optical Fibers and Applications of Optical Fibers in communication.

UNIT-V
10. Nanotechnology: Origin of Nanotechnology, Nano Scale, Surface to Volume Ratio, Quantum Confinement, Bottom-up Fabrication: Sol-Gel, Precipitation, Combustion Methods; Top-Down Fabrication: Chemical Vapor Deposition, Physical Vapor Deposition, Characterization Techniques(XRD, SEM &TEM) and Applications of Nanotechnology.

Text books:
1. Principles of Physics by Halliday, Resnick, Walker, Wiley India Pvt Ltd, 9th Edition.
2. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt Ltd, 7th Edition
3. Engineering Physics by R.K.GAUR & S.L.GUPTA, Dhanpat Rai Publications.
4. Solid State Physics by A J Dekker, MACMILLAN INDIA LTD.

References:
1. Modern Engineering Physics by Dr.K.Vijaya Kumar, Dr. S. Chandralingam, S.CHAND & COMPANY LTD
2. Applied Physics by P.K.Mittal, I K International Publishers
3. Applied Physics by P.K. Palanisamy :Scitech publishers
4. Introduction to Nanotechnology by Charles P.Poole, Jr.Frank J ownes, John Wiley & sons
5. Applied Physics for Engineers by P. Madusudana Rao, Academic Publishing Company
6. Engineering Physics by Sanjay D Jain, Girish G Sahasrbudha: University Press.

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ENGINEERING CHEMISTRY

Prerequisites: Nil

Course objectives:

- To inculcate the basic concepts of Chemistry required to make the student to develop the innovative materials for the development of technological arena.
- The latest techniques and skills for the treatment of raw water, facing the endanger of corrosion of structures and producing the polymers in varied applications.

Course Outcomes:

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

- Gain knowledge of various skills to control the corrosion of huge structures. The analysis of raw water and its treatment to provide soft water. The technologies to result polymers with multiple applications are understood. The principles of electrochemistry and batteries are clearly understood by the students.

Unit-I: Water and its treatment

Introduction – hardness of water – causes of hardness – types of hardness : temporary and permanent – expression and units of hardness – Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of potable water - Disinfection of potable water by chlorination and Ozonization. Boiler feed water and its treatment – Calgon conditioning – Phosphate conditioning - Colloidal conditioning – External treatment of water – ion-exchange processes. Desalination of water – Reverse osmosis. Numerical problems – Sewage water - COD, BOD definitions and their significance. Treatment of sewage- Steps involved (Primary, secondary & tertiary treatments).

Unit-II: Electrochemistry and corrosion

Electrochemistry: Conductance - Specific, equivalent and molar conductance and their interrelationship . Ionic mobilities – Relationship between ionic conductance and ionic mobilities. Electro Chemical cells - electrode potential, standard electrode potential, types of electrodes – Standard hydrogen electrode, calomel and glass electrode. Nernst equation - electrochemical series and its applications.– Concept of concentration cell –Numerical problems.

Corrosion- Causes and effects of corrosion – theories of chemical and electrochemical corrosion - mechanism of electrochemical corrosion. Types of corrosion : Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion. Corrosion control methods – Cathodic protection - sacrificial anode and impressed current cathodic methods. Surface coatings – metallic coatings – methods of application of metallic coatings – Hot dipping , cementation, electroplating of copper, electro less plating of Nickel - Organic coatings: Paints – their constituents and functions.

Unit-III: High Polymers

Definition – Classification of polymers with examples – Types of polymerisation – Chain growth (free radical addition mechanism), step growth polymerization, Plastics, fibres and elastomers - definition and characteristics. Plastics – thermoplastic and thermosetting plastics, compounding of plastics. Fibre reinforced plastics. Preparation, properties and Engineering applications of PVC, Teflon, Bakelite, Nylon 6:6 and terylene (Dacron); Rubber – Natural rubber , its processing and vulcanization. Elastomers: Preparation, properties and applications of Styrene butadiene, butyl and thiokol rubbers. Conducting polymers – Classification with examples; mechanism of conduction in trans-polyacetylene and applications of conducting polymers. Biodegradable polymers – concept and advantages - Polylactic acid and its applications.

Unit-IV: Chemistry of Energy sources

Fuels :Classification of fuels - characteristics of a good fuel . Solid fuels: Coal – Analysis of coal by proximate and ultimate methods. Liquid fuels- Petroleum and its refining. Characteristics and uses of

petrol, diesel and kerosene. Synthetic petrol- Fischer-Tropsch's process. Cracking – thermal cracking and catalytic cracking. Fluid bed catalytic cracking, Knocking - octane and cetane numbers. Gaseous fuels – Composition, properties and uses of Natural gas, LPG and CNG .

Combustion – Definition, calorific value, HCV and LCV. Calculation of air quantity required for combustion of a fuel - Numerical problems.

Alternate Energy sources :Biodiesel - trans-esterification - advantages of biodiesel, fuel cells (H_2-O_2 and Methanol –O_2 fuel cell).

Unit-V : Batteries and Materials

Batteries : Cell and battery - Primary battery (dry cell, alkaline cell and Lithium cell). Secondary battery (lead acid, Ni-Cd and lithium ion cell)

Liquid crystal polymers : classification, characteristics and applications.

Insulators- Characteristics and applications of thermal and electrical insulators.

Nanomaterials : Introduction. Preparation of nanomaterials by top down and bottom up approaches. Carbon nano fibres, and fullerenes - Applications of nanomaterials.

Text Books:

1. Engineering Chemistry by P.C.Jain & M.Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi, (15th Edition, 2005).
2. Engineering Chemistry by B.Rama Devi & Ch.Venkata Ramana Reddy ; Cengage Learning, 2012.

Reference Books:

1. A Text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co., New Delhi.(3rd Edition, 2003).
2. Engineering Chemistry by Y. Bharathi Kumari and C. Jyotsna, VGS Booklinks, 2012.
3. Text book of Engineering Chemistry by C P Murthy, C V Agarwal and A. Naidu; B.S.Publications, 2006.
4. Engineering Chemistry by M. Thirumala Chary and E. Lakshminarayana, Sci tech. Publications Pvt. Ltd., Chennai 2012.
5. Engineering Chemistry by B.Sivasankar, Tata McGraw-Hill Publishing Company Ltd., New Delhi 2008.
6. A Text Book of Engineering Chemistry by S.S. Dara, S.Chand Publications, (10th Edition ,2007).

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ENGINEEERING MECHANICS

Prerequisites: Nil

Course Objectives:

During this course, students should develop the ability to:

- Work comfortably with basic engineering mechanics concepts required for analyzing static structures
- Identify an appropriate structural system to studying a given problem and isolate it from its environment.
- Model the problem using good free-body diagrams and accurate equilibrium equations
- Identify and model various types of loading and support conditions that act on structural systems.
- Apply pertinate mathematical, physical and engineering mechanical principles to the system to solve and analyze the problem.
- Understand the meaning of centers of gravity (mass)/centroids and moments of Inertia using integration methods.
- Communicate the solution to all problems in an organized and coherent manner and elucidate the meaning of the solution in the context of the problem.

Course Outcomes:

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

- solve problems dealing with forces in a plane or in space and equivalent force Systems.
- solve beam and cable problems and understand distributed force systems.
- solve friction problems and determine moments of Inertia and centroid using intergration methods.
- understand and know how to solve three-dimension force and moment problems.
- understand and know how to use vector terminology.

UNIT – I

INTRODUCTION OF ENGINEERING. MECHANICS – Basic concepts System of Forces- Coplanar Forces – Components in Space – Resultant- Moment of Forces and its Application – Couples and Resultant of Force System - Equilibrium of System of Forces- Free body diagrams-Direction of Force Equations of Equilibrium of Coplanar Systems and Spatial Systems – Vector cross product- Support reactions different beams for different types of loading – concentrated, uniformly distributed and uniformly varying loading .

UNIT – II

FRICTION: Types of friction – Limiting friction – Laws of Friction – static and Dynamic Frictions – Angle of Friction –Cone of limiting friction– Friction of wedge, block and Ladder – Screw jack – Differential screw jack - Motion of Bodies**.**

UNIT – III

CENTROID AND CENTER OF GRAVITY: Centrods – Theorem of Pappus- Centroids of Composite figures – Centre of Gravity of Bodies - Area moment of Inertia: – polar Moment of Inertia – Transfer – Theorems - Moments of Inertia of Composite Figures.

MOMENT OF INERTIA: Moment of Inertia of Areas and Masses - Transfer Formula for Moments of Inertia - Moment of inertia of composite areas and masses.

UNIT – IV

KINEMATICS: Introduction – Rectilinear motion – Motion with uniform and variable acceleration – Curvilinear motion – Components of motion – Circular motion – Projectiles- Instantaneous centre.

UNIT – V

KINETICS: Kinetics of a particle – D'Alembert's principle – Motion in a curved path – work, energy and power. Principle of conservation of energy – Kinetics of a rigid body in translation, rotation – work done – Principle of work-energy – Impulse-momentum.

TEXT BOOKS:

1. Engineering Mechanics by shames & Rao - Pearson Education.
2. Engineering Mechanics by M.V. Seshagiri rao and Durgaih; University Press.
3. Engineering Mechanics – B. Bhattacharya - Oxford University Publications.

REFERENCES:

1. Engineering Mechanics (Statics and Dynamics) by Hibbler; Pearson Education.
2. Engineering Mechanics by Fedrinand L. Singer – Harper Collings Publishers.
3. Engineering Mechanics by A. K. Tayal, Umesh Publication.
4. Engineering Mechanics – G. S. Sawhney, Printice Hall of India.
5. A text book of engineering mechanics by R. K. Bansal; Laxmi publications.
6. Engineering Mechanics by R. S. Khurmi ; S. Chand & Co.

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COMPUTATIONAL MATHEMATICS
(Common to all Branches)

Pre Requisites: NIL

Course Objectives:
- This course aims at providing the student with the concepts of matrices, numerical techniques and curve fitting.

Course Outcomes:
At the end of the course, the student will be able to:
- analyze engineering problems using the concepts of Matrices and Numerical Methods.

UNIT-I: Matrices and Linear Transformations (8 lectures)
Real matrices – Symmetric, skew – symmetric, orthogonal. Complex matrices: Hermitian, Skew-Hermitian and Unitary Matrices. Idempotent matrix, Finding rank of a matrix by reducing to Echelon and Normal forms. Consistency of system of linear equations (homogeneous and non- homogeneous) using the rank of a matrix.
Cayley-Hamilton Theorem (without Proof) – Verification. Finding inverse of a matrix and powers of a matrix by Cayley-Hamilton theorem, Linear dependence and Independence of Vectors. Linear Transformation – Orthogonal Transformation. Eigen values and Eigen vectors of a matrix. Properties of Eigen values and Eigen vectors of matrices. Diagonolization of matrix – Quadratic forms upto three variables- Reduction of quadratic form to canonical form, Rank – Positive definite, negative definite – semi definite – index – signature of quadratic form.

UNIT–II: Interpolation and Curve fitting (5 lectures)
Interpolation: Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences- Backward differences –Central differences – Symbolic relations and separation of symbols- Difference Equations – Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unevenly spaced points-Lagrange's Interpolation formula. **Curve fitting**: Fitting a straight line –Second degree curve-exponential curve-power curve by method of least squares.

UNIT–III: Numerical techniques (5 lectures)
Solution of Algebraic and Transcendental Equations and Linear system of equations.
Introduction – Graphical interpretation of solution of equations .The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method .
Solving system of non-homogeneous equations by L-U Decomposition method(Crout's Method)Jacobi's and Gauss-Seidel Iteration method

UNIT- IV: Numerical Differentiation, Integration: (5 lectures)
Numerical differentiation, Numerical integration – Trapezoidal rule, Simpson's $1/3^{rd}$ and 3/8 Rule , Generalized Quadrature.

UNIT – V: Numerical solutions of First order differential equations (5 lectures)
Numerical solution of Ordinary Differential equations: Solution by Taylor's series method –Picard's Method of successive Approximation- single step methods-Euler's Method-Euler's modified method, Runge-Kutta Methods.

Text Books:
1) Introductory Methods Of Numerical Analysis By Ss Sastry
2) Numerical And Statistical Methods With Programming In C By Sujatha Sinha And Subhabrada Dinda, Scitec Publishers.
3) Numerical Methods, Principles, Analysis And Algorithms By Srimantapal & Subodh C. Bhunia, Oxford University Press.

References:

1) Advanced Engineering Mathematics By Alan Jeffery
2) Applied Numerical Methods Using Matlab By Rao.V.Dukkipati, New Age Publishers
3) Numerical Methods In Science And Engineering –Apractical Approach By S.Rajasekharan, S.Chand Publications

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BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

PART A: ELECTRONIC WORKSHOP PRACTICE (in 3 lab sessions):

- Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's
- Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.

Study and operation of

- Multimeters (Analog and Digital)
- Function Generator
- Regulated Power Supplies
- CRO.

PART B: (For Laboratory examination – Minimum of 09 experiments to be conducted)

1. PN Junction diode characteristics A) Forward bias B) Reverse bias.
2. Zener diode characteristics and Zener as voltage Regulator
3. Input & Output characteristics of Transistor in CB / CE configuration
4. Full Wave Rectifier with & without filters
5. Input and Output characteristics of FET in CS configuration
6. Measurement of h-parameters of transistor in CB, CE, CC configurations
7. SCR Characteristics.
8. Verification of KVL and KCL.
9. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
10. Verification of Superposition and Reciprocity theorems.
11. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
12. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

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APPLIED PHYSICS LAB

LIST OF EXPERIMENTS:

1. Study of characteristics of LED and LASER sources.
2. Magnetic field along the axis of current carrying coil-Stewart and Gee's method.
3. Study of characteristics of p-i-n diode detectors.
4. Determination of frequency of A.C Mains-Sonometer.
5. Torsional pendulum.
6. Energy gap of material of PN- junction.
7. Bending Losses of Fibers & Evaluation of numerical aperture of given fiber.
8. L-C-R circuit.
9. Time constant of an R-C Circuit.
10. Characteristics of solar cell

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COMPUTATIONAL MATHEMATICS LAB
(Common to all Branches)

UNIT- I: Interpolation
Programming Tasks:

A) Write a program to determine y for a given x, if two arrays of x and y of same size are given (using Newton's interpolation both forward and backward)
B) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Lagrange 's interpolation)
C) Write a program to determine y for a given x, if two arrays of x and y of same size are given.(using Gauss interpolation)
(Selection criteria of the interpolation formula are important.)

UNIT- II: Curve fitting
Programming Tasks:

A) Write a program to find a line of best fit from the given two arrays of x and y of same size.
B) Write a program to find a curve of the form $y = Ae^{Bx}$ from the given two arrays of x and y of same size.
C) Write a program to find a curve of the form $y = Ax^{B}$ from the given two arrays of x and y of same size.
D) Write a program to find a curve of the form $y = Ax^2 + Bx + C$ from the given two arrays of x and y of same size.

UNIT- III: Solution of Algebraic and Transcendental Equations
Programming Tasks:

A) Write a program to find the root of a given equation using bisection method.
(Write this program such that the initial values given to the system are not usable, then the system should ask us to give new set of initial values).
B) Write a program to find the root of a given equation using method of false position(regula false position).
C) Write a program to find the root of a given equation using iteration method.
D) Write a program to find the root of a given equation using Newton Rophson method.

UNIT- IV: Linear system of equations
Programming Tasks:

A) Write a program to find the solution of given system of linear equations using L- U decomposition method.
B) Write a program to find the solution of given system of linear equations using jacobi's method.
C) Write a program to find the solution of given system of equations using Gauss sidel iteration method.
D) Write a program to find the solution of given system of equations using Gauss Jordan elimination method.

UNIT-V:Numerical Differentiation, Integration and Numerical solutions of First order differential equations
Programming Tasks:

A) Write a program to evaluate definite integral using trapezoidal rule, Simpson's 1/3rd rule and 3/8th rule.
B) Write a program to solve a given differential equation using Taylor's series.
C) Write a program to solve a given differential equation Euler's and modified Eulers method.
D) Write a program to solve a given differential equation using Ruge-Kutta method.

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MATHEMATICS – III

Pre Requisites: Nil

Course Objectives:

- To enable the students to understand the concepts of probability distributions, statistical Inferences, and testing of hypothesis.
- To enable the students to understand the key concepts of Complex functions and the calculus of complex functions.

Course Outcomes:

- The student achieves the knowledge to testing the hypothesis and form the probability distributions to make inferences.
- The students can study some problems of engineering using the concepts of residue theorem, Laurent series of functions of complex variables.

UNIT-I: Single Random variables and probability distributions.

Random variables – Discrete and continuous. Probability distributions, mass function/ density function of a probability distribution. Mathematical Expectation, Moment about origin, Central moments Moment generating function of probability distribution.

Binomial , Poisson & normal distributions and their properties . Moment generating functions of the above three distributions. and hence finding the mean and variance.

UNIT-II: Multiple Random variables, Correlation & Regression

Joint probability distributions- Joint probability mass / density function, Marginal probability mass / density functions, Covariance of two random variables, Correlation -Coefficient of correlation, The rank correlation.

Regression- Regression Coefficient, The lines of regression and multiple correlation & regression.

UNIT-III: Sampling Distributions and Testing of Hypothesis

Sampling: Definitions of population, sampling, statistic, parameter. Types of sampling, Expected values of Sample mean and varience, sampling distribution, Standard error, Sampling distribution of means and sampling distribution of varience.

Parameter estimations – likelihood estimate, interval estimations .

Testing of hypothesis: Null hypothesis, Alternate hypothesis, type I, & type II errors – critical region, confidence interval, Level of significance. One sided test, Two sided test,

Large sample tests:

(i) Test of Equality of means of two samples equality of sample mean and population mean (cases of known varience & unknown varience, equal and unequal variances)

(ii) Tests of significance of difference between sample S.D and population S.D.

(iii) Tests of significance difference between sample proportion and population proportion & difference between two sample proportions.

Small sample tests:

Student t-distribution,its properties; Test of significance difference between sample mean and population mean; difference between means of two small samples

Snedecor's F- distribution and it's properties. Test of equality of two population variences

Chi-square distribution , it's properties, Chi-square test of goodness of fit.

UNIT-IV: Functions of Complex Variables

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

Line integral – Evaluation along a path and by indefinite integration – Cauchy's integral theorem – Cauchy's integral formula – Generalized integral formula.
Radius of convergence – Expansion in Taylor's series, Maclaurin's series and Laurent series. Singular point –Isolated singular point – pole of order m – essential singularity

UNIT – V: C**ontour Integration**
Residue – Evaluation of residue by formula and by Laurent series – Residue theorem.
Evaluation of integrals of the type

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

Conformal mapping.
Transformation of z-plane to w-plane by a function, Conformal transformation. Standard transformations- Translation; Magnification and rotation; inversion and reflection, Transformations like e^z, log z, z^2, and Bilinear transformation. Properties of Bilinear transformation, determination of bilinear transformation when mappings of 3 points are given .

Text Books:
1) Fundamentals of mathematical statistics by s c gupta and v.k.kapoor
2) Probability and statistics for engineers and scientists by sheldon m.ross,academic press
3) Probability and statistics for engineering and the sciencec by jay l.devore.
4) Higher engineering mathematics by b s grewal.
5) Advanced engineering mathematics by peter v o'neil, cengage learning
6) Engineering mathematics by erwin kreyszig,10^{th} edition wiely publications

References:
1) Mathematics for engineers series –probability statistics and stochastic process by k.b.datta and m.a s.srinivas,cengage publications
2) Probability, statistics and stochastic process by prof.a r k prasad., wiely india
3) Advanced engineering mathematics by sahanaz bathul, phi publication
4) Probability and statistics by t.k.v.iyengar &b.krishna gandhi etel
5) Mathematics for engineers series- advanced mathematics for engineers by k.b.datta and m.a s.srinivas, cengage publications
6) Advanced engineering mathematics for engineers by prof.a r k prasad., wiely india

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SIGNALS AND SYSTEMS

Prerequisite: Mathematics – II

Course Objectives:

- This gives the basics of Signals and Systems required for all Electrical Engineering related courses.
- This gives concepts of Signals and Systems and its analysis using different transform techniques.
- This gives basic understanding of random process which is essential for random signals and systems encountered in Communications and Signal Processing areas.

Course Outcomes:

Upon completing his course, the student will be able to

- Represent any arbitrary analog or Digital time domain signal in frequency domain.
- Understand the importance of sampling, sampling theorem and its effects.
- Understand the characteristics of linear time invariant systems.
- Determine the conditions for distortion less transmission through a system.
- Understand the concepts of Random Process and its Characteristics.
- Understand the response of linear time Invariant system for a Random Processes.

UNIT-I: Signal Analysis

Signal Analysis:

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

Fourier Series:

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

UNIT -II: Fourier Transforms and Sampling

Fourier Transforms:

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

Sampling:

Sampling theorem – Graphical and analytical proof for Band Limited Signals, Reconstruction of signal from its samples, Effect of under sampling – Aliasing.

UNIT -III: Laplace Transforms and Z-Transforms

Laplace Transforms:

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

Z–Transforms:

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

UNIT -IV: Signal Transmission Through Linear Systems

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

UNIT- V : RANDOM PROCESSES – TEMPORAL CHARACTERISTICS: The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide-Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Autocorrelation Function and Its Properties, Cross-Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal , Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

RANDOM PROCESSES – SPECTRAL CHARACTERISTICS: The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function,The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

TEXT BOOKS:

1. Signals, Systems & Communications - B.P. Lathi, 2013, BSP.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2 Ed., PHI.
3. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4th Edition, 2001

REFERENCE BOOKS:

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

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ELECTRICAL TECHNOLOGY

Pre-requisite: None

Course Objectives: Objectives of this course are

- To Know the basic principle of DC Generators and motors.
- To Know the basic principle of Single Phase Transformers.
- To Understand the basic principle of three-phase induction motor and alternators.
- To understand the basic principle of special motors and electrical instruments.

Course OUTCOMES: After this course, the student

- To analyze the performance of DC generators and motors.
- To analyze the performance of Transformers.
- To learn the in-depth knowledge on three phase induction motors.
- To analyze the performance of special motors and electrical instruments in real time applications.

UNIT I

D.C Generators and DC Motors: Principle of operation of DC Machines- EMF equation – Types of generators – Magnetization and load characteristics of DC generators, DC Motors – Types of DC Motors – Characteristics of DC motors – 3-point starters for DC shunt motor – Losses and efficiency – Swinburne's test – Speed control of DC shunt motor – Flux and Armature voltage control methods.

UNIT II

Transformers & Performance: Principle of operation of single phase transformer – types – Constructional features – Phasor diagram on No Load and Load – Equivalent circuit, Losses and Efficiency of transformer and Regulation – OC and SC tests – Predetermination of efficiency and regulation (Simple Problems).

UNIT III

Three Phase Induction Motor: Principle of operation of three-phase induction motors –Slip ring and Squirrel cage motors – Slip-Torque characteristics – Efficiency calculation – Starting methods.

UNIT IV

Alternators: Alternators – Constructional features – Principle of operation – Types - EMF Equation – Distribution and Coil span factors – Predetermination of regulation by Synchronous Impedance Method – OC and SC tests.

UNIT V

Special Motors & Electrical Instruments : Principle of operation - Shaded pole motors – Capacitor motors, AC servomotor, AC tachometers, Synchros, Stepper Motors – Characteristics,Basic Principles of indicating instruments – Moving Coil and Moving iron Instruments (Ammeters and Voltmeters).

TEXT BOOKS

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - T.K. Nagasarkar and M.S.Sukhija, Oxford University Press, 2005

REFERENCES

1. Principles of Electrical Engineering - V.K Mehta, S.Chand Publications.
2. Theory and Problems of basic electrical engineering - I.J. Nagarath amd D.P Kothari, PHI Publications
3. Essentials of Electrical and Computer Engineering - David V. Kerns, JR. J. David Irwin

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ANALOG ELECTRONICS

Pre Requisites: Basic Electrical and Electronics Engineering.

Course Objectives:

- To introduce circuit realizations with components such as diodes, BJTs and transistors studied earlier.
- To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
- To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.

Course Outcomes:

Upon completion of the Course, the students will be able to :

- Design and analyze small signal amplifier circuits applying the biasing techniques learnt earlier.
- Cascade different amplifier configurations to obtain the required overall specifications like Gain, Bandwidth, Input and Output interfacing Impedances.
- Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
- Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.

UNIT – I:

ANALYSIS AND DESIGN OF SMALL SIGNAL LOW FREQUENCY BJT AMPLIFIERS

Classification of Amplifiers – Distortion in amplifiers, Analysis of CE, CC, and CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors, Design of single stage RC coupled amplifier Different coupling schemes used in amplifiers, Analysis of Cascaded RC Coupled amplifiers, Cascode amplifier, Darlington pair, Frequency response of BJT amplifier – Analysis at low and high frequencies, The Hybrid- pi (π) – Common Emitter transistor model, CE short circuit current gain, current gain with resistive load, single stage CE transistor amplifier response, Gain-bandwidth product

UNIT – II: FET AMPLIFIERS

Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers, comparison of performance with BJT Amplifiers, Basic Concepts of MOS Amplifiers, –MOSFET – MOSFET Characteristics in Enhancement and Depletion mode – MOS Small signal model, Common source amplifier with resistive, Diode connected and Current source loads, Source follower, Common Gate Stage, Cascode and Folded Cascode Amplifier – frequency response.

UNIT –III: POSITIVE & NEGATIVE FEEDBACK IN AMPLIFIERS

Classification of amplifiers, Concepts of feedback – Classification of feedback amplifiers – General characteristics of negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations – Simple problems.

Condition for oscillations. RC and LC type Oscillators – Frequency and amplitude stability of oscillators – Generalized analysis of LC oscillators, Quartz, Hartley, and Colpitts Oscillators – RC-phase shift and Wien-bridge oscillators.

UNIT – IV:

LARGE SIGNAL AMPLIFIERS

Class A Power Amplifier, Maximum Value of Efficiency of Class – A Amplifier, Transformer Coupled Amplifier, Push Pull and Complimentary Symmetry Class B and Class AB Power Amplifiers – Principle of operation of class –C Amplifier, Transistor Power Dissipation, Heat Sinks.

UNIT – V:

TUNED AMPLIFIERS

Introduction, Q-Factor, Small Signal Tuned Amplifiers, Effect of Cascading single Tuned amplifiers on Bandwidth, Effect of Cascading Double Tuned amplifiers on Bandwidth, Stagger Tuned Amplifiers, Stability of Tuned amplifiers

TEXT BOOKS:

1. Electronic Devices and Circuits, David A. Bell – 5th Edition, Oxford.
2. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2nd Edition, TMH.

REFERENCES:

1. Integrated Electronics, Jacob Millman, Christos C Halkias, TMH
2. Introductory Electronic Devices and Circuits (Conventional flow version) – Robert T. Paynter, 7th Edition, 2009, PEI.
3. Microelectronic Circuits – Sedra / Smith – 5th Edition – Oxford, 2009
4. Electronic Circuit Analysis – K. Lal Kishore, BS Publications, 2004.
5. Electronic Devices and Circuits, Anil.K. Maini, Varsha Agrawal, 1st Edition, WILEY.
6. Electronic Devices and Circuit Theory, Robert L.Boylestad, Louis Nashelsky, 9th Edition, Pearson Education.

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NETWORK ANALYSIS

Pre-requisite: Basic Electrical & Electronics Engineering

Course Objectives: Objectives of this course are
- To understand the basic concepts on RLC circuits.
- To know the behavior of the steady states and transients states in RLC circuits.
- To know the basic Laplace Transforms techniques in periods waveforms.
- To understand the two port network parameters.
- To understand the properties of LC networks and filters.

Course OUTCOMES: After this course
- Gains the knowledge on Basic network elements.
- Learns and analyze the RLC circuits behavior in detaile.
- Analyze the performance of periodic waveforms.
- Learns and gain the knowledge in characteristics of two port network paramenters (Z,Y, ABCD, h & g).
- To analyze the filter design concepts in real world applications.

UNIT -I
Review of R, L,C, RC, RL, RLC circuits, Netrwork Topology, Terminology, Basic cutest and tieset matrices for planar networks, Illustrative Problems, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

UNIT -II
Steady state and transient analysis of RC, RL and RLC Circuits, Circuits with switches, step response, 2^{nd} order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves

UNIT -III
Network Analysis using Laplace transform techniques, step, impulse and exponential excitation, response due to periodic excitation, RMS and average value of periodic waveforms.

UNIT -IV
Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros.

UNIT V
Standard T, π, L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network, T and π Conversion, LC Networks and Filters: Properties of LC Networks, Foster's Reactance theorem, design of constant K, LP, HP and BP Filters, Composite filter design.

TEXT BOOKS
1. Network Analysis – ME Van Valkenburg, Prentice Hall of India, 3^{rd} Edition, 2000.
2. Networks, Lines and Fields - JD Ryder, PHI, 2^{nd} Edition, 1999.

REFERENCES
1. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 5^{th} Edition, 1993.
2. Network Analysis and Synthesis – N.C.Jagan and C.Lakshminarayana, B.S. Publications, 2004.
3. Electric Circuits – J.Edminister and M.Nahvi – Schaum's Outlines, TMH, 1999.
4. Network Theory – Sudarshan and Shyam Mohan, TMH.
5. Communication Engineering Networks – Everitt and Anner.

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GENDER SENSITIZATION LAB
(Common to All Branches)
(An Activity-based Course)

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

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

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

Unit-II: GENDER AND BIOLOGY
Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4)
Declining Sex Ratio. Demographic Consequences.
Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)
Two or Many? Struggles with Discrimination.

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

Unit – IV: ISSUES OF VIOLENCE
Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)
Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*
Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)
Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.
Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)
Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

Unit – V: GENDER : CO-EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

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

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

Reference Books:

1. Sen, Amartya. "More than One Million Women are Missing." New York Review of Books 37.20 (20 December 1990). Print. '*We Were Making History…' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.
2. Tripti Lahiri. "By the Numbers: Where Indian Women Work." *Women's Studies Journal* (14 November 2012) Available online at: http:// blogs.wsj.com/ India real time/2012/11/14/by –the-numbers-where-Indan-women-work/>
3. K. Satyanarayana and Susie Tharu (Ed.) Steel Nibs Are Sprouting: New Dalit Writing From South India, Dossier 2: Telugu And Kannada http://harpercollins.co.in/BookDetail.asp?Book_Code=3732
4. Vimala. "Vantillu (The Kitchen)*". Women Writing in India: 600 BC to the Present. Volume II*: The 20th Century. Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 599-601.
5. Shatrughna, Veena et al. *Women's Work and its Impact on Child Health and Nutrition*, Hyderabad, National Institute of Nutrition, Indian Council of Medical Research. 1993.
6. Stree Shakti Sanghatana*. "We Were Making History ….' Life Stories of Women in the Telangana People's Struggle*. New Delhi: Kali for Women, 1989.
7. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
8. Jayaprabha, A. "Chupulu (Stares)". *Women Writing in India: 600BC to the Present. Volume II*: The 20th Century Ed. Susie Tharu and K. Lalita. Delhi: Oxford University Press, 1995. 596-597.
9. Javeed, Shayan and Anupam Manuhaar. "Women and Wage Discrimination in India: A Critical Analysis." *International Journal of Humanities and Social Science Invention* 2.4(2013)
10. Gautam, Liela and Gita Ramaswamy. "A 'conversation' between a Daughter and a Mother." *Broadsheet on Contemporary Politics*. Special Issue on *Sexuality and Harassment: Gender Politics on Campus Today*. Ed. Madhumeeta Sinha and Asma Rasheed. Hyderabad: Anveshi Research Center for Women's Studies, 2014.
11. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
12. Jeganathan Pradeep, Partha Chatterjee (Ed). "*Community, Gender and Violence Subaltern Studies XI*". Permanent Black and Ravi Dayal Publishers, New Delhi, 2000
13. K. Kapadia. The *Violence of Development: The Politics of Identity, Gender and Social Inequalities in India.* London: Zed Books, 2002
14. S. Benhabib. *Situating the Self: Gender, Community, and Postmodernism in Contemporary Ethics,* London: Routledge, 1992
15. Virginia Woolf. *A Room of One's Own.* Oxford: Black Swan. 1992.
16. T. Banuri and M. Mahmood, *Just Development: Beyond Adjustment with a Human Face,* Karachi: Oxford University Press, 1997

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ANALOG ELECTRONICS LAB - I

List of Experiments (Twelve experiments to be done):
Design (any six) and Simulation (any Ten) using Multisim or Pspice or Equivalent Simulation

Software:

1. Common Emitter Amplifier
2. Common Base Amplifier
3. Common Source amplifier
4. Two Stage RC Coupled Amplifier
5. Current Shunt and Voltage Series Feedback Amplifier
6. Cascode Amplifier
7. Wien Bridge Oscillator using Transistors
8. RC Phase Shift Oscillator using Transistors
9. Class A Power Amplifier (Transformer less)
10. Class B Complementary Symmetry Amplifier
11. Hartley and Colpitt's Oscillator
12. Single Tuned Voltage Amplifier

Equipments required for Laboratories:

1. For software simulation of Electronic circuits
   - i) Computer Systems with latest specifications
   - ii) Connected in LAN (Optional)
   - iii) Operating system (Windows XP)
   - iv) Simulations software (Multisim / TINAPRO) Package

2. For Hardware simulations of Electronic Circuits
   - i) RPSs
   - ii) CROs
   - iii) Functions Generators
   - iv) Multimeters
   - v) Components

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ELECTRICAL TECHNOLOGY LAB

PART – A

1. Serial and Parallel Resonance – Timing, Resonant frequency, Bandwidth and Q-factor determination for RLC network.
2. Time response of first order RC/RL network for periodic non-sinusoidal inputs – time constant and steady state error determination.
3. Two port network parameters – Z-Y Parameters, chain matrix and analytical verification.
4. Verification of Superposition and Reciprocity theorems.
5. Verification of maximum power transfer theorem. Verification on DC, verification on AC with Resistive and Reactive loads.
6. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.

PART – B

1. Magnetization characteristics of D.C. Shunt generator. Determination of critical field resistance.
2. Swinburne's Test on DC shunt machine (Predetermination of efficiency of a given DC Shunt machine working as motor and generator).
3. Brake test on DC shunt motor. Determination of performance characteristics.
4. OC & SC tests on Single-phase transformer (Predetermination of efficiency and regulation at given power factors and determination of equivalent circuit).
5. Brake test on 3-phase Induction motor (performance characteristics).
6. Regulation of alternator by synchronous impedance method.

Note: Any **TEN** of the above experiments are to be conducted

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BASIC SIMULATION LAB

Note:

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 15 experiment are to be completed

List of Experiments:

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

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SWITCHING THEORY AND LOGIC DESIGN

Prerequisite : Nil

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

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

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

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

UNIT-I:
Number System and Boolean Algebra And Switching Functions: Review of number systems, Complements of Numbers, Codes- Binary Codes, Binary Coded Decimal Code and its Properties, Unit Distance Codes, Error Detecting and Correcting Codes.
Boolean Algebra: Basic Theorems and Properties, Switching Functions, Canonical and Standard Form, Algebraic Simplification of Digital Logic Gates, Properties of XOR Gates, Universal Gates, Multilevel NAND/NOR realizations.

UNIT-II:
Minimization and Design of Combinational Circuits:
Introduction, The Minimization of switching function using theorem, The Karnaaugh Map Method-Up to Five Variable Maps, Don't Care Map Entries, Tabular Method, Design of Combinational Logic: Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Decoders, Encoders and Code converters, Hazards and Hazard Free Relations.

UNIT-III:
Sequential Machines Fundamentals and Applications:
Introduction: Basic Architectural Distinctions between Combinational and Sequential circuits, The Binary Cell, Fundamentals of Sequential Machine Operation, Latches, Flip Flops: SR, JK, Race Around Condition in JK, JK Master Slave, D and T Type Flip Flops, Excitation Table of all Flip Flops, Design of a Clocked Flip-Flop , Timing and Triggering Consideration, Clock Skew, Conversion from one type of Flip-Flop to another.
Registers and Counters: Shift Registers, Data Transmission in Shift Registers, Operation of Shift Registers, Shift Register Configuration, Bidirectional Shift Registers, Applications of Shift Registers, Design and Operation of Ring and Twisted Ring Counter, Operation Of Asynchronous And Synchronous Counters.

UNIT-IV:

Sequential Circuits-I:

Introduction, State Diagram, Analysis of Synchronous Sequential Circuits, Approaches to the Design of Synchronous Sequential Finite State Machines, Synthesis of Synchronous Sequential Circuits, Serial Binary Adder, Sequence Detector, Parity-bit Generator, Design of Asynchronous Counters, Design of Synchronous Modulo N –Counters.

UNIT-V:

Sequential Circuits-II:

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

Algorithmic State Machines: Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

TEXT BOOKS:

1. Switching and Finite Automata Theory- Zvi Kohavi & Niraj K. Jha, 3rdEdition, Cambridge.
2. Switching Theory and Logic Design – A Anand Kumar, PHI,2013.

REFERENCE BOOKS:

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

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PULSE AND DIGITAL CIRCUITS

Prerequisite : Analog Electronics

Course Objectives:

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

Course Outcomes:

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

- Understand the applications of diode as integrator, differentiator, clippers, clampler circuits..
- Learn various switching devices such as diode, transistor, SCR. Difference between logic gates and sampling gates
- Design mutivibrators for various applications, synchronization techniques and sweep circuits.
- Realizing logic gates using diodes and transistors.
- Understanding of time and frequency domain aspects.
- Importance of clock pulse and its generating techniques.

UNIT-I:

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

UNIT-II:

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

UNIT-III:

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

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

UNIT–IV:

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

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

UNIT-V:

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Pulse and Digital Circuits – A. Anand Kumar, 2005, PHI.
2. Fundamentals of Pulse and Digital Circuits- Ronald J. Tocci, 3 Ed., 2008.
3. Pulse and Digital Circuits – Motheki S. Prakash Rao, 2006, TMH.
4. Wave Generation and Shaping - L. Strauss.
5. Pulse, Switching and Digital Circuits – 5th Edition, David A. Bell, Oxford, 2015.

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ELECTROMAGNETIC THEORY AND TRANSMISSION LINES

Prerequisite : Nil

Course Objectives:
This is a structured foundation course, dealing with concepts, formulations and applications of Electromagnetic Theory and Transmission Lines, and is the basic primer for all electronic communication engineering subjects. The main objectives of the course are …

- To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
- To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
- To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
- To conceptually understand the UPW Polarization features and Poynting Theorem, and apply them for practical problems.
- To determine the basic Transmission Line Equations and telephone line parameters and estimate the distortions present.
- To understand the concepts of RF Lines and their characteristics, Smith Chart and its applications, acquire knowledge to configure circuit elements, QWTs and HWTs, and to apply the same for practical problems.

Course Outcomes : Having gone through this foundation course, the students would be able to …

- Distinguish between the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions, and use them for solving engineering problems.
- Analyze the Wave Equations for good conductors and good dielectrics, and evaluate the UPW Characteristics for several practical media of interest.
- Establish the proof and estimate the polarization features, reflection and transmission coefficients for UPW propagation, distinguish between Brewster and Critical Angles, and acquire knowledge of their applications.
- Determine the Transmission Line parameters for different lines, characterize the distortions and estimate the characteristics for different lines.
- Analyze the RF Line features and configure them as SC, OC Lines, QWTs and HWTs, and design the same for effective impedance transformation.
- Study the Smith Chart profile and stub matching features, and gain ability to practically use the same for solving practical problems.

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

UNIT–II:
Magnetostatics: Biot-Savart's Law, Ampere's Circuital Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law, Illustrative Problems.
Maxwell's Equations (Time Varying Fields): Faraday's Law and Transformer EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Final Forms and

Word Statements, Conditions at a Boundary Surface : Dielectric-Dielectric and Dielectric-Conductor Interfaces, Illustrative Problems .

UNIT–III:

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

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

UNIT–IV:

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

UNIT–V:

Transmission Lines – II: Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR. UHF Lines as Circuit Elements; $\lambda/4$, $\lambda/2$, $\lambda/8$ Lines – Impedance Transformations, Significance of Z_{min} and Z_{max} , Smith Chart – Configuration and Applications, Single Matching, Illustrative Problems.

TEXT BOOKS:

1. Principles of Electromagnetics – Matthew N.O. sadiku and S.V. Kulkarni, 6th Ed., Oxford University Press, Aisan Edition, 2015.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2nd Ed., 2000, PHI.
3. Transmission Lines and Networks – Umesh Sinha, Satya Prakashan, 2001, (Tech. India Publications), New Delhi.

REFERENCE BOOKS:

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

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ANALOG COMMUNICATIONS

Prerequisite : Signals and Systems

Course Objectives:

- To develop ability to analyze system requirements of analog communication systems.
- To understand the need for modulation
- To understand the generation, detection of various analog modulation techniques and also perform the mathematical analysis associated with these techniques.
- To acquire knowledge to analyze the noise performance of analog modulation techniques.
- To acquire theoretical knowledge of each block in AM and FM receivers.
- To understand the pulse modulation techniques.

Course Outcomes:

- Able to analyze and design various modulation and demodulation analog systems.
- Understand the characteristics of noise present in analog systems.
- Study of signal to Noise Ration (SNR) performance, of various Analog Communication systems.
- Analyze and design the various Pulse Modulation Systems.
- Understand the concepts of Multiplexing : Time Division Multiplexing (TDM) and Frequency Division Multiplexing (FDM).

UNIT I
AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, Frequency Division Multiplexing , Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, square law Modulator, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

UNIT II
SSB MODULATION

Introduction to Hilbert Transform, Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT III
ANGLE MODULATION

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

UNIT IV
NOISE

Resistive Noise Source (Thermal), Arbitrary Noise Sources, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties

Noise in Analog communication System, Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.

UNIT V

RECEIVERS

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

PULSE MODULATION

Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Divison Multiplexing.

TEXTBOOKS

1. Communication Systems by Simon Haykins John Wiley & Sons , 4th Edition.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Communication Systems – B.P. Lathi, BS Publication , 2004.
4. Electronics & Communication System – George Kennedy and Bernard Davis , TMH 2004.

REFERENCES

1. Electronic Communication Systems – Modulation and Transmission - Robert J. Schoenbeck, 2nd Edition, PHI.
2. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
3. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005
4. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition,2009,PHI.

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CONTROL SYSTEMS

Pre-requisite: Network Analysis

Course Objectives:
Objectives of course are
- To introduce the principles and applications of control systems in everyday life
- To introduce the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems
- To understand different aspects of stability analysis of systems in frequency domain and time domain.

Course Outcomes: After this course, the student gets a thorough knowledge of
- Open loop and closed loop control systems.
- Modeling and transfer function derivations of translational and rotational systems.
- Represent transfer functions through block diagrams and signal flow graphs.
- Design a control systems using time domain and frequency domain techniques.
- Time response analysis, stability analysis, frequency response analysis of different ordered systems through their characteristic equation and time-domain specifications.
- Applications of concepts to electrical and electronics problems.

UNIT – I INTRODUCTION:
Concepts of Control Systems- Open Loop and closed loop control systems and their differences- Different examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.
Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

TRANSFER FUNCTION EPRESENTATION:
Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

UNIT-II TIME RESPONSE ANALYSIS:
Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

UNIT – III STABILITY ANALYSIS:
The concept of stability - Routh stability criterion – qualitative stability and conditional stability.
Root Locus Technique:
The root locus concept - construction of root loci-effects of adding poles and zeros to G(s) H(s) on the root loci.
Frequency Response Analysis:
Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

UNIT-IV STABILITY ANALYSIS IN FREQUENCY DOMAIN:
Polar Plots, Nyquist Plots and applications of Nyquist criterion to find the stability –Effects of adding poles and zeros to G(s)H(s) on the shape of the Nyquist diagrams.

Classical Control Design Techniques:
Compensation techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.

UNIT – V STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS:
Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and its Properties.

TEXT BOOKS:
1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2nd edition.
2. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3rd edition, 1998.

REFERENCE BOOKS:
1. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3rd Edition, 1998.
2. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
3. Control Systems Engg. by NISE 3rd Edition – John wiley
4. Control Systems by S.Kesavan , Hitech Publications.
5. "Modeling & Control Of Dynamic Systems" by Narciso F. Macia George J. Thaler, Thomson Publishers.

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ANALOG COMMUNICATIONS LAB

Note:
- Minimum 12 experiments should be conducted:
- All these experiments are to be simulated first either using MATLAB, Comsim or any other simulation package and then to be realized in hardware

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

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PULSE AND DIGITAL CIRCUITS LAB

Minimum Twelve experiments to be conducted:

1. Linearwave Shaping
   a. RC Low Pass Circuit for different time constants
   b. RC High Pass Circuit for different time constants

2. Non-linear wave shaping
   a. Transfer characteristics and response of Clippers:
      i) Positive and Negative Clippers
      ii) Clipping at two independent levels
   b. The steady state output waveform of clampers for a square wave input
      i) Positive and Negative Clampers
      ii) Clamping at different reference voltage

3. Comparison Operation of different types of Comparators
4. Switching characteristics of a transistor
5. Design a Bistable Multivibrator and draw its waveforms
6. Design an Astable Multivibrator and draw its waveforms
7. Design a Monostable Multivibrator and draw its waveforms
8. Response of Schmitt Trigger circuit for loop gain less than and greater than one
9. UJT relaxation oscillator
10. The output- voltage waveform of Boot strap sweep circuit
11. The output- voltage waveform of Miller sweep circuit
12. Pulse Synchronization of An Astable circuit
13. Response of a transistor Current sweep circuit
14. Sampling gates
    a. Response of Unidirectional gate
    b. Response of Bidirectional gate using transistors
15. Study of logic gates

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ANALOG ELECTRONICS LAB - II

List of Experiments (Twelve experiments to be done):

Hardware Testing in Laboratory:

Part A: Minimum of 6 out of the 10 experiments listed on breadboard.

1. Current Shunt Feedback amplifier
2. Voltage Series Feedback amplifier
3. Cascode amplifier
4. Darlington Pair
5. RC Phase shift Oscillator
6. Hartley and Colpitt's Oscillators
7. Class A power amplifier
8. Class B Complementary symmetry amplifier

Part B: Testing of any 2 circuits designed and simulated out of the 4 experiments listed.

1. Common Emitter Amplifier
2. Common Source Amplifier
3. Two Stage RC Coupled Amplifier
4. Wien Bridge Oscillator using Transistors

Part C:

1. Introduction to PCB fabrication methods
2. Translation of any tested/designed and tested circuits on a PCB.

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HUMAN VALUES AND PROFESSIONAL ETHICS

Prerequisite: Nil

Course Objectives:
1. To introduce the basic concepts of universal human values
2. To familiarize the students with desirable business and professional ethics, rights and responsibilities
3. To prepare students against possible gaps and unethical practices in contemporary times
4. To sensitize the students so that they can protect themselves and the organization from the possible professional crime malpractices

Course Outcomes:
1. The students learn about diverse ethical issues rooted in society, trade, business, and environment on local as well as a global platform.
2. The students appreciate their role as a responsible citizen, professional, and as managers, advisors, experts and consultants.
3. The students will reflect and learn major values and ethics from their observations of a spiritual discourse and a visit to a business organization as a practical part of this course.

Unit 1 Human Values: Morals, values, ethics – integrity – work ethics –service learning –civic virtue – respect for others- living peacefully - Caring –sharing –honesty – courage –valuing time – cooperation – commitment –empathy – self-confidence –spirituality – character- Mini-Cases

Unit II Professional Ethics: Profession- and professionalism - Two models of professionalism – Professional etiquette -Three types of Ethics or morality Responsibility in Engineering – Engineering standards –Engineering Ethics – Positive and Negative Faces. Professional Codes and Code of conduct of Institute of Engineers. Mini-cases.

Unit III Professional Responsibilities: Ethical standards Vs Professional Conduct – Zero Tolerance for Culpable Mistakes – Hazards and Risks- Risk benefit analysis– congeniality, collegiality and loyalty. Respect for authority – conflicts of interest –Mini-Cases.

Unit IV Professional Rights: professional rights and employee rights communicating risk and public policy – Whistle blowing - Professionals /engineers as managers, advisors, experts, witnesses and consultants – moral leadership- Regulatory compliances, Monitoring and control- Mini-Cases

Unit V Ethics in global context: Global issues in MNCs- Problems of bribery, extortion, and grease payments – Problem of nepotism, excessive gifts – paternalism – different business practices – negotiating taxes. Mini-Cases.

Mini-projects

Project 1: The student of this course should invariably attend (or watch on internet/any TV channel/youtube/social media) two speeches of 30 minutes duration each dealing with spiritual discourse and submit a report on the contents of the lecture proceedings.

Project 2: Visit any organization (including shops/ hotels or shopping malls in your region) of your choice and observe how the professionals perform the given job with a focus on professional ethics and human values.

References

1. Aryasri, Human Values and Professional Ethics, Maruthi Publications.
2. S B George, Human Values and Professional Ethics, Vikas Publishing.
3. KR Govindan & Saenthil Kumar:Professional *Ethics and Human Values*, Anuradha Publications.
4. S K Chakraborthy & D.Chakraborthy: *Human Values and Ethics*, Himalaya.
5. M. Govindarajan, S. Natarajan, & V.S. Senthilkumar: *Engineering Ethics(Includes Human Values),* HI Learning Pvt. Ltd., New Delhi – 110001

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LINEAR AND DIGITAL IC APPLICATIONS

Prerequisite: Pulse and Digital Circuits

Course Objectives:
The main objectives of the course are:
1. To introduce the basic building blocks of linear integrated circuits.
2. To teach the linear and non - linear applications of operational amplifiers.
3. To introduce the theory and applications of analog multipliers and PLL.
4. To teach the theory of ADC and DAC.
5. To introduce the concepts of waveform generation and introduce some special function ICs.
6. To understand and implement the working of basic digital circuits

Course Outcomes:
On completion of this course, the students will have:
1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Understanding of the different families of digital integrated circuits and their characteristics.
3. Also students will be able to design circuits using operational amplifiers for various applications.

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

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

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

UNIT -IV:
Digital Integrated Circuits
Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT -V:
Sequential Logic IC's and Memories
Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.
Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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ANTENNAS AND WAVE PROPAGATION

Prerequisite : Electromagnetic Theory and Transmission Lines

Course Objectives: This can be termed a middle level course in the electronic communication engineering domain. The course deals with antenna basics, different types of antennas, some design features, antenna measurements and wave propagation, and has the following main objectives …

- To understand the concept of radiation, antenna definitions and significance of antenna parameters, to derive and analyze the radiation characteristics of thin wire dipole antennas and solve numerical problems.
- To distinguish between UHF, VHF and Microwave Antennas, their requirements, specifications, characteristics and design relations.
- To analyze the characteristics of yagi-uda antennas, helical antennas, pyramidal horns, microstrip patch antennas and parabolic reflectors and identify the requirements to facilitate their design.
- To identify the antenna array requirements, to determine the characteristics of ULAs and estimate the patterns of BSA, EFA, and Binomial Arrays.
- To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
- To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

Course Outcomes:
Having gone through this course on Antenna Theory and Techniques, and Wave Propagation, the students would be able to

- Explain the mechanism of radiation, distinguish between different antenna characteristic parameters, establish their mathematical relations, estimate them for different practical cases.
- Distinguish between short dipoles, half-wave dipoles, quarter-wave monopoles and small loops, configure their current distributions, derive their far fields and radiation characteristics and sketch their patterns.
- Characterize the antennas based on frequency, configure the geometry and establish the radiation patterns of folded dipole, Yagi-Uda Antenna, Helical Antennas, Horn Antennas, and to acquire the knowledge of their analysis, design and development.
- Analyse a microstrip rectangular patch antenna and a parabolic reflector antenna, identify the requirements and relevant feed structure, carry out the design and establish their patterns.
- Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
- Carry out the Linear Array Analysis, estimate the array factor and characteristics and sketch the pattern for 2-element array, N-element BSA, EFA, modified EFA, Binomial Arrays.
- Classify the different wave propagation mechanisms, identify their frequency ranges, determine the characteristic features of ground wave, ionospheric wave, space wave, duct and tropospheric propagations, and estimate the parameters involved.

UNIT -I:
Antenna Basics: Introduction, Basic Antenna Parameters – Patterns, Beam Area, Radiation Intensity, Beam Efficiency, Directivity-Gain-Resolution, Antenna Apertures, Effective Height, Illustrative Problems.

Fields from Oscillating Dipole, Field Zones, Front - to-back Ratio, Antenna Theorems, Radiation, Retarded Potentials – Helmholtz Theorem

Thin Linear Wire Antennas – Radiation from Small Electric Dipole, Quarter Wave Monopole and Half Wave Dipole – Current Distributions, Field Components, Radiated Power, Radiation Resistance, Beam Width, Directivity, Effective Area and Effective Height, Natural Current Distributions, Far Fields and Patterns of Thin Linear Centre-fed Antennas of Different Lengths, Illustrative Problems. Loop Antennas - Introduction, Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

UNIT -II:

VHF, UHF and Microwave Antennas - I : Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics, Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes, Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns, Illustrative Problems.

UNIT -III:

VHF, UHF and Microwave Antennas - II: Microstrip Antennas – Introduction, Features, Advantages and Limitations, Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flar Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features, Illustrative Problems.

UNIT -IV:

Antenna Arrays: Point Sources – Definition, Patterns**,** arrays of 2 Isotropic Sources **-** Different Cases, Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, Endfire Arrays, EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSAs with Non-uniform Amplitude Distributions – General Considerations and Binomial Arrays, Illustrative Problems.

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

UNIT -V:

Wave Propagation – I: Introduction, Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts, Ground Wave Propagation (Qualitative Treatment) – Introduction, Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. Space Wave Propagation – Introduction, Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Tropospheric Propagation.

Wave Propagation – II: Sky Wave Propagation – Introduction, Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

TEXT BOOKS:

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

REFERENCE BOOKS:

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3rd Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.

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DIGITAL COMMUNICATIONS

Prerequisite : Analog Communications

Course Objectives:

- To understand the functional block diagram of Digital communication system.
- To understand the need for source and channel coding.
- To study various source and channel coding techniques.
- To understand a mathematical model of digital communication system for bit error rate analysis of different digital communication systems.

Course Outcomes:

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

- Understand basic components of Digital Communication Systems.
- Design optimum receiver for Digital Modulation techniques.
- Analyze the error performance of Digital Modulation Techniques.
- Understand the redundancy present in Digital Communication by using various source coding techniques.
- Know about different error detecting and error correction codes like block codes, cyclic codes and convolution codes.

UNIT I:

Elements of Digital Communication Systems: Model of Digital Communication Systems, Digital Representation of Analog Signal, Certain Issues in Digital Transmission, Advantages of Digital Communication Systems, Sampling Theorem, Types of Sampling – Impulse Sampling , Natural Sampling , Flat – Top Sampling. Introduction to Baseband Sampling.

Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

UNIT II:

Digital Modulation Techniques: Introduction, ASK, ASK Modulator, Coherent ASK Detector, Non-Coherent ASK Detector, FSK, Bandwidth and Frequency Spectrum of FSK, Non Coherent FSK Detector, Coherent FSK Detector, FSK Detection using PLL, BPSK, Coherent PSK Detection, QPSK, Differential PSK.

UNIT III:

Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, Signal Space Representation and Probability of Error, Eye Diagrams, Cross Talk.

UNIT IV:

Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

UNIT V:

Error Control Codes

Linear Block Codes: Matrix Description of Linear Block Codes, Error Detection and Error Correction Capabilities of Linear Block Codes.

Cyclic Codes: Algebraic Structure, Encoding, Syndrome Calculation, Decoding.

Convolution Codes: Encoding, Decoding using State, Tree and Trellis Diagrams, Decoding using Viterbi Algorithm, Comparison of Error Rates in Coded and Uncoded Transmission.

TEXT BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schiling, Goutam Saha, 3rd Edition, Mcgraw-Hill, 2008.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

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1. Digital Communications – John G. Proakis , Masoud Salehi – 5th Edition, Mcgraw-Hill, 2008.
2. Digital Communication – Simon Haykin, Jon Wiley, 2005.
3. Digital Communications – Ian A. Glover, Peter M. Grant, 2nd Edition, Pearson Edu., 2008.
4. Communication Systems – B.P. Lathi, BS Publication, 2006.

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MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Prerequisite : Nil.

Course Objective:

- To understand the concepts and importance of economics in managerial problems
- To understand the basic financial management concepts including the principles of financial analysis

Course Outcomes:

- Students will be able to apply the principles of economics for managerial decisions.
- The students will be able to analyze the financial position of a company with the techniques of financial accounting and ratio analysis

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

Unit II Production & Cost Analysis: *Production Function* – Isoquants and Isocosts, MRTS, Least Cost Combination of Inputs, Laws of Returns, Internal and External Economies of Scale. Break-even Analysis (BEA)-Determination of Break-Even Point (simple problems) - Managerial Significance.

Unit III Markets & Forms of Business Organisations: Types of competition and Markets, Features of Perfect competition and Monopoly. Price-Output Determination in case of Perfect Competition and Monopoly. *Pricing*: Objectives and Policies of Pricing. Methods of Pricing. *Business:* Features and evaluation of different forms of Business Organisation: Sole Proprietorship, Partnership, Limited companies.

Unit IV Capital Budgeting: Methods and sources of raising capital - Capital Budgeting: Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method (simple problems).

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

TEXT BOOKS:

1. Aryasri: Managerial Economics and Financial Analysis, TMH,.
2. Vijay Kumar & Appa Rao Managerial Ecoconomics & Financial Analysis, Cengage.
3. J. V. Prabhakar Rao & P.V. Rao Managerial Ecoconomics & Financial Analysis, Maruthi Publishers,

REFERENCES:

1. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
2. H. Craig Peterson & W. Cris Lewis, Managerial Economics, Pearson,
3. Lipsey & Chrystel, Economics, Oxford University Press, Domnick Salvatore: Managerial Economics In a Global Economy, Thomson,.
4. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI, 2012.

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LINEAR IC APPLICATIONS LAB

Note:

- Verify the functionality of the IC in the given application.

Design and Implementation of :

1. Inverting and Non-inverting Amplifiers using Op Amps.
2. Adder and Subtractor using Op Amp.
3. Comparators using Op Amp.
4. Integrator Circuit using IC 741.
5. Differentiator circuit using Op Amp.
6. Active Filter Applications – LPF, HPF (first order)
7. IC 741 Waveform Generators – Sine, Square wave and Triangular waves.
8. Mono-stable Multivibrator using IC 555.
9. Astable Multivibrator using IC 555.
10. Schmitt Trigger Circuits – using IC 741.
11. IC 565 – PLL Applications.
12. Voltage Regulator using IC 723.
13. Three Terminal Voltage Regulators –7805, 7809, 7912.

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DIGITAL COMMUNICATIONS LAB

Design the following:

1. PCM Generation and Detection
2. Differential Pulse Code Modulation
3. Delta Modulation
4. Time Division Multiplexing of 2 Band Limited Signals
5. Frequency Shift Keying: Generation and Detection
6. Phase Shift Keying: Generation and Detection
7. Amplitude Shift Keying: Generation and Detection
8. Study of the spectral characteristics of PAM,
9. Study of the spectral characteristics of QAM.
10. DPSK :Generation and Detection
11. QPSK : Generation and Detection
12. OFDM: Generation and Detection

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DESIGN LAB

Design and Implementation of the following experiments using Integrated Circuits (ICs) :

1. Design a 16 x 4 priority encoder using two 8 x 3 priority encoder.
2. Design an 16 bit comparator using 4 bit Comparators.
3. Design a model to 53 counter using two decade counters.
4. Design a 450 KHz clock using NAND / NOR gates.
5. Design a 4 bit pseudo random sequence generator using 4 – bit ring counter.
6. Design a 16 x 1 multiplexer using 8 x 1 multiplexer.
7. Design a 16 bit Adder / Subtractor using 4 – bit Adder / Subtractor IC's
8. Plot the transform Characteristics of 74H,LS,HS series IC's.
9. Design a 4 – bit gray to Binary and Binary to Gray Converter.
10. Design a two Digit 7 segment display unit using this display the Mod counter output of experiment 3.
11. Design an 8 bit parallel load and serial out shift register using two 4 bit shift register.
12. Design a 4 digit hex Counter using synchronous and Asynchronous one digit hex counters. Compute the display between Asynchronous counter and Synchronous counter.

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CELLULAR AND MOBILE COMMUNICATIONS
(PE-I)

Prerequisite : Digital Communications

Course Objectives:
The course objectives are:
- To provide the student with an understanding of the Cellular concept, Frequency reuse, Hand-off strategies.
- To enable the student to analyze and understand wireless and mobile cellular communication systems over a stochastic fading channel.
- To provide the student with an understanding of Co-channel and Non-Co-channel interferences.
- To give the student an understanding of cell coverage for signal and traffic, diversity techniques and mobile antennas.
- To give the student an understanding of frequency management, Channel assignment and types of handoff.

Course Outcomes:
By the end of the course,
- The student will be able to analyze and design wireless and mobile cellular systems.
- The student will be able to understand impairments due to multipath fading channel.
- The student will be able understand the fundamental techniques to overcome the different fading effects.
- The student will be able to understand Co-channel and Non Co-channel interferences
- The student will be able to familiar with cell coverage for signal and traffic, diversity techniques and mobile antennas.
- The student will have an understanding of frequency management, Channel assignment and types of handoff.

UNIT-I:
Introduction to Cellular Mobile Radio Systems:
Limitations of Conventional Mobile Telephone Systems, Basic Cellular Mobile System, First, Second, Third and Fourth Generation Cellular Wireless Systems, Uniqueness of Mobile Radio Environment-Fading -Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time.
Fundamentals of Cellular Radio System Design:
Concept of Frequency Reuse, Co-Channel Interference, Co-Channel Interference Reduction Factor, Desired C/I From a Normal Case in a Omni Directional Antenna System, System Capacity, Trunking and Grade of Service, Improving Coverage and Capacity in Cellular Systems- Cell Splitting, Sectoring, Microcell Zone Concept.

UNIT-II:
Co-Channel Interference:
Measurement Of Real Time Co-Channel Interference, Design of Antenna System, Antenna Parameters and Their Effects, Diversity Techniques-Space Diversity, Polarization Diversity, Frequency Diversity, Time Diversity.
Non-Co-Channel Interference:
Adjacent Channel Interference, Near End Far End Interference, Cross Talk, Effects on Coverage and Interference by Power Decrease, Antenna Height Decrease, Effects of Cell Site Components.

UNIT-III:
Cell Coverage for Signal and Traffic:
Signal Reflections in Flat And Hilly Terrain, Effect of Human Made Structures, Phase Difference Between Direct and Reflected Paths, Constant Standard Deviation, Straight Line Path Loss Slope,

General Formula for Mobile Propagation Over Water and Flat Open Area, Near and Long Distance Propagation, Path Loss From a Point to Point Prediction Model in Different Conditions, Merits of Lee Model.

Cell Site and Mobile Antennas:

Space Diversity Antennas, Umbrella Pattern Antennas, Minimum Separation of Cell Site Antennas, Mobile Antennas.

UNIT-IV*:*

Frequency Management and Channel Assignment:

Numbering And Grouping, Setup Access And Paging Channels, Channel Assignments to Cell Sites and Mobile Units, Channel Sharing and Borrowing, Sectorization, Overlaid Cells, Non Fixed Channel Assignment.

UNIT-V:

Handoffs and Dropped Calls:

Handoff Initiation, Types of Handoff, Delaying Handoff, Advantages of Handoff, Power Difference Handoff, Forced Handoff, Mobile Assisted and Soft Handoff, Intersystem Handoff, Introduction to Dropped Call Rates and their Evaluation.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Mc Graw Hill, 2nd Edn., 1989.
2. Wireless Communications - Theodore. S. Rapport, Pearson Education, 2nd Edn., 2002.
3. Mobile Cellular Communication - Gottapu sashibhushana Rao, Pearson, 2012.

REFERENCE BOOKS:

1. Principles of Mobile Communications – Gordon L. Stuber, Springer International, 2nd Edn., 2001.
2. Modern Wireless Communications-Simon Haykin, Michael Moher, Pearson Eduction, 2005.
3. Wireless Communications Theory and Techniques, Asrar U. H .Sheikh, Springer, 2004.
4. Wireless Communications and Networking, Vijay Garg, Elsevier Publications, 2007.
5. Wireless Communications – Andrea Goldsmith, Cambridge University Press, 2005.

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COMPUTER ORGANIZATION AND OPERATING SYSTEMS
(PE-I)

Prerequisite : Nil

Course Objectives:
The course objectives are:
- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.
- To study the hierarchical memory system including cache memories and virtual memory.
- To demonstrate the knowledge of functions of operating system memory management scheduling, file system and interface, distributed systems, security and dead locks.
- To implement a significant portion of an Operating System.

Course Outcomes:
Upon completion of the course, students will have thorough knowledge about:
- Basic structure of a digital computer
- Arithmetic operations of binary number system
- The organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
- Operating system functions, types, system calls.
- Memory management techniques and dead lock avoidance operating systems' file system implementation and its interface.

UNIT-I:
Basic Structure of Computers: Computer Types, Functional UNIT, Basic OPERATIONAL Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi Computers, Data Representation, Fixed Point Representation, Floating – Point Representation.
Register Transfer Language and Micro Operations: Register Transfer
Language, Register Transfer Bus and Memory Transfers, Arithmetic Micro Operations, Logic Micro Operations, Shift Micro Operations, Arithmetic Logic Shift Unit, Instruction Codes, Computer Registers Computer Instructions– Instruction Cycle.
Memory – Reference Instructions, Input – Output and Interrupt, STACK
Organization, Instruction Formats, Addressing Modes, DATA Transfer and Manipulation, Program Control, Reduced Instruction Set Computer.

UNIT -II:
Micro Programmed Control: Control Memory, Address Sequencing,
Microprogram Examples, Design of Control Unit, Hard Wired Control,
Microprogrammed Control.
The Memory System: Basic Concepts of Semiconductor RAM Memories, Read-Only Memories, Cache Memories Performance Considerations, Virtual99 Memories Secondary Storage, Introduction to RAID.

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

UNIT -IV:

Operating Systems Overview: Overview of Computer Operating Systems Functions, Protection and Security, Distributed Systems, Special Purpose Systems, Operating Systems Structures-Operating System Services and Systems Calls, System Programs, Operating Systems Generation.
Memory Management: Swapping, Contiguous Memory Allocation, Paging, Structure of The Page Table, Segmentation, Virtual Memory, Demand Paging, Page-Replacement Algorithms, Allocation of Frames, Thrashing Case Studies - UNIX, Linux, Windows
Principles of Deadlock: System Model, Deadlock Characterization,
Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

UNIT -V:
File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Mounting, File Sharing, Protection.
File System Implementation: File System Structure, File System
Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

TEXT BOOKS:
1. Computer Organization – Carl Hamacher, Zvonks Vranesic, SafeaZaky, 5th Edition, McGraw Hill.
2. Computer Systems Architecture – M.Moris Mano, 3rd Edition, Pearson
3. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin,Greg Gagne, 8th Edition, John Wiley.

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

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DIGITAL IMAGE PROCESSING
(**PE-I)**

Prerequisite : Signals and Systems

Course Objectives:

- To comprehend the relation between human visual system and machine perception and processing of digital images.
- To provide a detailed approach towards image processing applications like enhancement, segmentation and compression.

Course Outcomes:

- Exploration of the limitations of the computational methods on digital images.
- Expected to implement the spatial and frequency domain image transforms on enhancement and restoration of images.
- Elaborate understanding on image enhancement techniques.
- Expected to define the need for compression and evaluate the basic compression algorithms.

UNIT-I:

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

Image Transforms: 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT-II:

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood creterion, Median Filter, Spatial Domain High-Pass Filtering.

Image Enhancement (Frequency Domain): Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT -III:

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

UNIT -IV:

Image Segmentation: Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, Region Oriented Segmentation.

Morphological Image Processing: Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation.

UNIT -V:

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

TEXT BOOKS:

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 3rd Edition, Pearson, 2008
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

REFERENCE BOOKS:

1. Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2nd Ed, CRC Press, 2011
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2nd Edition, TMH, 2010.
3. Fundamentals of Digital Image Processing – A.K.Jain , PHI, 1989
4. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
5. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2008, 2nd Edition
6. Introduction to Image Processing & Analysis – John C. Russ, J. Christian Russ, CRC Press, 2010.
7. Digital Image Processing with MATLAB & Labview – Vipula Singh, Elsevier.

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TELEVISION ENGINEERING
(PE-I)

Prerequisite : Nil

Course Objectives:

- Study the different camera and picture tubes.
- Know about various standard TV channels.
- Study about TV receiver, sync separation, detector etc.,
- Study about color signal encoding ,decoding and receiver.

Course Outcomes:

- Expected to understand the concept of TV transmission and reception.
- Acquired knowledge about complete TV receiver.
- Expected to learn about color separation, color coding etc.,

UNIT–I:

Introduction:

TV transmitter and receivers, synchronization. Geometric form and aspect ratio, image continuity, interlaced scanning, picture resolution, Composite video signal, TV standards. Camera tubes: image Orthicon, Plumbicon, vidicon, silicon Diode Array vidicon, Comparison of camera tubes, Monochrome TV camera,

TV Signal Transmission a**nd Propagation**:

Picture Signal transmission, positive and negative modulation, VSB transmission, sound signal transmission, standard channel BW,TV transmitter, TV signal propagation, interference, TV broadcast channels, TV transmission Antennas.

UNIT –II:

Monochrome TV Receiver:

RF tuner, IF subsystem, video amplifier, sound section, sync separation and processing, deflection circuits, scanning circuits, AGC, noise cancellation, video and inter carrier sound signal detection, vision IF subsystem of Black and White receivers, Receiver sound system: FM detection, FM Sound detectors, and typical applications.

UNIT –III:

Sync Separation and Detection:

TV Receiver Tuners, Tuner operation, VHF and UHF tuners, digital tuning techniques, remote control of receiver functions. Sync Separation, AFC and Deflection Oscillators: Synchronous separation, k noise in sync pulses, separation of frame and line sync pulses. AFC, single ended AFC circuit, Deflection Oscillators, deflection drive Ics, Receiver Antennas, Picture Tubes.

UNIT–IV:

Color Television:

Colour signal generation, additive colour mixing, video signals for colours, colour difference signals, encoding, Perception of brightness and colours luminance signal, Encoding of colour difference signals, formation of chrominance signals, color cameras, Colour picture tubes.

Color Signal Encoding and Decoding:

NTSC colour system PAL colour system, PAL encoder, PAL-D Decoder, chrome signal amplifiers, separation of U and V signals, colour burst separation, Burst phase discriminator, ACC amplifier, Reference oscillator, Indent and colour killer circuits, U& V demodulators.

UNIT –V:

Color Receiver:

Introduction to colour receiver, Electron tuners, IF subsystem, Y-signal channel, Chroma decoder, Separation of U & V Color, Phasors, synchronous demodulators, Sub carrier generation, raster circuits.

Digital TV:
Introduction to Digital TV, Digital Satellite TV, Direct to Home Satellite TV, Digital TV Transmitter, Digital TV Receiver, Digital Terrestrial TV, LCD TV, LED TV, CCD Image Sensors, HDTV.

TEXT BOOKS:
1. Television and Video Engineering- A.M.Dhake, 2nd Edition.
2. Modern Television Practice – Principles, Technology and Service- R.R.Gallatin, New Age International Publication, 2002.
3. Monochrome and Colour TV- R.R. Gulati, New Age International Publication, 2002.

REFERENCE BOOKS:
1. Colour Television Theory and Practice-S.P.Bali, TMH, 1994.
2. Basic Television and Video Systems-B.Grob and C.E.Herndon, McGraw Hill, 1999.

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COMPUTER NETWORKS
(PE-II)

Prerequisite : Digital Communications

Course Objectives:

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.
- To have the concept of different routing techniques for data communications.

Course Outcomes:

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

UNIT I:

Introduction to Networks: Internet, Protocols and Standards, The OSI Model, Layers in OSI Model, TCP/IP Suite, Addressing.

Physical Layer: Multiplexing, Transmission Media, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT II:

Data Link Layer: Introduction, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, Random Access Controlled Access, Channelization, IEEE Standards, Ethernet, Giga-Bit Ethernet, Wireless LANs, SONET-SDH, Frame Relay and ATM.

UNIT III:

Network Layer: Logical Addressing, Internetworking, Tunneling, Address Mapping, ICMP, IGMP, Forwarding, Routing-Flooding, Bellman& Ford, Disjkstra's routing protocols, RIP, OSPF, BGP,- and Multicast Routing Protocols. Connecting Devices-Passive Hubs, Repeaters, Active Hubs, Bridges, Routers.

UNIT IV:

Transport Layer: Process to Process Delivery, UDP, TCP and SCTP Protocols, Congestion, Congestion Control, Quality of Service.

Application Layer: Domain Name Space, DNS in Internet, Electronic Mail, File Transfer Protocol, WWW, HTTP, SNMP, Multi-Media.

UNIT V:

Network Security: Security services, mechanisms and attacks, IPSec, SSL, VPN, Firewall. Bluetooth, Zigbee, IPv4, IPv6.

TEXT BOOKS:

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

REFERENCES:

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

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DIGITAL SYSTEM DESIGN
(PE-II)

Prerequisite : Switching Theory and Logic Design

Course Objectives:
- To provide extended knowledge of digital logic circuits in the form of state model approach.
- To provide an overview of system design approach using programmable logic devices.
- To provide and understand of fault models and test methods.

Course Outcomes:
- To understands the minimization of Finite state machine.
- To exposes the design approaches using ROM's, PAL's and PLA's.
- To provide in depth understanding of Fault models.
- To understands test pattern generation techniques for fault detection.
- To design fault diagnosis in sequential circuits.

UNIT- I: Minimization and Transformation of Sequential Machines
The Finite State Model – Capabilities and limitations of FSM – State equivalence and machine minimization – Simplification of incompletely specified machines.
Fundamental mode model – Flow table – State reduction – Minimal closed covers – Races, Cycles and Hazards.

UNIT- II: Digital Design
Digital Design Using ROMs, PALs and PLAs , BCD Adder, 32 – bit adder, State graphs for control circuits, Scoreboard and Controller, A shift and add multiplier, Array multiplier, Keypad Scanner, Binary divider.

UNIT - III: SM Charts
State machine charts, Derivation of SM Charts, Realization of SM Chart, Implementation of Binary Multiplier, dice game controller.

UNIT- IV: Fault Modeling & Test Pattern Generation
Logic Fault model – Fault detection & Redundancy- Fault equivalence and fault location –Fault dominance – Single stuck at fault model – Multiple stuck at fault models –Bridging fault model.
Fault diagnosis of combinational circuits by conventional methods – Path sensitization techniques, Boolean Difference method – Kohavi algorithm – Test algorithms – D algorithm, PODEM, Random testing, Transition count testing, Signature analysis and test bridging faults.

UNIT- V: Fault Diagnosis in Sequential Circuits
Circuit Test Approach, Transition Check Approach – State identification and fault detection experiment, Machine identification, Design of fault detection experiment

TEXT BOOKS:
1. Fundamentals of Logic Design – Charles H. Roth, 5th ed., Cengage Learning.
2. Digital Systems Testing and Testable Design – Miron Abramovici, Melvin A. Breuer and Arthur D. Friedman- John Wiley & Sons Inc.
3. Logic Design Theory – N. N. Biswas, PHI

REFERENCE BOOKS:
1. Switching and Finite Automata Theory – Z. Kohavi , 2nd ed., 2001, TMH
2. Digital Design – Morris Mano, M.D.Ciletti, 4th Edition, PHI.
3. Digital Circuits and Logic Design – Samuel C. Lee , PHI

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ELECTRONIC MEASUREMENTS AND INSTRUMENTATION (PE-II)

Prerequisite : Basic Electrical and Electronics Engineering

Course Objectives:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

On completion of this course student can be able to

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

UNIT I:

Block Schematics of Measuring Systems: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag ;Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

UNIT II:

Signal Analyzers: AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

UNIT III:

Oscilloscopes: CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

Special Purpose Oscilloscopes: Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

UNIT IV:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

UNIT V:

Bridges: Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

Measurement of Physical Parameters: Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature -Measurements, Data Acquisition Systems.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.
3. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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SCRIPTING LANGUAGES
(PE-II)

Prerequisite : Nil

Course Objectives: The goal of the course is to study:
- The principles of scripting languages.
- Motivation for and applications of scripting.
- Difference between scripting languages and non- scripting languages.
- Types of scripting languages.
- Scripting languages such as PERL, TCL/TK, python and BASH.
- Creation of programs in the Linux environment.
- Usage of scripting languages in IC design flow.

Course Outcomes:
Upon learning the course, the student will have the:

- Ability to create and run scripts using PERL/TCl/Python in IC design flow.
- Ability to use Linux environment and write programs for automation of scripts in VLSI tool design flow.

Unit – 1 : Linux Basics
Introduction to Linux , File System of the Linux, General usage of Linux kernel & basic commands, Linux users and group, Permissions for file, directory and users, searching a file & directory, zipping and unzipping concepts.

Unit – 2 : Linux Networking
Introduction to Networking in Linux, Network basics & Tools, File Transfer Protocol in Linux, Network file system, Domain Naming Services, Dynamic hosting configuration Protocol & Network information Services.

Unit – 3 : Perl Scripting.
Introduction to Perl Scripting, working with simple values, Lists and Hashes, Loops and Decisions, Regular Expressions, Files and Data in Perl Scripting, References & Subroutines, Running and Debugging Perl, Modules, Object – Oriented Perl.

Unit – 4 : Tcl / Tk Scripting
Tcl Fundamentals, String and Pattern Matching, Tcl Data Structures, Control Flow Commands, Procedures and Scope, Evel, Working with Unix, Reflection and Debugging, Script Libraries, Tk Fundamentals, Tk by examples, The Pack Geometry Manager, Binding Commands to X Events, Buttons and Menus, Simple Tk Widgets, Entry and List box Widgets Focus, Grabs and Dialogs.

Unit – 5 : Python Scripting.
Introduction to Python, using the Python Interpreter, More Control Flow Tools, Data Structures, Modules, Input and Output, Errors and Exceptions, Classes, Brief Tour of the Standard Library.

Text Books:
1. Python Tutorial by Guido Van Rossum, Fred L. Drake Jr. editor , Release 2.6.4
2. Practical Programming in Tcl and Tk by Brent Welch, Updated for Tcl 7.4 and Tk 4.0.
3. Teach Yorself Perl in 21 days by David Till.
4. Red Hat Enterprise Linux 4 : System Administration Guide Copyright, 2005 Red Hat Inc.

Reference Books:
1. Learning Python – 2nd Ed., Mark Lutz and David Ascher, 2003, O'Reilly.
2. Perl in 24 Hours – 3rd Ed., Clinton Pierce, 2005, Sams Publishing.
3. Learning Perl – 4th Ed. Randal Schwartz, Tom Phoenix and Brain d foy. 2005.
4. Jython Essentials – Samuele Pedroni and Noel Pappin.2002. O'Reilly.
5. Programming Perl – Larry Wall, Tom Christiansen and John Orwant, 3rd Edition, O'Reilly, 2000. (ISBN 0596000278)

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MICROPROCESSORS AND MICROCONTROLLERS

Prerequisite : Computer Organization and Operating Systems

Course Objectives:

- To develop an understanding of the operations of microprocessors and micro controllers; machine language programming and interfacing techniques.

Course Outcomes:

- Understands the internal architecture and organization of 8086, 8051 and ARM processors/controllers.
- Understands the interfacing techniques to 8086 and 8051 and can develop assembly language programming to design microprocessor/ micro controller based systems.

UNIT -I:

8086 Architecture: 8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

Instruction Set and Assembly Language Programming of 8086: Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

UNIT -II:

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

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

UNIT –III:

I/O And Memory Interface: LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

Serial Communication and Bus Interface: Serial Communication Standards, Serial Data Transfer Scheme, On board Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication Interfaces-RS232,USB.

UNIT –IV:

ARM Architecture: ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

Unit – V:

Advanced ARM Processors: Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

TEXT BOOKS:

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2nd Edition 2006.
2. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3rd Ed.
3. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012

REFERENCE BOOKS:

1. Microprocessors and Interfacing, D. V. Hall, TMGH, 2nd Edition 2006.
2. Introduction to Embedded Systems, Shibu K.V, TMH, 2009
3. The 8051Microcontrollers, Architecture and Programming and Applications -K.Uma Rao, Andhe Pallavi, Pearson, 2009.
4. ARM Reference Manuals
5. Digital Signal Processing and Applications with the OMAP-L138 Experimenter, Donald Reay,WILEY.

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DIGITAL SIGNAL PROCESSING

Prerequisite : Signals and Systems

Course Objectives:

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

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

Course Outcomes:

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

- Perform time, frequency and Z -transform analysis on signals and systems.
- Understand the inter-relationship between DFT and various transforms.
- Understand the significance of various filter structures and effects of round off errors.
- Design a digital filter for a given specification.
- Understand the fast computation of DFT and appreciate the FFT processing.
- Understand the tradeoffs between normal and multi rate DSP techniques and finite length word effects.

Unit I:

Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems

Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

Unit II:

Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform, Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT, and FFT with General Radix-N.

Unit III:

IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

Unit IV:

FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response, Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

Unit V:

Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Upsampling, Interpolation, Sampling Rate Conversion, Conversion of Band Pass Signals, Concept of Resampling.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS:

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

REFERENCES:

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

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ADVANCED ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

1. Introduction

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

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

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

2. Objectives:

This Lab focuses on using multi-media instruction for language development to meet the following targets:

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

Learning Outcomes

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

3. Syllabus:

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

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

5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

4. Minimum Requirement:

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

- Spacious room with appropriate acoustics
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

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

6. Suggested Software:

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

- **Oxford Advanced Learner's Compass**, 8th Edition
- **DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider**, by Dreamtech
- **TOEFL & GRE** (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)
- **The following software from 'train2success.com'**
  - **Preparing for being Interviewed**
  - **Positive Thinking**
  - **Interviewing Skills**
  - **Telephone Skills**
  - **Time Management**

7. Books Recommended:

1. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
2. **English Language Communication : A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
3. **Advanced Communication Skills Laboratory Manual** by Sudha Rani, D, Pearson Education 2011.
4. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. **Business and Professional Communication:** Keys for Workplace Excellence. Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications. 2011.
6. **The Basics of Communication: A Relational Perspective**. Steve Duck & David T. McMahan. Sage South Asia Edition. Sage Publications. 2012.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Management Shapers Series** by Universities Press(India)Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
10. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. **Handbook for Technical Writing** by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
13. **Master Public Speaking** by Anne Nicholls, JAICO Publishing House, 2006.

14. **English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.**
15. Books on **TOEFL/GRE/GMAT/CAT/ IELTS** by Barron's/DELTA/Cambridge University Press.
16. **International English for Call Centres** by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

DISTRIBUTION AND WEIGHTAGE OF MARKS:

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

1. The practical examinations for the ACS Laboratory practice shall be conducted as per the University norms prescribed for the core engineering practical sessions.
2. For the English Language lab sessions, there shall be continuous evaluation during the year for 25 sessional marks and 50 End Examination marks. Of the 25 marks, 15 marks shall be awarded for day-to-day work and 10 marks to be awarded by conducting Internal Lab Test(s). The End Examination shall be conducted by the teacher concerned, by inviting the External Examiner from outside. In case of the non-availability of the External Examiner, other teacher of the same department can act as the External Examiner.

Mini Project: As a part of Internal Evaluation

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

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

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DIGITAL SIGNAL PROCESSING LAB

The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Equivalent) and Hardware (Using TI / Analog Devices / Motorola / Equivalent DSP processors).

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations
2. Histogram of White Gaussian Noise and Uniformly Distributed Noise.
3. To find DFT / IDFT of given DT Signal
4. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
5. Obtain Fourier series coefficients by formula and using FET and compare for half sine wave.
6. Implementation of FFT of given Sequence
7. Determination of Power Spectrum of a given Signal(s).
8. Implementation of LP FIR Filter for a given Sequence/Signal.
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Narrow Band Signal through Filtering
11. Generation of DTMF Signals
12. Implementation of Decimation Process
13. Implementation of Interpolation Process
14. Implementation of I/D Sampling Rate Converters
15. Impulse Response of First order and Second Order Systems.

Note: - Minimum of 12 experiments has to be conducted.

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MICROPROCESSORS AND MICROCONTROLLERS LAB

Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32 Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

Cycle 2: Using 8051 Microcontroller Kit (6 weeks)

- Introduction to Keil IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of 8051.
  3. Serial Communication from / to 8051 to / from I/o devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency on P2.1 Using Timer0 8051 in 8bit Auto reload Mode and Connect a 1HZ Pulse to INT1 pin and Display on Port0.Assume Crystal Frequency as 11.0592MHZ

Cycle 3: Interfacing I/O Devices to 8051(5 Weeks)

1. 7 Segment Display to 8051.
2. Matrix Keypad to 8051.
3. Sequence Generator Using Serial Interface in 8051.
4. 8bit ADC Interface to 8051.
5. Triangular Wave Generator through DAC interfaces to 8051.

BOOKS:

1. Advanced Microprocessors And Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 **Microcontrollers**: Architecture, Programming & Applications by Dr. K. Uma Rao,

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MICROWAVE ENGINEERING

Prerequisite : Electromagnetic Theory and Transmission Lines ;
Antennas and wave Propagation

Course Objectives:

This is a core course in Microwave Communications domain, and covers contents related to Microwave Theory and Techniques. The main objectives of the course are ….

- To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
- To develop the theory related to microwave transmission lines, and to determine the characteristics of rectangular waveguides, microstrip lines, and different types of waveguide components and ferrite devices.
- To distinguish between different types of microwave tubes, their structures and principles of microwave power generation, and to characterize their performance features and applications - at tube levels as well as with solid state devices.
- To impart the knowledge of Scattering Matrix, its formulation and utility, and establish the S-Matrix for various types of microwave junctions.
- To understand the concepts of microwave measurements, identify the equipment required and precautions to be taken, and get familiarized with the methods of measurement of microwave power and various other microwave parameters.

Course Outcomes :

Having gone through this course covering different aspects of microwave theory and techniques, the students would be able to

- To analyze completely the rectangular waveguides, their mode characteristics, and design waveguides for solving practical microwave transmission line problems.
- To distinguish between the different types of waveguide and ferrite components, explain their functioning and select proper components for engineering applications.
- To distinguish between the methods of power generation at microwave frequencies, derive the performance characteristics of 2-Cavity and Relfex Klystrons, Magnetrons, TWTs and estimate their efficiency levels, and solve related numerical problems
- To realize the need for solid state microwave sources, understand the concepts of TEDs, RWH Theory and explain the salient features of Gunn Diodes and ATT Devices.
- To establish the properties of Scattering Matrix, formulate the S-Matrix for various microwave junctions, and understand the utility of S-parameters in microwave component design.
- To set up a microwave bench, establish the measurement procedure and conduct the experiments in microwave lab for measurement of various microwave parameters.

UNIT I:

Microwave Transmission Lines - I: Introduction, Microwave Spectrum and Bands, Applications of Microwaves. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Filter Characteristics, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Mode Characteristics – Phase and Group Velocities, Wavelengths and Impedance Relations, Illustrative Problems.

Rectangular Guides - Power Transmission and Power Losses, Impossibility of TEM Mode. Micro strip Lines– Introduction, Z_o Relations, Effective Dielectric Constant, Losses, Q factor.

UNIT II:

Cavity Resonators– Introduction, Rectangular Cavities, Dominant Modes and Resonant Frequencies, Q Factor and Coupling Coefficients, Illustrative Problems

Waveguide Components and Applications: Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Different Types, Resistive Card and Rotary Vane Attenuators; Waveguide Phase Shifters – Types, Dielectric and Rotary Vane Phase Shifters, Waveguide Multiport Junctions – E plane and H plane Tees, Magic Tee. Directional Couplers – 2 Hole, Bethe Hole types, Illustrative Problems

Ferrites– Composition and Characteristics, Faraday Rotation, Ferrite Components – Gyrator, Isolator, Circulator.

UNIT III:

Microwave Tubes: Limitations and Losses of conventional Tubes at Microwave Frequencies, Microwave Tubes – O Type and M Type Classifications, O-type Tubes : 2 Cavity Klystrons – Structure, Reentrant Cavities, Velocity Modulation Process and Applegate Diagram, Bunching Process and Small Signal Theory – Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical Theory of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics, Effect of Repeller Voltage on Power O/P, Illustrative Problems.

Helix TWTs: Significance, Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

UNIT IV:

M-Type Tubes:

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics, Illustrative Problems

Microwave Solid State Devices: Introduction, Classification, Applications. TEDs – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Basic Modes of Operation - Gunn Oscillation Modes, LSA Mode, Introduction to Avalanche Transit Time Devices.

UNIT V:

Scattering Matrix– Significance, Formulation and Properties, S Matrix Calculations for – 2 port Junctions, E plane and H plane Tees, Magic Tee, Circulator and Isolator, Illustrative Problems.

Microwave Measurements:

Description of Microwave Bench – Different Blocks and their Features, Errors and Precautions, Microwave Power Measurement, Bolometers. Measurement of Attenuation, Frequency. Standing Wave Measurements – Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

TEXT BOOKS:

1. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Edition, 2003.
2. Microwave Principles – Herbert J. Reich, J.G. Skalnik, P.F. Ordung and H.L. Krauss, CBS Publishers and Distributors, New Delhi, 2004.

REFERENCES:

1. Foundations for Microwave Engineering – R.E. Collin, IEEE Press, John Wiley, 2nd Edition, 2002.
2. Microwave Circuits and Passive Devices – M.L. Sisodia and G.S.Raghuvanshi, Wiley Eastern Ltd., New Age International Publishers Ltd., 1995.
3. Microwave Engineering Passive Circuits – Peter A. Rizzi, PHI, 1999.
4. Electronic and Radio Engineering – F.E. Terman, McGraw-Hill, 4th Ed., 1955.
5. Microwave Engineering – A. Das and S.K. Das, TMH, 2nd Ed., 2009.

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RADAR SYSTEMS
(PE -III)

Prerequisite : Microwave Engineering

Course Objectives:
This is a system oriented course and needs the knowledge of Signal and Systems, EM Theory and Transmission Lines, Antennas and Wave Propagation, and Microwave Engineering. The main objectives of this course are …

- To understand the working principle of a radar, identify the frequency bands, and formulate the complete radar range equation, listing out all the losses to be accounted for.
- To identify the need for modulation and Doppler effect; to get acquainted with the working principles of CW radar, FM-CW radar.
- To impart the knowledge of functioning of MTI radar and its variants; to establish the DLC features and to bring out the MTI radar performance limitations.
- To establish the principle of Tracking Radar and differentiate between different types of tracking radars, identifying their principle of operation with necessary schematics.
- To explain the concept of a Matched Filter in radar receiver, and to configure its response characteristics; to impart the working knowledge of different receiver blocks – duplexers, displays, phased array antennas, their requirements and utilities.

Course Outcomes :
Having gone through this course on Radar Systems, the students would be able to …..

- Explain the working principle of a pulse radar and establish the complete radar range equation, identifying the significance and choice of all parameters involved, and solve numerical problems to establish the radar characteristics.
- Account for the need and functioning of CW, FM-CW and MTI radars, identifying the complete block diagrams and establishing their characteristics.
- Illustrate the DLC characteristics, account for the range gated Doppler filter bank, and estimate the MTI radar performance characteristics and limitations.
- Distinguish between Sequential Lobing, Conical Scan, Monopulse type of Tracking Radars, specify their requirements and compare their characteristic features.
- Derive the matched filter response characteristics for radar applications and account for correlation receivers; to distinguish between different radar displays and duplexers.
- Account for the electronic scanning principle, and implement the same through phased array antennas, knowing their requirements and utilities.

UNIT–I:

Basics of Radar : Introduction, Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation, Illustrative Problems.

Radar Equation : SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets , Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment), Illustrative Problems.

UNIT–II:

CW and Frequency Modulated Radar : Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non-zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar. Illustrative Problems

FM-CW Radar: Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

UNIT-III:

MTI and Pulse Doppler Radar: Introduction, Principle, MTI Radar with - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

UNIT –IV:

Tracking Radar: Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

UNIT –V:

Detection of Radar Signals in Noise : Introduction, Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

Radar Receivers – Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

TEXT BOOKS:

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2nd Ed., 2007.

REFERENCE BOOKS:

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013
4. Introduction to Radar Systems, 3rd edition – M.I. Skolnik, TMH Ed., 2005

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OPTICAL COMMUNICATIONS
(PE - III)

Prerequisite Subject: None

Course Objectives:

The objectives of the course are:

1. To realize the significance of optical fibre communications.
2. To understand the construction and characteristics of optical fibre cable.
3. To develop the knowledge of optical signal sources and power launching.
4. To identify and understand the operation of various optical detectors.
5. To understand the design of optical systems and WDM.

Course Outcomes:

1. At the end of the course, the student will be able to:
2. Understand and analyze the constructional parameters of optical fibres.
3. Be able to design an optical system.
4. Estimate the losses due to attenuation, absorption, scattering and bending.
5. Compare various optical detectors and choose suitable one for different applications.

UNIT -I:

Overview of Optical Fiber Communication: - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

Single Mode Fibers- Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

UNIT -II:

Signal Distortion in Optical Fibers: Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

UNIT -III:

Fiber Splicing: Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss-Multimode Fiber Joints, Single Mode Fiber Joints.

Optical Sources- LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

Source to Fiber Power Launching: - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

UNIT -IV:

Optical Detectors: Physical Principles of PIN and APD, Detector Response Time, Temperature Effect on Avalanche Gain, Comparison of Photo Detectors, Optical Receiver Operation- Fundamental Receiver Operation, Digital Signal Transmission, Error Sources, Receiver Configuration, Digital Receiver Performance, Probability of Error, Quantum Limit, Analog Receivers.

UNIT -V:

Optical System Design: Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples.

Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

TEXT BOOKS:

1. Optical Fiber Communications – Gerd Keiser, TMH, 4th Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3rd Edition, 2009.

REFERENCE BOOKS:

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Ediition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.
5. Optical Communication Systems – John Gowar, 2nd Edition, PHI, 2001.

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SATELLITE COMMUNICATIONS
(PE-III)

Prerequisite: Analog Communications and Digital Communications

Course Objectives :

The course objectives are:

- To prepare students to excel in basic knowledge of satellite communication principles
- To provide students with solid foundation in orbital mechanics and launches for the satellite communication
- To train the students with a basic knowledge of link design of satellite with a design examples.
- To provide better understanding of multiple access systems and earth station technology
- To prepare students with knowledge in satellite navigation and GPS & and satellite packet communications.

Course Outcomes:

At the end of the course,

- Students will understand the historical background, basic concepts and frequency allocations for satellite communication
- Students will demonstrate orbital mechanics, launch vehicles and launchers
- Students will demonstrate the design of satellite links for specified C/N with system design examples.
- Students will be able to visualize satellite sub systems like Telemetry, tracking, command and monitoring power systems etc.
- Students will understand the various multiple access systems for satellite communication systems and satellite packet communications.

UNIT I:

Introduction: Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

Orbital Mechanics and Launchers: Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

UNIT II:

Satellite Subsystems: Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and Space Qualification.

UNIT III:

Satellite Link Design: Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

Multiple Access: Frequency Division Multiple Access (FDMA), Intermodulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

Unit IV:

Earth Station Technology: Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

Unit V:

Low Earth Orbit and Geo-Stationary Satellite Systems: Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

Satellite Navigation & Global Positioning System : Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

TEXT BOOKS:

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Edition, 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Edition, Pearson Publications, 2003.

REFERENCES:

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2nd Edition, 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5th Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4th Edition, 2009.

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ARTIFICIAL NEURAL NETWORKS
(PE - III)

Prerequisite Subject: None

Course Objectives:
1. To understand the biological neural network and to model equivalent neuron models.
2. To understand the architecture, learning algorithm and issues of various feed forward and feedback neural networks.

Course Outcomes:
By completing this course the student will be able to:
1. Create different neural networks of various architectures both feed forward and feed backward.
2. Perform the training of neural networks using various learning rules.
3. Perform the testing of neural networks and do the perform analysis of these networks for various pattern recognition applications.

UNIT-I:
Introduction: A Neural Network, Human Brain, Models of a Neuron, Neural Networks viewed as Directed Graphs, Network Architectures, Knowledge Representation, Artificial Intelligence and Neural Networks
Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning, Credit Assignment Problem, Memory, Adaption, Statistical Nature of the Learning Process

UNIT-II:
Single Layer Perceptrons: Adaptive Filtering Problem, Unconstrained Organization Techniques, Linear Least Square Filters, Least Mean Square Algorithm, Learning Curves, Learning Rate Annealing Techniques, Perceptron –Convergence Theorem, Relation Between Perceptron and Bayes Classifier for a Gaussian Environment
Multilayer Perceptron: Back Propagation Algorithm XOR Problem, Heuristics, Output Representation and Decision Rule, Computer Experiment, Feature Detection

UNIT-III:
Back Propagation: Back Propagation and Differentiation, Hessian Matrix, Generalization, Cross Validation, Network Pruning Techniques, Virtues and Limitations of Back Propagation Learning, Accelerated Convergence, Supervised Learning

UNIT-IV:
Self-Organization Maps (SOM): Two Basic Feature Mapping Models, Self-Organization Map, SOM Algorithm, Properties of Feature Map, Computer Simulations, Learning Vector Quantization, Adaptive Patter Classification

UNIT-V:
Neuro Dynamics: Dynamical Systems, Stability of Equilibrium States, Attractors, Neuro Dynamical Models, Manipulation of Attractors as a Recurrent Network Paradigm
Hopfield Models – Hopfield Models, Computer Experiment

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

REFERENCE BOOKS:
1. Artificial Neural Networks - B. Vegnanarayana Prentice Hall of India P Ltd 2005
2. Neural Networks in Computer Inteligance, Li Min Fu TMH 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

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ADVANCED DIGITAL SIGNAL PROCESSING
(PGC – I)

Course Objectives :

The objectives of this course are to make the student

1. Understand the design of various types of digital filters and implement them using various implementation structures and study the advantages & disadvantages of a variety of design procedures and implementation structures.
2. understand the concept and need for Multirate signal Processing and their applications in various fields of Communication & Signal Processing
3. understand difference between estimation & Computation of Power spectrum and the need for Power Spectrum estimation.
4. Study various Parametric & Non parametric methods of Power spectrum estimation techniques and their advantages & disadvantages
5. Understand the effects of finite word/register length used in hardware in implementation of various filters and transforms using finite precision processors.

Course Outcomes:

On completion of this course student will be able to

1. Design and implement a filter which is optimum for the given specifications.
2. Design a Mutirate system for the needed sampling rate and can implement the same using Polyphase filter structures of the needed order.
3. Estimate the power spectrum of signal corrupted by noise through a choice of estimation methods: Parametric or Non Parametric.
4. Can calculate the output Noise power of different filters due to various finite word length effects viz: ADC Quantization, product quantization, and can calculate the scaling factors needed to avoid Limit cycles: Zero input, overflow. Also they can decide the stability of the system by studying the effect due to coefficient quantization while implementing different filters and transforms.

UNIT –I:
Review of DFT, FFT, IIR Filters and FIR Filters.
Introduction to filter structures (IIR & FIR).Implementation of Digital Filters, specifically 2^{nd} Order Narrow Band Filter and 1^{st} Order All Pass Filter. Frequency sampling structures of FIR, Lattice structures, Forward prediction error, Backward prediction error, Reflection coefficients for lattice realization, Implementation of lattice structures for IIR filters, Advantages of lattice structures.

UNIT -II:
Non-Parametric Methods:
Estimation of spectra from finite duration observation of signals, Non-parametric Methods: Bartlett, Welch & Blackman-Tukey methods, Comparison of all Non-Parametric methods

UNIT - III:
Parametric Methods:
Autocorrelation & Its Properties, Relation between auto correlation & model parameters, AR Models - Yule-Walker & Burg Methods, MA & ARMA models for power spectrum estimation, Finite word length effect in IIR digital Filters – Finite word-length effects in FFT algorithms.

UNIT –IV:

Multi Rate Signal Processing: Introduction, Decimation by a factor D, Interpolation by a factor I, Sampling rate conversion by a rational factor I/D, Multistage Implementation of Sampling Rate Conversion, Filter design & Implementation for sampling rate conversion. Examples of up-sampling using an All Pass Filter.

UNIT –V:

Applications of Multi Rate Signal Processing

Design of Phase Shifters, Interfacing of Digital Systems with Different Sampling Rates, Implementation of Narrow Band Low Pass Filters, Implementation of Digital Filter Banks, Subband Coding of Speech Signals, Quadrature Mirror Filters, Transmultiplexers, Over Sampling A/D and D/A Conversion.

TEXT BOOKS:

1. Digital Signal Processing: Principles, Algorithms & Applications - J.G.Proakis& D. G. Manolakis, 4th Ed., PHI.
2. Discrete Time signal processing - Alan V Oppenheim & Ronald W Schaffer, PHI.
3. DSP – A Practical Approach – Emmanuel C. Ifeacher, Barrie. W. Jervis, 2 ed., Pearson Education.

REFERENCE BOOKS:

1. Modern spectral Estimation: Theory & Application – S. M .Kay, 1988, PHI.
2. Multi Rate Systems and Filter Banks – P.P.Vaidyanathan – Pearson Education.
3. Digital Signal Processing: A Practitioner's Approach, Kaluri V. Rangarao, Ranjan K. Mallik ISBN: 978-0-470-01769-2, 210 pages, November 2006 John Weley.
4. Digital Signal Processing – S.Salivahanan, A.Vallavaraj, C.Gnanapriya, 2000,TMH

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TRANSFORM TECHNIQUES
(PG E - I)

Prerequisite: None

Course Objectives:
1. To learn basics of two dimensional transform.
2. Understand the various two dimensional transform definition, properties and applications.
3. Understand the design of filter Bank structure.
4. To learn the fundamentals of wavelet transform and special wavelets.

Course Outcomes:
1. The student will learn basics of two dimensional transforms.
2. Understand the definition, properties and applications of various two dimensional transform.
3. Understand the basic concepts of wavelet transform.
4. Understand the special topics such as wavelet packets, Bi-orthogonal wavelets e.t.c.

UNIT -I: Fourier Analysis
Vector space, Hilbert spaces, Fourier basis, FT- Limitations of Fourier Analysis, Need for time-frequency analysis, DFT, 2D-DFT: Definition, Properties and Applications, IDFT, Hilbert Transform, STFT.

UNIT -II: Transforms
Walsh, Hadamard, Haar and Slant Transforms, DCT, DST, KLT,– definition, properties and applications

UNIT -III: Continuous Wavelet Transform (CWT)
Short comings of STFT, Need for wavelets, Wavelet Basis- Concept of Scale and its relation with frequency, Continuous time wavelet Transform Equation- Series Expansion using Wavelets- CWT-Tiling of time scale plane for CWT. Important Wavelets: Haar, Mexican Hat, Meyer, Shannon, Daubechies.

UNIT -IV: Multi Rate Analysis and DWT:
Need for Scaling function – Multi Resolution Analysis, Two-Channel Filter Banks, Perfect Reconstruction Condition, Relationship between Filter Banks and Wavelet Basis, DWT, Structure of DWT Filter Banks, Daubechies Wavelet Function, Applications of DWT.

UNIT -V: Special Topics:
Wavelet Packet Transform, Multidimensional Wavelets, Bi-orthogonal basis- B-Splines, Lifting Scheme of Wavelet Generation, Multi Wavelets

TEXT BOOKS:
1. Wavelet Transforms-Introduction theory and applications -Raghuveer M.Rao and Ajit S. Bopardikar, Pearson Edu, Asia, New Delhi, 2003.
2. “Insight into Wavelets from Theory to practice “, Soman. K. P, Ramachandran. K.I, Printice Hall India, First Edition, 2004.

REFERENCE BOOKS:
1. “Fundamentals of Wavelets- Theory, Algorithms and Applications”, Jaideva C Goswami, Andrew K Chan, John Wiley & Sons, Inc, Singapore, 1999.
2. “Wavelets and sub-band coding”, Vetterli M. Kovacevic, PJI, 1995.
3. “Introduction to Wavelets and Wavelet Transforms”, C. Sydney Burrus, PHI, First Edition, 1997.
4. “A Wavelet Tour of Signal Processing”, Stephen G. Mallat,. Academic Press, Second Edition
5. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar – TMH,2009

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BIOMEDICAL SIGNAL PROCESSING
(PG E - I)

Prerequisite: Advanced Digital Signal Processing

Course Objectives:
The main objectives of the course are :
1. To use basic probability theory to model random signals in terms of Random Processes.
2. To derive the noise power Spectral Density of Random signals and its analysis.
3. To understand lossless and lossy compression techniques related to ECG data.
4. To understand various cardilogical signal processing techniques and noise cancellation techniques.
5. To understand estimation of signals using Prony's and least square and linear prediction methods.
6. To analyze evoked potentials.
7. To comprehend EEG signals, modeling and sleep stages.

Course Outcomes:
After studying the course , each student is expected to be able to :
1. Use probability theory to model random processes.
2. Analyze random signals using power spectral densities.
3. Compare various lossless and lossy techniques.
4. Compare various ECG processing and noise cancellation techniques.
5. Analyze evoked potentials.
6. Model and estimate EEG signals and various sleep stages.

UNIT -I:
Random Processes
Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

UNIT -II:
Data Compression Techniques: Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

UNIT -III:
Cardiological Signal Processing: Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.
Adaptive Noise Cancelling: Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

UNIT -IV:
Signal Averaging, Polishing – Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

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

TEXT BOOKS:

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4th Ed., 2009, TMH.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, 2005, TMH.

REFERENCE BOOKS:

1. Digital Bio Dignal Processing - Weitkunat R, 1991, Elsevier.
2. Biomedical Signal Processing - Akay M , IEEE Press.
3. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, 1986, CRC Press.
4. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI.

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RF CIRCUIT DESIGN
(PG E – I)

Perquisite : None

Course Objectives:
The course objectives are:
1. To educate students fundamental RF circuit and system design skills.
2. To introduce students the basic transmission line theory, single and multiport networks, RF component modeling.
3. To offer students experience on designing matching and biasing networks & RF transistor amplifier design.

Course Outcomes:
Upon completion of the course, the students will be able to:
1. Explore fundamental RF circuit and system design skills.
2. Understand the basic transmission line theory, single and multiport networks, RF component modeling.
3. Design matching and biasing networks & RF transistor amplifiers.

UNIT I: Introduction:
Importance of RF Design-Dimensions and Units-Frequency Spectrum-RF Behaviour of Passive Components: High Frequency Resistors, High Frequency Capacitors, High Frequency Inductors.-Chip Components and Circuit Board Considerations: Chip Resistors, Chip Capacitors, and Surface Mount Inductors.
Review of Transmission Lines:
Types of Transmission Lines-Equivalent Circuit representation-R, L, C, G parameters of Different Line configurations-Terminated Lossless Transmission Lines-Special Terminations: Short Circuit, Open Circuit and Quarter Wave Transmission Lines- Sourced and Loaded Transmission Lines: Power Considerations, Input Impedance Matching, Return Loss and Insertion Loss.

UNIT II: Single and Multi-Port Networks:
The Smith Chart: Reflection Coefficient, Normalized Impedance-Impedance Transformation: Standing wave Ratio, Special Transformation Conditions-Admittance Transformation-Parallel and Series RL & RC Connections-Basic Definitions of Single and Multi-Port Networks-Interconnecting Networks.
RF Filter Design:
Scattering Parameters: Definition, Meaning, Chain Scattering Matrix, Conversion Between S- and Z-parameters, Signal Flow Chart Modeling, Generalization-Basic Resonator and Filter Configurations: Low Pass, High Pass, Band Pass and Band Stop type Filters-Filter Implementation using Unit Element and Kuroda's Identities Transformations-Coupled Filters.

UNIT III: Active RF Component Modelling:
RF Diode Models: Nonlinear and Linear Models-Transistor Models: Large Signal and Small Signal BJT Models, Large Signal and Small Signal FET Models- Scattering Parameter, Device Characterization.

UNIT IV: Matching and Biasing Networks:
Impedance Matching Using Discrete Components: Two Component Matching Networks,
Forbidden Regions, Frequency Response and Quality Factor, T and Pi Matching Networks-Amplifier Classes of Operation and Biasing Networks: Classes of Operation and Efficiency of Amplifiers, Biasing Networks for BJT, Biasing Networks for FET.

UNIT V: RF Transistor Amplifier Design:
Characteristics of Amplifiers- Amplifier Power Relations: RF Source, Transducer Power Gain, Additional Power Relations-Stability Considerations: Stability Circles, Unconditional Stability, And

Stabilization Methods-Unilateral and Bilateral Design for Constant Gain- Noise Figure Circles-Constant VSWR Circles.

RF Oscillators and Mixers:
Basic Oscillator Model: Negative Resistance Oscillator, Feedback Oscillator Design, Design steps, Quartz Oscillators- Fixed Frequency High Frequency Oscillator -Basic Characteristics of Mixers: Concepts, Frequency Domain Considerations, Single Ended Mixer Design, Single and Double Balanced Mixers.

TEXT BOOKS:
1. RF Circuit Design – Theory and Applications by Reinhold Ludwig, Pavel Bsetchko – Pearson Education India, 2000.
2. Radio Frequency and Microwave Communication Circuits – Analysis and Design by Devendra K.Misra – Wiley Student Edition – John Wiley & Sons, Inc.

REFERENCES:
1. Radio Frequency and Microwave Electronics – Illustrated by Matthew M. Radmanesh – PEI.
2. RF Circuit Design – Christopher Bowick, Cheryl Aljuni and John Biyler, Elsevier Science, 2008.
3. Secrets of RF Circuit Design by Joseph J.Carr, TMH, 2000.
4. Design of RF and Microwave Amplifiersand Oscillators, Peter L.D. Abrif, Artech House, 2000.
5. The Design of CMOS Radio Frequency Integrated Circuits by Thomas H.Lee , 2/e – Cambridge University Press, 2004.

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VLSI TECHNOLOGY AND DESIGN
(PG E - II)

Prerequisite: VLSI

Course Objectives:
1) Students from other engineering background to get familiarize with large scale integration technology.
2) To expose fabrication methods, layout and design rules.
3) Learn methods to improve Digital VLSI system's performance.
4) To know about VLSI Design constraints.
5) Visualize CMOS Digital Chip Design.

Course Outcomes:
1) Review of FET fundamentals for VLSI design.
2) To acquires knowledge about stick diagrams and layouts.
3) Enable to design the subsystems based on VLSI concepts.

UNIT –I:
Review of Microelectronics and Introduction to MOS Technologies:
MOS, CMOS, BiCMOS Technology. Basic Electrical Properties of MOS, CMOS & BiCMOS Circuits: Ids – Vds relationships, Threshold Voltage VT, Gm, Gds and ωo, Pass Transistor, MOS, CMOS & Bi CMOS Inverters, Zpu/Zpd, MOS Transistor circuit model, Latch-up in CMOS circuits.

UNIT –II:
Layout Design and Tools:
Transistor structures, Wires and Vias, Scalable Design rules, Layout Design tools.
Logic Gates & Layouts:
Static Complementary Gates, Switch Logic, Alternative Gate circuits, Low power gates, Resistive and Inductive interconnect delays.

UNIT –III:
Combinational Logic Networks:
Layouts, Simulation, Network delay, Interconnect design, Power optimization, Switch logic networks, Gate and Network testing.

UNIT –IV:
Sequential Systems:
Memory cells and Arrays, Clocking disciplines, Design, Power optimization, Design validation and testing.

UNIT –V:
Floor Planning:
Floor planning methods, Global Interconnect, Floor Plan Design, Off-chip connections.

TEXT BOOKS:
1. Essentials of VLSI Circuits and Systems, K. Eshraghian Eshraghian. D, A. Pucknell, 2005, PHI.
2. Modern VLSI Design – Wayne Wolf, 3rd Ed., 1997, Pearson Education.

REFERENCE BOOKS:
1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Principals of CMOS VLSI Design – N.H.E Weste, K. Eshraghian, 2nd Ed., Addison Wesley.

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ADVANCED DATA COMMUNICATIONS
(PG E - II)

Prerequisite : Digital Communication

Course Objectives:

1. To learn about basics of Data Communication networks, different protocols, standards and layering concepts.
2. To study about error detection and correction techniques.
3. Know about link layer protocol and point to point protocols.
4. To understand Medium Access Control sub layer protocols
5. To know about Switching circuits, Multiplexing and Spectrum Spreading techniques for data transmission.
6. To study Wired LANs different Ethernet standards

Course Outcomes:

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

1. Understand the concepts of Data Communication networks, different protocols, standards and layering.
2. Acquire the knowledge of error detection, forward and reverse error correction techniques.
3. Analyze link layer protocol and point to point protocols
4. Explain and compare the performance of different MAC protocols like Aloha, CSMA, CSMA/CA, TDMA, FDMA & CDMA.
5. Understand the features and the significance of Switching circuits, Multiplexing and Spectrum Spreading for data transmission .
6. Understand the characteristics of Wired LANs and also the operation and applications of Connecting Devices
7. Understand the services and functions of Network layer protocols.

Unit I

Data Communications, Networks and Network Types, Internet History, Standards and Administration, Protocol Layering, TCP/IP protocol suite, OSI Model. Digital Data Transmission, DTE-DCE interface.

Data Link Layer

Introduction, Data Link Layer, Nodes and Links, Services, Categories of Links, sub layers, Link Layer Addressing, Address Resolution Protocol.

Unit II

Error Detection and Correction: Types of Errors, Redundancy, detection versus correction, Coding Block Coding: Error Detection, Vertical redundancy cheeks, longitudinal redundancy cheeks, Error Correction, Error correction single bit, Hamming code.

Cyclic Codes: Cyclic Redundancy Check, Polynomials, Cyclic Code Encoder Using Polynomials, Cyclic Code Analysis, Advantage of Cyclic Codes, Checksum

Data Link Control: DLC Services, Data Link Layer Protocols, HDLC, Point to Point Protocol

Unit III

Media Access Control (MAC) Sub Layer

Random Access, Aloha, Carrier Sense Multiple Access (CSMA), Carrier Sense Multiple Access with Collision Avoidance (CSMA/CA), Controlled Access- Reservation, Polling- Token Passing, Channelization - Frequency Division Multiple Access (FDMA), Time - Division Multiple Access (TDMA), Code - Division Multiple Access (CDMA).

Unit IV

Switching: Introduction to Switching, Circuit Switched Networks, Packet Switching, Structure of switch

Multiplexing and Spectrum Spreading: Multiplexing, Frequency Division Multiplexing, Time Division Multiplexing, Spread Spectrum -Frequency Hopping Spread Spectrum and Direct Sequence Spread Spectrum.

Unit V

Wired LANS: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10 Giga bit Ethernet

Connecting Devices: Hubs, Link Layer Switches, Routers

Networks Layer: Packetizing, Routing and Forwarding, Packet Switching, Network Layer Performance, IPv4 Address, Address Space, Classful Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution(NATF), Forwarding of IP Packets, Forwarding based on Destination Address, Forwarding based on Label, Routing as Packet Switches.

TEXT BOOKS:

1. Data Communications and Networking - B. A. Forouzan, 5th , 2013,TMH.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data Communications and Networking - B. A. Forouzan, 2nd , 2013, TMH.
3. Data Communications and Computer Networks- Brijendra Singh, 2nd ed., 2005, PHI.

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DETECTION AND ESTIMATION THEORY
(PG E-II)

Prerequisite: RP& QT

Course Objectives:
1. The main objective of this course is to provide basic estimation and detection background for engineering applications.
2. This course provides the main concepts and algorithms for detection and estimation theory.
3. Students learn the statistics and estimating the parameters of Random Process from detection.

Course Outcomes:
1. Students will understand the basic detection methods.
2. Learn about basic estimation methods.
3. Gain ability to apply estimation method for real time engineering problems.

UNIT –I:
Random Processes: Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT –II:
Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)- minimum probability error with and without equal a priori probabilities, Neyman-Pearson Classifier, General Calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT –III:
Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real-time Digital Wiener Filters, Kalman Filters.

UNIT –IV:
Statistics: Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of Estimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear Regression, Multiple Linear Regression.

UNIT –V:
Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

TEXT BOOKS:
1. Random Signals: Detection, Estimation and Data Analysis – K. Sam Shanmugan & A.M. Breipohl, Wiley India Pvt. Ltd, 2011.
2. Random Processes: Filtering, Estimation and Detection – Lonnie C. Ludeman, Wiley India Pvt. Ltd., 2010.

REFERENCE BOOKS:
1. Fundamentals of Statistical Signal Processing: Volume I Estimation Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
2. Fundamentals of Statistical Signal Processing: Volume I Detection Theory– Steven.M.Kay, Prentice Hall, USA, 1998.
3. Introduction to Statistical Signal Processing with Applications – Srinath, Rajasekaran, Viswanathan, 2003, PHI.
4. Statistical Signal Processing: Detection, Estimation and Time Series Analysis – Louis L.Scharf, 1991, Addison Wesley.
5. Detection, Estimation and Modulation Theory: Part – I – Harry L. Van Trees, 2001, John Wiley & Sons, USA.
6. Signal Processing: Discrete Spectral Analysis – Detection & Estimation – Mischa Schwartz, Leonard Shaw, 1975, Mc Graw Hill.

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AD-HOC WIRELESS AND SENSOR NETWORKS
(PG E - III)

Prerequisite: Computer Networks

Course Objectives:
1. To study the fundamentals of wireless Ad-Hoc Networks.
2. To study the operation and performance of various Adhoc wireless network protocols.
3. To study the architecture and protocols of Wireless sensor networks.

Course Outcomes:
1. Students will be able to understand the basis of Ad-hoc wireless networks.
2. Students will be able to understand design, operation and the performance of MAC layer protocols of Adhoc wireless networks.
3. Students will be able to understand design, operation and the performance of routing protocol of Adhoc wireless network.
4. Students will be able to understand design, operation and the performance of transport layer protocol of Adhoc wireless networks.
5. Students will be able to understand sensor network Architecture and will be able to distinguish between protocols used in Adhoc wireless network and wireless sensor networks.

UNIT - I:
Wireless LANs and PANs
Introduction, Fundamentals of WLANS, IEEE 802.11 Standards, HIPERLAN Standard, Bluetooth, Home RF.
AD HOC WIRELESS NETWORKS
Introduction, Issues in Ad Hoc Wireless Networks.

UNIT - II:
MAC Protocols
Introduction, Issues in Designing a MAC protocol for Ad Hoc Wireless Networks, Design goals of a MAC Protocol for Ad Hoc Wireless Networks, Classifications of MAC Protocols, Contention - Based Protocols, Contention - Based Protocols with reservation Mechanisms, Contention – Based MAC Protocols with Scheduling Mechanisms, MAC Protocols that use Directional Antennas, Other MAC Protocols.

UNIT - III:
Routing Protocols
Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classification of Routing Protocols, Table –Driven Routing Protocols, On – Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power – Aware Routing Protocols.

UNIT – IV:
Transport Layer Protocols
Introduction, Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks, Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks, Classification of Transport Layer Solutions, TCP Over Ad Hoc Wireless Networks, Other Transport Layer Protocol for Ad Hoc Wireless Networks.

UNIT – V:

Wireless Sensor Networks

Introduction, Sensor Network Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network, Evolving Standards, Other Issues.

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI.
2. Wireless Ad- hoc and Sensor Networks: Protocols, Performance and Control - Jagannathan Sarangapani, CRC Press.

REFERENCE BOOKS:

1. Ad- Hoc Mobile Wireless Networks: Protocols & Systems, C.K. Toh , 1st Ed. Pearson Education.
2. Wireless Sensor Networks - C. S. Raghavendra, Krishna M. Sivalingam, 2004, Springer

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RANDOM PROCESSES AND QUEUING THEORY
(PG E – III)

Prerequisite: Probability Theory & Stochastic Processes

Course Objectives:
1. To expose the students to the random process and queuing theory related topics for their subsequent study of Computer Networks and wireless communication and Networks.

Course Outcomes: Students will be able to:
1. Understand Random variables as an intrinsic need for the analysis of random phenomena.
2. Evaluate and apply moments and Characteristics functions.
3. Understand the concept of random process spectral density of stationary process.
4. Understand the concepts of Markov Chains and queuing theory.
5. Understand the concepts of M| M|1, M|M|1|K, M|G|1 queuing Process.
6. Understand the modeling of telecommunication networks using appropriate queuing process.

UNIT I: RANDOM VARIABLE
Random Variables-Basic Definitions and properties, Sum of independent random variables, Minimum and Maximum of random variables, Comparisons between random variables, Moments of the random variables, Random variables in the field of telecommunications, Transformations of random variables- The probability generating function, the characteristic function of a pdf, The Laplace Transform of a pdf, Methods for the generation of random variables- Method of the inverse of the distribution function, Method of the transformation.

UNIT II: RANDOM PROCESSES
The Random Process Concept, Concept of Stationarity and Statistical Independence, First Order Stationary Processes, Second Order and Wide Sense Stationary, (N-Order) and Strict Sense Stationarity, Time Averages and Ergodicity, Mean Ergodic Processes, Correlation Ergodic Processes, Autocorrelation Function and its Properties, Cross Correlation function and its properties, Covariance Functions, The Power Spectrum- Properties, Relationship between Power spectrum and Autocorrelation function.

UNIT III: Markov Chains and Queuing Theory
Queues, Poisson arrival process- Sum of independent Poisson processes, Random splitting of a Poisson process, Compound Poisson processes, Birth death Markov chains, Formulation of Hidden Markov Model (HMM), building, evaluation and decoding of HMM, Notations for Queuing systems, The Little Theorem, M/M/1 queue analysis, M/M/1/K queue analysis, M/M/S queue analysis, M/M/S/S queue analysis, The M/M/∞ queue analysis, Distribution of the queuing delays in the FIFO case- M/M/1 case, M/M/S case.

UNIT IV: M/G/1 Queuing Theory
M/G/1 queue, M/G/1 system delay distribution in the FIFO case, Laplace Transform numerical inversion method, Generalizations of the M/G/1 theory, Different imbedding instants in the M/G/1 theory, M/G/1 with geometrically distributed messages.

UNIT V: Local Area Network Analysis
Introduction, Contention based protocols- Aloha, Slotted Aloha, Aloha Protocol with ideal capture effect, CSMA Schemes, Demand assignment protocols-Polling protocol, Token passing protocol, Analysis of token and polling Schemes, R-Aloha, PRMA protocol, Comparisons between CSMA/CD and Token Protocols, Fixed assignment Protocols- FDMA, TDMA, Resource reuse in cellular systems, CDMA.

TEXTBOOK

1. Queuing Theory and Telecommunications Networks and Applications, Springer, Giovanni Giambene.
2. Probability, Random Variables & Random Signal Principles-Peyton Z. Peebles, TMH, 4th Edition,2001.
3. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, PHI.

REFERENCE BOOKS:

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis, S. Unnikrishna Pillai – TMH, 2008
2. Probability and Random Processes with Applications to Signal Processing – Henry Stark, John W. Woods, 3rd Edition, Pearson
3. Probability and Stochastic Processes – A Friendly Introduction for Electrical and Computer Engineers – Roy D. Yates, David J. Goodman.

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TCP/ IP AND ATM NETWORKS
(PG E - III)

Prerequisite: Computer Networks

Course Objectives:

1. To study Network Layer Protocols, Next Generation IP protocols
2. To learn about User Datagram Protocol, Transmission Control Protocol and stream control Transmission protocol.
3. To understand techniques to improve QoS
4. To learn about the features of ATM networks. .
5. To study the various Interconnection Networks

Course Outcomes:

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

1. Get the concept of Network Layer Protocols and Transport Layer Protocols.
2. Understand and analyze about UDP, TCP AND SCTP protocols, flow and error control techniques.
3. Learn congestion control mechanisms and techniques to improve Quality of Service in switched networks
4. To understand features of Virtual circuit networks like ATM networks and their applications
5. Design and analyze various types of Inter connection Networks, understand the functioning of Folding , Benes, Lopping bit allocation algorithms and their significance.

Unit I

Network Layer Protocols: Internet Protocol (IP), ICMPv4, Mobile IP
Next Generation IP: IPv6, Addressing IPv6 Protocol, ICMPV6 Protocol, Transition from IPV4 to IPV6
Transport Layer: Introduction to Transport Layer, Transport Layer Protocols: Simple Protocols, Stop and Wait Protocols, Go Back N Protocol, Selective Repeat Protocol, Bidirectional Protocols: Piggybacking Transport layer protocols Services and Port Numbers.

Unit II

User Datagram Protocol: User Datagram, UDP Services, UDP Applications
Transmission Control Protocol: TCP Services, TCP Features, Segments, TCP Connection, State Transition Diagram, Windows in TCP, Flow and Error Control ,TCP Congestion Control, TCP Timers,
SCTP: SCTP Services, SCTP Features, Packet Format, An SCTP Association SCTP Flow and Error Control, TCP in Wireless Domain.

Unit III

Congestion Control and Quality of Service: Data Traffic, Congestion, Congestion Control, Quality of Service, Techniques to Improve QoS, Integrated Services, Differentiated Services, QoS in Switched Networks
Queue Management: Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

Unit IV

Virtual-Circuit Networks: Introduction, Frame relay Operation, Frame relay Layers, Congestion Control, Leaky Bucket algorithm.
ATM: Design Goals, ATM Architecture, Switching, Switch Fabric, ATM Layers, Service Classes, ATM Application.
SONET/SDH: Architecture, SONET Layers, SONET Frames, STS Multiplexing, SONET Networks

Unit V

Interconnection Networks

Introduction, Banyan Networks, Properties, Crossbar switch, Three stage Class networks, Rearrangeble Networks, Folding algorithm, Benes Networks, Lopping algorithm, Bit allocation algorithm.

TEXT BOOKS:

1. Data Communications and Networking - B. A.Forouzan, 5th edition, 2013, TMH.
2. High Performance TCP/IP Networking –Mahabub Hassan and Raj Jain ,PHI,2005

REFERENCE BOOKS:

1. ATM Fundamentals –N.N Biswas, Adventure Books,1998
2. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
3. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.

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MICROWAVE ENGINEERING LAB
PC (UG)

1. Reflex Klystron Characteristics
2. Gunn Diode Characteristics
3. Directional Coupler Characteristics
4. VSWR Measurement
5. Measurement of Waveguide Parameters
6. Measurement of Impedance of a given Load
7. Measurement of Scattering Parameters of a Magic Tee
8. Measurement of Scattering Parameters of a Circulator
9. Attenuation Measurement
10. Microwave Frequency Measurement
11. Antenna Pattern Measurements.
12. Study of HFSS.
13. Simulation of Radiation Patterns for some Standard Antennas
    a) Dipole
    b) Rectangular Patch
    c) Circular Patch

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ADVANCED DIGITAL SIGNAL PROCESSING LAB
(PGC – lab)

Note:

A. Minimum of 10 Experiments have to be conducted

B. All Experiments may be Simulated using MATLAB and to be verified theoretically.

1. Basic Operations on Signals, Generation of Various Signals and finding its FFT.
2. Program to verify Decimation and Interpolation of a given Sequences.
3. Program to Convert CD data into DVD data
4. Generation of Dual Tone Multiple Frequency (DTMF) Signals
5. Plot the Periodogram of a Noisy Signal and estimate PSD using Periodogram and Modified Periodogram methods
6. Estimation of Power Spectrum using Bartlett and Welch methods
7. Verification of Autocorrelation Theorem
8. Parametric methods (Yule-Walker and Burg) of Power Spectrum Estimation
9. Estimation of data series using Nth order Forward Predictor and comparing to the Original Signal
10. Design of LPC filter using Levinson-Durbin Algorithm
11. Computation of Reflection Coefficients using Schur Algorithm
12. To study Finite Length Effects using Simulink
13. ECG signal compression
14. Design and verification of Matched filter
15. Adaptive Noise Cancellation using Simulink
16. Design and Simulation of Notch Filter to remove 60Hz Hum/any unwanted frequency component of given Signal (Speech/ECG)

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MANAGEMENT SCIENCE

Objective

The course introduces the basic concepts of Management Science and Operations Management and its application to business. The topics include human resource management, project and strategic management; the course develops problem solving and spreadsheet skills, an invaluable tool for modern business.

Learning outcome

- To enable students to gain an insight into different managerial decisions using standard techniques and problem structuring methods
- Students will be able to gain an understanding of the core concepts of Management Science and Operations Management;
- To understand the management issues in different functional areas of management namely operations and Human resources, strategy, marketing and project management.

Unit I Introduction to Management & Organisation: Concepts of Management and organization-nature, importance and Functions of Management, Systems Approach to Management - Taylor's Scientific Management Theory – Fayal's Principles of Management – Maslow's theory of Hierarchy of Human Needs – Douglas McGregor's Theory X and Theory Y – Hertzberg Two Factor Theory of Motivation - Leadership Styles, Social responsibilities of Management. Designing Organisational Structures: Basic concepts related to Organisation - Departmentation and Decentralisation, Types and Evaluation of mechanistic and organic structures of organisation and suitability.

Unit II Operations & Marketing Management: Principles and Types of Plant Layout-Methods of production (Job, batch and Mass Production), Work Study -Basic procedure involved in Method Study and Work Measurement – Business Process Reengineering (BPR) - Statistical Quality Control: control charts for Variables and Attributes (simple Problems) and Acceptance Sampling, TQM, Six Sigma, Deming's contribution to quality. Objectives of Inventory control, EOQ, ABC Analysis, Purchase Procedure, Stores Management and Stores Records – JIT System, Supply Chain Management, Functions of Marketing, Marketing Mix, and Marketing Strategies based on Product Life Cycle, Channels of distribution.

Unit III Human Resources Management (HRM): Concepts of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs PMIR, Basic functions of HR Manager: Manpower planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating – Capability Maturity Model (CMM) Levels – Performance Management System.

Unit IV Project Management *(PERT/CPM)*: Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), Identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing (simple problems).

Unit V *Strategic Management and Contemporary Strategic Issues*: Mission, Goals, Objectives, Policy, Strategy, Programmes, Elements of Corporate Planning Process, Environmental Scanning, Value Chain Analysis, SWOT Analysis, Steps in Strategy Formulation and Implementation, Generic Strategy alternatives. Bench Marking and Balanced Score Card as Contemporary Business Strategies.

TEXTBOOKS:

1. Aryasri: *Management Science*, McGraw Hill, 2012.
2. Vijay Kumar and Appa Rao, *Management Science*, Cengage, 2012.

REFERENCES :

1. Kotler Philip & Keller Kevin Lane: Marketing Management, Pearson, 2012.
2. Koontz & Weihrich: *Essentials of Management*, McGraw Hill, 2012.
3. Thomas N.Duening & John M.Ivancevich *Management—Principles and Guidelines,* Biztantra, 2012.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2012.
5. Samuel C.Certo: *Modern Management*, 2012.
6. Schermerhorn, Capling, Poole & Wiesner: *Management*, Wiley, 2012.
7. Parnell: *Strategic Management*, Cengage,2012.
8. Lawrence R Jauch, R.Gupta &William F.Glueck: *Business Policy and Strategic Management*, Frank Bros.2012.

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ADVANCED COMPUTER NETWORKS
(PGC - II)

Prerequisite: Computer Networks

Course Objectives:
1. To study the WLAN and WPAN architecture and protocols
2. To know about WiMAX services, 802.16 standard, cellular telephony & satellite networks.
3. To study the techniques to improve QoS.in Networks
4. To learn about the basic concepts of Ad hoc wireless Networks
5. To know about various Routing Protocols in Ad hoc Networks.
6. To learn the concepts of Wireless Sensor Networks, architecture and various data dissemination and data gathering techniquess

Course Outcomes:
At the end of the course, the student will be able to:
1. Acquire the knowledge about Wireless LANs, Bluetooth and WiMAX standards, architecture and their sub-layers.
2. Understand congestion control mechanisms and techniques to improve Quality of Service in switched networks
3. Get the basic concepts of Ad hoc wireless networks and its protocols and issues related to QoS, energy management, scalability and Security.
4. Explain about Wireless Sensor Network architecture, data dissemination & data gathering techniques and will be able to address the issues and challenges in designing Sensor Networks.

Unit I
Wireless LANs: Architectural Comparison, Characteristics, Access Control, IEEE 802.11 Project: Architecture, MAC Sub layer, Addressing Mechanism, Physical Layer
Bluetooth: Architecture, Bluetooth Layers
WiMAX: Services, IEEE Project 802.16, Cellular Telephony: operation,1G,2G,3G,4G, Satellite Networks, GEO, MEO and LEO Satellites

Unit II
Congestion Control and Quality of Service: Data Traffic, Congestion, Congestion Control, Quality of Service, Techniques to Improve QoS, Integrated Services, Differentiated Services, QoS in Switched Networks
Queue Management: Passive-Drop trial, Drop front, Random drop, Active- early Random drop, Random Early detection.

Unit III
AD HOC WIRELESS NETWORKS: Introduction, Cellular and Ad hoc Wireless Networks, Application of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks, Medium Access Scheme, Routing, Multicasting, Transport Layer Protocols, Pricing Scheme, Quality of Service Provisioning, Self-Organization, Security, Addressing and Service Discovery, Energy Management, Scalability, Deployment Considerations, Ad Hoc Wireless Internet

Unit IV
Quality of Service in Ad Hoc Wireless Networks:
Introduction, Real Time Traffic Support in Ad Hoc Wireless Networks, QoS Parameters in Ad Hoc Wireless Network, Issues and Challenges in providing QoS in Ad Hoc Wireless Networks, Classification of QoS Solutions: MAC Layer Solutions, Cluster TDMA, IEEE 802.11e, DBASE, Network Layer Solutions, QoS Routing Protocols, Ticket Based QoS Routing Protocol, Predictive Location Based QoS routing protocol, Trigger Based Distributed QoS Routing Protocol, QoS enabled AODV Routing Protocol, Bandwidth QoS Routing Protocol, On Demand QoS Routing Protocol, On

Demand Link-State Multipath QoS Routing Protocol, Asynchronous Slot Allocation Strategies. QoS Frameworks for Ad Hoc Wireless Networks.

Unit V

Wireless Sensor Networks

Introduction, Application of Sensor Network , Comparison with Ad hoc Wireless Networks, Issues and challenges in Designing a Sensor Network, Sensor Network Architecture, Layer Architecture, Cluster Architecture, Data Dissemination Flooding, Gossiping, Rumor Routing, Sequential Assignment Routing, Direct Diffusion, Sensor Protocols for Information via Negotiation, Cost- Field Approach, Geography Hash Table, Small Minimum Energy Communication Network, Data Gathering, Direct Transmission, Power Efficient Gathering for Sensor Information Systems, Binary Scheme, Chain Based Three-Level Scheme.

TEXT BOOKS:

1. Ad Hoc Wireless Networks: Architectures and Protocols - C. Siva Ram Murthy and B.S.Manoj, 2004, PHI
2. Data Communications and Networking - B. A.Forouzan, 5th , 2013, TMH.

REFERENCE BOOKS:

1. Data Communications and Computer Networks - Prakash C. Gupta, 2006, PHI.
2. Data and Computer Communications - William Stallings, 8th ed., 2007, PHI.

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ADAPTIVE SIGNAL PROCESSING
(PG E – IV)

Prerequisite: Digital Signal Processing

Course Objectives :
The main objectives of the course are:
1. This course focuses on problems algorithms and solutions for processing signals in an manner that is responsive to a changing environment.
2. To develop systems on recursive, model based estimation methods taking the advantage of the statistical properties of the received signals.
3. To analyze the performance of adaptive filters and considers the application of the theory to a variety of practical problems such as beam forming and echo cancellation signal.
4. To understand innovation process, Kalman filter theory and estimation of state using the innovation process , concept of Kalman Gain and Filtering.

Course Outcomes:
After studying the course, the student is expected to be able to :
1. Design and apply optimal minimum mean square estimators and in particular linear estimators.
2. Understand and compute their expected performance and verify it.
   Design , implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
3. To understand innovation process, Kalman filter theory and estimation of state using the Innovation Process, concept of Kalman Gain and Filtering.
4. Design , implement and apply LMS, RLS and Kalman filters to given applications.

UNIT –I:
Introduction to Adaptive Systems
Adaptive Systems: Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

UNIT –II:
Development of Adaptive Filter Theory & Searching the Performance surface:
Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonality - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error.
Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves.

UNIT –III:
Steepest Descent Algorithms
Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

UNIT –IV:
LMS Algorithm & Applications
Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms - LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm.
Applications: Noise cancellation – Cancellation of Echoes in long distance telephone circuits, Adaptive Beam forming.

UNIT –V:

Kalman Filtering: Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

TEXT BOOKS:

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Strearns, 2005, PE.
2. Adaptive Filter Theory - Simon Haykin-, 4 ed., 2002,PE Asia.

REFERENCE BOOKS:

1. Optimum signal processing: An introduction - Sophocles.J.Orfamadis, 2 ed., 1988, McGraw-Hill, Newyork
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, 1986, Springer – Verlag.
3. Siganl analysis – Candy, Mc Graw Hill Int. Student Edition
4. James V. Candy, Signal Processing : A Modern Approach, McGraw-Hill, International Edition, 1988.

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EMBEDDED SYSTEM DESIGN
(PG E – IV)

Prerequisite : None

Course Objectives:
1. To provide an overview of Design Principles of Embedded System.
2. To provide clear understanding about the role of firmware , operating systems in correlation with hardware systems.

Course Outcomes :
1. Expected to understand the selection procedure of Processors in the Embedded domain.
2. Design Procedure for Embedded Firmware.
3. Expected to visualize the role of Real time Operating Systems in Embedded Systems
4. Expected to evaluate the Correlation between task synchronization and latency issues

UNIT -I:
Introduction to Embedded Systems
Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

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

UNIT -III:
Embedded Firmware:
Reset Circuit, Brown-out Protection Circuit, Oscillator Unit, Real Time Clock, Watchdog Timer, Embedded Firmware Design Approaches and Development Languages.

UNIT -IV:
RTOS Based Embedded System Design:
Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.

UNIT -V:
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS.

TEXT BOOKS:
1. Introduction to Embedded Systems - Shibu K.V, Mc Graw Hill.

REFERENCE BOOKS:
1. Embedded Systems - Raj Kamal, TMH.
2. Embedded System Design - Frank Vahid, Tony Givargis, John Wiley.
3. Embedded Systems – Lyla, Pearson, 2013
4. An Embedded Software Primer - David E. Simon, Pearson Education.

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NETWORK SECURITY AND CRYPTOGRAPHY
(PG E - IV)

Prerequisite : None

Course Objectives:
1. Understand the basic concept of Cryptography and Network Security, their mathematical models
2. To provide deeper understanding of application to network security, threats/vulnerabilities to networks and countermeasures
3. To create an understanding of Authentication functions the manner in which Message Authentication Codes and Hash Functions works
4. To provide familiarity in Intrusion detection and Firewall Design Principles

Course Outcomes:
After completion of this course, the student shall be able to:
1. Describe computer and network security fundamental concepts and principles
2. Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities
3. Encrypt and decrypt messages using block ciphers
4. Describe the inner-workings of today's remote exploitation and penetration techniques
5. Describe the inner-workings of popular encryption algorithms, digital signatures, certificates, anti-cracking techniques, and copy-right protections
6. Demonstrate the ability to select among available network security technology and protocols such as IDS, IPS, firewalls, SSL, SSH, IPSec, TLS, VPNs, etc.
7. Analyze key agreement algorithms to identify their weaknesses

UNIT- I: Introduction : Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques.
Modern Techniques : Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

UNIT- II: Encryption : Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block cifers.
Conventional Encryption
Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

UNIT - III: Public Key Cryptography
Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptograpy.
Number Theory
Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

UNIT- IV: Message Authentication and Hash Functions
Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.
Hash and Mac Algorithms
MD File, Message digest Algorithm, Secure Hash Algorithm.
Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.
Authentication Applications
Kerberos, Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT – V: IP Security

Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

Intruders, Viruses and Worms: Intruders, Viruses and Related threats.

Fire Walls: Fire wall Design Principles, Trusted systems.

TEXT BOOKS:

1. Cryptography and Network Security: Principles and Practice - William Stallings, Pearson Education.
2. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.

REFERENCE BOOKS:

1. Fundamentals of Network Security by Eric Maiwald (Dreamtech press)
2. Network Security - Private Communication in a Public World by Charlie Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI.
3. Principles of Information Security, Whitman, Thomson.
4. Network Security: The complete reference, Robert Bragg, Mark Rhodes, TMH
5. Introduction to Cryptography, Buchmann, Springer.

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ADVANCED COMPUTER NETWORKS LAB
(PGC Lab)

1. Simulation and analysis of MAC Layer protocols.
2. Simulation and analysis of various topologies.
3. Simulation and analysis of wired routing protocols.
4. Simulation and analysis of wireless routing protocols.
5. Simulation and analysis of various security attacks.
6. Analysis of log files and provide the intruder statistics.
7. Simulation of Queue Management Schemes.
8. Evaluation of DES, AES and Triple-DES.
9. Evaluation of Substitution and Transposition ciphers.
10. Error correcting coding in CDMA Mobile communication system.
11. Capturing and tracking of GOLD sequence in CDMA system.
12. Study of Satellite Azimuth & Elevation using sky Plot Window.
13. Study of Global Positioning System Applications.
14. Study of I2C and UART protocols.

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WIRELESS COMMUNICATIONS AND NETWORKS
(PGC – III)

Prerequisite: Digital Communications

Course objectives:
The course objectives are:
- To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
- To equip the students with various kinds of wireless networks and its operations.
- To prepare students to understand the concept of frequency reuse, and be able to apply it in the design of mobile cellular system.
- To prepare students to understand various modulation schemes and multiple access techniques that are used in wireless communications,
- To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
- To train students to understand the architecture and operation of various wireless wide area networks such as GSM, IS-95, GPRS and SMS.
- To train students to understand wireless LAN architectures and operation.
- To prepare students to understand the emerging technique OFDM and its importance in the wireless communications.

Course Outcomes:
Upon completion of the course, the student will be able to:
- Understand the principles of wireless communications.
- Understand fundamentals of wireless networking
- Understand cellular system design concepts.
- Analyze various multiple access schemes used in wireless communication.
- Understand wireless wide area networks and their performance analysis.
- Demonstrate wireless local area networks and their specifications.
- Familiar with some of the existing and emerging wireless standards.
- Understand the concept of orthogonal frequency division multiplexing.

UNIT -I:
The Cellular Concept-System Design Fundamentals
Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference , Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring .

UNIT –II:
Mobile Radio Propagation: Large-Scale Path Loss
Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from prefect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Ryce Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models- Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

UNIT –III:

Mobile Radio Propagation: Small –Scale Fading and Multipath

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

UNIT -IV:

Equalization and Diversity

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Non linear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration-Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

UNIT -V:

Wireless Networks

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11,IEEE 802.11 Medium Access Control, Comparision of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

TEXT BOOKS:

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2nd Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

REFERENCE BOOKS:

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI.

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IMAGE AND VIDEO PROCESSING
(PG E – V)

Prerequisite: Digital Signal Processing

Course Objectives:

1. The student will be able to understand the quality improvement methods of Image.
2. To study the basic digital image and video filter operations.
3. Understand the fundamentals of Image Compression.
4. Understand the representation of video.
5. Understand the principles and methods of motion estimation.

Course Outcomes:

1. The students will learn image representation, filtering , compression.
2. Students will learn the basics of video processing , representation, motion estimation.

UNIT – I:

Fundamentals of Image Processing and Image Transforms

Basic steps of Image Processing System Sampling and Quantization of an image, Basic relationship between pixels.

Image Segmentation

Segmentation concepts, Point, Line and Edge Detection, Thresholding, Region based segmentation.

UNIT – II:

Image Enhancement

Spatial domain methods: Histogram processing, Fundamentals of Spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Frequency domain methods: Basics of filtering in frequency domain, image smoothing, image sharpening, Selective filtering.

UNIT – III:

Image Compression

Image compression fundamentals - Coding Redundancy, Spatial and Temporal redundancy, Compression models: Lossy & Lossless, Huffman coding, , Bit plane coding, Transform coding, Predictive coding, Wavelet coding, Lossy Predictive coding, JPEG Standards.

UNIT - IV:

Basic Steps of Video Processing

Analog Video, Digital Video. Time-Varying Image Formation models: Three-Dimensional Motion Models, Geometric Image Formation, Photometric Image Formation, Sampling of Video signals, Filtering operations.

UNIT – V:

2-D Motion Estimation

Optical flow, General Methodologies, Pixel Based Motion Estimation, Block- Matching Algorithm, Mesh based Motion Estimation, Global Motion Estimation, Region based Motion Estimation, Multi resolution motion estimation, Waveform based coding, Block based transform coding, Predictive coding, Application of motion estimation in Video coding.

TEXT BOOKS:

1. Digital Image Processing – Gonzaleze and Woods, 3rd ed., Pearson.
2. Video Processing and Communication – Yao Wang, Joem Ostermann and Ya–quin Zhang. 1st Ed., PH Int.

REFRENCE BOOKS:

1. Digital Video Processing – M. Tekalp, Prentice Hall International
2. Digital Image Processing – S.Jayaraman, S.Esakkirajan, T.Veera Kumar –TMH, 2009

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4G TECHNOLOGIES
(PG E - V)

Prerequisite: None.

Course Objectives:

1. To know about Second Generation and Third Generation Cellular technologies
2. To study the Evolution Generation(2.5G) technology platforms,
3. To learn about OFDM modulation technique and their evaluation parameters.
4. To understand UWB wireless channels, data modulation and its features.
5. To study the 4G technology.

Course Outcomes:

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

1. Explain and compare Second and Third Generation technologies and their architectures.
2. Understand improved version of 2G technology i.e., evolution Generation (2.5G) and data transmission using GPRS, EDGE, HSCSD.
3. Get the knowledge of Orthogonal Frequency Division Multiplexing and evaluate the performance using channel model and SNR, issues regarding OFDM.
4. Acquire the knowledge about UWB wireless channels, data modulation and their features.
5. Understand 4G Cellular technology and advantages of new technologies in cellular data networks.

UNIT I: **2G and 3G technology**

Second Generation (2G) - Overview, Enhancements over 1G Systems, Integration with Existing 1G Systems, GSM, IS-136 System Description, IS-95 System Description, iDEN (Integrated Dispatch Enhanced Network), CDPD

Third Generation (3G)- Overview, Introduction, Universal Mobile Telecommunications Service (UMTS), UMTS Services, The UMTS Air Interface, Overview of the 3GPP Release 1999 Network Architecture, Overview of the 3GPP Release 4 Network Architecture, Overview of the 3GPP Release 5 All-IP Network Architecture, Overview CDMA2000, Commonality Between, DMA/CDMA2000/CDM

UNIT II: The Evolution Generation (2.5G)

What Is 2.5G?,Enhancements over 2G, Technology Platforms, General Packet Radio Service, (GPRS), Enhanced Data Rates for Global Evolution (EDGE),High-Speed Circuit Switched Data (HSCSD), CDMA2000 (1XRTT), WAP, Migration Path from 2G to 2.5G to 3G,

UNIT III: OFDM

Introduction to OFDM, Multicarrier Modulation and Cyclic Prefix, Channel model and SNR performance, OFDM Issues – PAPR, Frequency and Timing Offset Issues.

UNIT IV: UWB

UWB Definition and Features, UWB Wireless Channels, UWB Data Modulation, Uniform Pulse Train.

UNIT V: 4G Cellular technology :

4G evolution, objectives of the projected 4G, advantages of 4G network technology over 3G, applications of 4G, 4G technologies, Smart antenna techniques, 4G software, New technologies in cellular data networks.

Text books:

1. 3G Wireless Networks, 2nd ed., Clint Smith, P.E , Daniel Collins
2. Mobile Cellular Communication , Gottapu Sasibhuhsana Rao, PEARSON, 2013

Reference Books:

1. 3G Networks Architecture, Protocols and Procedures, Sumith Kaseara, Nishit Narang

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MULTI-MEDIA AND SIGNAL CODING
(PG E-V)

Prerequisite: Artificial Neural Networks and Fuzzy Systems.

Course Objectives:
This course makes the students to Understand
1. Various image & video processing algorithms.
2. Various video compression techniques.
3. Various audio compression techniques.

Course Outcomes:
On completion of this course the students will be able to
1. Represent and convert various colour models.
2. Simulate various video compression image techniques and can suggest the appropriate video compression techniques for specific application.
3. Simulate various audio compression techniques and can suggest the appropriate audio compression method for specific application.

UNIT -I:
Introduction to Multimedia: Multimedia, World Wide Web, Overview of Multimedia Tools, Multimedia Authoring, Graphics/ Image Data Types, and File Formats.
Color in Image and Video: Color Science – Image Formation, Camera Systems, Gamma Correction, Color Matching Functions, CIE Chromaticity Diagram, Color Monitor Specifications, Out-of-Gamut Colors, White Point Correction, XYZ to RGB Transform, Transform with Gamma Correction, L*A*B* Color Model. Color Models in Images – RGB Color Model for CRT Displays, Subtractive Color: CMY Color Model, Transformation from RGB to CMY, Under Color Removal: CMYK System, Printer Gamuts, Color Models in Video – Video Color Transforms, YUV Color Model, YIQ Color Model, Ycbcr Color Model.

UNIT -II:
Video Concepts: Types of Video Signals, Analog Video, Digital Video.
Audio Concepts: Digitization of Sound, Quantization and Transmission of Audio.

UNIT -III:
Compression Algorithms:
Lossless Compression Algorithms: Run Length Coding, Variable Length Coding, Arithmetic Coding, Lossless JPEG, Image Compression.
Lossy Image Compression Algorithms: Transform Coding: KLT And DCT Coding, Wavelet Based Coding.
Image Compression Standards: JPEG and JPEG2000.

UNIT -IV:
Video Compression Techniques: Introduction to Video Compression, Video Compression Based on Motion Compensation, Search for Motion Vectors, H.261- Intra-Frame and Inter-Frame Coding, Quantization, Encoder and Decoder, Overview of MPEG1 and MPEG2.

UNIT -V:
Audio Compression Techniques: ADPCM in Speech Coding, G.726 ADPCM, Vocoders – Phase Insensitivity, Channel Vocoder, Formant Vocoder, Linear Predictive Coding, CELP, Hybrid Excitation Vocoders, MPEG Audio – MPEG Layers, MPEG Audio Strategy, MPEG Audio Compression Algorithms, MPEG-2 AAC, MPEG-4 Audio.

TEXT BOOKS:

1. Fundamentals of Multimedia – Ze- Nian Li, Mark S. Drew, PHI, 2010.
2. Multimedia Signals & Systems – Mrinal Kr. Mandal Springer International Edition 1st Edition, 2009

REFERENCE BOOKS:

1. Multimedia Communication Systems – Techniques, Stds& Netwroks K.R. Rao, Zorans. Bojkoric, Dragorad A.Milovanovic, 1st Edition, 2002.
2. Fundamentals of Multimedia Ze- Nian Li, Mark S.Drew, Pearson Education (LPE), 1st Edition, 2009.
3. Multimedia Systems John F. Koegel Bufond Pearson Education (LPE), 1st Edition, 2003.
4. Digital Video Processing – A. Murat Tekalp, PHI, 1996.
5. Video Processing and Communications – Yaowang, Jorn Ostermann, Ya-QinZhang, Pearson, 2002.
6. Judith Jeffocate, "*Printmedia in practice (Theory and Applications)*", PHI, 1998.

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CODING THEORY AND TECHNIQUES
(PG E - VI)

Prerequisite: Digital Communications

Course Objectives:
1. To acquire the knowledge in measurement of information and errors.
2. T study the generation of various code methods.
3. To study the various application of codes.

Course Outcomes:
1. Learning the measurement of information and errors.
2. Obtain knowledge in designing various codes like block codes, cyclic codes, convolution codes, turbo codes and space codes

UNIT – I:
Coding for Reliable Digital Transmission and storage
Mathematical model of Information, A Logarithmic Measure of Information, Average and Mutual Information and Entropy, Types of Errors, Error Control Strategies.
Linear Block Codes: Introduction to Linear Block Codes, Syndrome and Error Detection, Minimum Distance of a Block code, Error-Detecting and Error-correcting Capabilities of a Block code, Standard array and Syndrome Decoding, Probability of an undetected error for Linear Codes over a BSC, Hamming Codes. Applications of Block codes for Error control in data storage system

UNIT - II:
Cyclic Codes : Description, Generator and Parity-check Matrices, Encoding, Syndrome Computation and Error Detection, Decoding ,Cyclic Hamming Codes, Shortened cyclic codes, Error-trapping decoding for cyclic codes, Majority logic decoding for cyclic codes.

UNIT – III:
Convolutional Codes : Encoding of Convolutional Codes, Structural and Distance Properties, maximum likelihood decoding, Sequential decoding, Majority- logic decoding of Convolution codes. Application of Viterbi Decoding and Sequential Decoding, Applications of Convolutional codes in ARQ system.

UNIT – IV:
Turbo Codes
LDPC Codes- Codes based on sparse graphs, Decoding for binary erasure channel, Log-likelihood algebra, Brief propagation, Product codes, Iterative decoding of product codes, Concatenated convolutional codes- Parallel concatenation, The UMTS Turbo code, Serial concatenation, Parallel concatenation, Turbo decoding

UNIT - V:
Space-Time Codes
Introduction, Digital modulation schemes, Diversity, Orthogonal space- Time Block codes, Alamouti's schemes, Extension to more than Two Transmit Antennas, Simulation Results, Spatial Multiplexing : General Concept, Iterative APP Preprocessing and Per-layer Decoding, Linear Multilayer Detection, Original BLAST Detection, QL Decomposition and Interface Cancellation, Performance of Multi – Layer Detection Schemes, Unified Description by Linear Dispersion Codes.

TEXT BOOKS:
1. Error Control Coding- Fundamentals and Applications –Shu Lin, Daniel J.Costello,Jr, Prentice Hall, Inc.
2. Error Correcting Coding Theory-Man Young Rhee- 1989, McGraw-Hill

REFERENCE BOOKS:

1. Error Correcting Coding Theory-Man Young Rhee-1989,McGraw – Hill Publishing,19
2. Digital Communications-Fundamental and Application - Bernard Sklar, PE.
3. Digital Communications- John G. Proakis, 5th ed., 2008, TMH.
4. Introduction to Error Control Codes-Salvatore Gravano-oxford
5. Error Correction Coding – Mathematical Methods and Algorithms – Todd K.Moon, 2006, Wiley India.
6. Information Theory, Coding and Cryptography – Ranjan Bose, 2nd Edition, 2009, TMH.

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SOFTWARE DEFINED RADIO
(PG E-VI)

Prerequisite: TCP/ IP , Digital Signal Processing

Course Objectives:
The objectives of this course is
1. To provide fundamentals and state of the art concepts in software defined radio.

Course Outcomes:
On completion of this course, the students:
1. Understand the design principles of software defined radio.
2. Understand the analog RF components as front end block in implementation of SDR.
3. Understand digital hardware architectures and development methods.
4. Understand the radio recourse management in heterogeneous networks.
5. Understand the object oriented representation of radio and network resources.

UNIT -I: Introduction: The Need for Software Radios, What is Software Radio, Characteristics and benefits of software radio- Design Principles of Software Radio, RF Implementation issues- The Purpose of RF Front – End, Dynamic Range- The Principal Challenge of Receiver Design – RF Receiver Front- End Topologies- Enhanced Flexibility of the RF Chain with Software Radios- Importance of the Components to Overall Performance- Transmitter Architectures and Their Issues- Noise and Distortion in the RF Chain, ADC and DAC Distortion.

UNIT -II: Profile and Radio Resource Management : Communication Profiles- Introduction, Communication Profiles, Terminal Profile, Service Profile , Network Profile, User Profile, Communication Profile Architecture, Profile Data Structure, XML Structure, Distribution of Profile Data, Access to Profile Data, Management of Communication Profiles, Communication Classmarks, Dynamic Classmarks for Reconfigurable Terminals, Compression and Coding, Meta Profile Data

UNIT -III: Radio Resource Management in Heterogeneous Networks : Introduction, Definition of Radio Resource Management, Radio Resource Units over RRM Phases, RRM Challenges and Approaches, RRM Modelling and Investigation Approaches, Investigations of JRRM in Heterogeneous Networks, Measuring Gain in the Upper Bound Due to JRRM, Circuit-Switched System, Packet-Switched System, Functions and Principles of JRRM, General Architecture of JRRM, Detailed RRM Functions in Sub-Networks and Overall Systems

UNIT -IV: Reconfiguration of the Network Elements : Introduction, Reconfiguration of Base Stations and Mobile Terminals, Abstract Modelling of Reconfigurable Devices, the Role of Local Intelligence in Reconfiguration, Performance Issues, Classification and Rating of Reconfigurable Hardware, Processing Elements, Connection Elements, Global Interconnect Networks, Hierarchical Interconnect Networks, Installing a New Configuration, Applying Reconfiguration Strategies, Reconfiguration Based on Comparison, Resource Recycling, Flexible Workload Management at the Physical Layer, Optimised Reconfiguration, Optimisation Parameters and Algorithms, Optimization Algorithms, Specific Reconfiguration Requirements, Reconfiguring Base Stations, Reconfiguring Mobile Terminals

UNIT -V: Object – Oriented Representation of Radios and Network Resources: Networks- Object Oriented Programming- Object Brokers- Mobile Application Environments- Joint Tactical Radio System.
Case Studies in Software Radio Design: Introduction and Historical Perspective, SPEAK easy- JTRS, Wireless Information Transfer System, SDR-3000 Digital Transceiver Subsystem, Spectrum Ware, CHARIOT.

TEXT BOOKS:

1. Software Defined Radio Architecture System and Functions- Markus Dillinger, Kambiz Madani, WILEY 2003
2. Software Defined Radio: Enabling Technologies- Walter Tuttle Bee, 2002, Wiley Publications.

REFERENCE BOOKS:

1. Software Radio: A Modern Approach to Radio Engineering - Jeffrey H. Reed, 2002, PEA Publication.
2. Software Defined Radio for 3G - Paul Burns, 2002, Artech House.
3. Software Defined Radio: Architectures, Systems and Functions - Markus Dillinger, Kambiz Madani, Nancy Alonistioti, 2003, Wiley.
4. Software Radio Architecture: Object Oriented Approaches to wireless System Enginering – Joseph Mitola, III, 2000, John Wiley & Sons.

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SPREAD SPECTRUM COMMUNICATIONS
(PG E – VI)

Prerequisite: Communication

Course Objectives:
The objectives of this course are to make the student
1. Understand the concept of Spread Spectrum and study various types of Spread spectrum sequences and their generation.
2. Understand the principles of Code Division Multiple Access (CDMA) and use of Spread spectrum concept in CDMA
3. Understand various Code tracing loops for optimum tracking of wideband signals viz spread spectrum signals
4. Understand the procedure for synchronization of receiver for receiving the Spread spectrum signal.
5. Study the performance of spread spectrum systems in Jamming environment, systems with Forward Error Correction and Multiuser detection in CDMA cellular radio.

Course Outcomes:
On completion of this course student will be able to
1. Generate various types of Spread spectrum sequences and can simulate CDMA system (Both Transmitter & Receiver).
2. Analyze the performance of Spread spectrum systems in Jamming environment and systems with Forward Error Correction.
3. Can provide detection and cancellation schemes for Multiusers in CDMA cellular radio.

UNIT -I:
Introduction to Spread Spectrum Systems: Fundamental Concepts of Spread Spectrum Systems, Pseudo Noise Sequences, Direct Sequence Spread Spectrum, Frequency Hop Spread Spectrum, Hybrid Direct Sequence Frequency Hop Spread Spectrum, Code Division Multiple Access.
Binary Shift Register Sequences for Spread Spectrum Systems:
Introduction, Definitions, Mathematical Background and Sequence Generator Fundamentals, Maximal Length Sequences, Gold Codes.

UNIT -II:
Code Tracking Loops: Introduction, Optimum Tracking of Wideband Signals, Base Band Delay-Lock Tracking Loop, Tau-Dither Non- Coherent Tracking Loop, Double Dither Non-Coherent Tracking Loop.

UNIT -III:
Initial Synchronization of the Receiver Spreading Code: Introduction, Problem Definition and the Optimum Synchronizer, Serial Search Synchronization Techniques, Synchronization using a Matched Filter, Synchronization by Estimated the Received Spreading Code.

UNIT -IV:
Cellular Code Division Multiple Access (CDMA) Principles: Introduction, Wide Band Mobile Channel, The Cellular CDMA System, Single User Receiver in a Multi User Channel, CDMA System Capacity,
Multi-User Detection in CDMA Cellular Radio: Optimal Multi-User Detection, Linear Suboptimal Detectors, Interference Combat Detection Schemes, Interference Cancellation Techniques.

UNIT -V:
Performance of Spread Spectrum Systems in Jamming Environments: Spread Spectrum Communication System Model, Performance of Spread Spectrum Systems without Coding.

Performance of Spread Spectrum Systems with Forward Error Correction: Elementary Block Coding Concepts, Optimum Decoding Rule, Calculation of Error Probability, Elementary Convolution Coding Concepts, Viterbi Algorithm, Decoding and Bit-Error Rate.

TEXT BOOKS:

1. Rodger E Ziemer, Roger L. Peterson and David E Borth - "Introduction to Spread Spectrum Communication- Pearson, 1st Edition, 1995.
2. Mosa Ali Abu-Rgheff – "Introduction to CDMA Wireless Communications." Elsevier Publications, 2008.

REFERENCE BOOKS:

1. George R. Cooper, Clare D. Mc Gillem - "Modern Communication and Spread Spectrum," McGraw Hill, 1986.
2. Andrew j. Viterbi - "CDMA: Principles of spread spectrum communication," Pearson Education, 1st Edition, 1995.
3. Kamilo Feher - "Wireless Digital Communications," PHI, 2009.
4. Andrew Richardson - "WCDMA Design Handbook," Cambridge University Press, 2005.
5. Steve Lee - Spread Spectrum CDMA, McGraw Hill, 2002.

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DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES
(PG E – VII)

Prerequisite: Digital Signal Processing

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

Course Outcomes
Upon completion of the course, the student
- Be able to distinguish between the architectural features of General purpose processors and DSP processors.
- Understand the architectures of TMS320054xx and ADSP 2100 DSP devices.
- Be able to write simple assembly language programs using instruction set of TMS32OC54xx.
- Can inteace various devices to DSP Processors.

UNIT –I
Introduction to Digital Signal Processing
Introduction, A Digital signal- processing system, The sampling process, Discrete time sequences. Discrete Fourier Transform (DFT) and Fast Fourier Transform (FET), Linear time- invariant systems, Digital filters, Decimation and interpolation.
Computational Accuracy in DSP Implementations
Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision,Sources of error in DSP implementations, AID Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

UNIT —II
Architectures for Programmable DSP Devices
Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

UNIT -III
Programmable Digital Signal Processors: Commercial Digital signal- processing Devices, Data Addressing modes of TMS32OC54XX DSPs, Data Addressing modes of TMS32OC54XX Processors, Memory space of TMS32OC54XX Processors, Program Control, TMS32OC54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS32OC54XX processors, Pipeline Operation of TMS32OC54XX Processors.

UNIT -IV
Analog Devices Family of DSP Devices
Analog Devices Family of DSP Devices —ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP 2100, ADSP-2181 high performance Processor.
Introduction to Blackfin Processor – The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

UNIT -V

Interfacing Memory and I/O Peripherals to Programmable DSP Devices

Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

TEXT BOOKS

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

REFERENCE BOOKS

1. Digital Signal Processors, Architecture, Programming and Applications — B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing — Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architectures & Features — Lapsleyet al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Engineering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI
5. The Scientist and Engineer's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes, ISBN 0750679123, 2005.

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SPEECH AND AUDIO SIGNAL PROCESSING
(PG E - VII)

Prerequisite: Advanced Digital Signal Processing

Course Objectives:

The objectives of this course are to make the student

1. Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.
2. To understand the articulatory and acoustic interpretation of various phonemes and their allophones.
3. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,
4. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a bye product of Homomorphic processing of Speech.
5. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.
6. To study various Audio coding techniques based on perceptual modeling of the human ear.

Course Outcomes:

On completion of this course student will be able to

1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Can extract the features for Automatic speaker recognition system which can used for classification.
6. Can design basic audio coding methods for coding the audio signal.

Unit – I :

Fundamentals of Digital Speech Processing:

Anatomy & Physiology of Speech Organs, The Process of Speech Production, The Acoustic theory of speech production- Uniform lossless tube model, effect of losses in vocal tract, effect of radiation at lips, Digital models for speech signals.

Perception : Anatomical pathways from the Ear to the Perception of Sound, The Peripheral Auditory system, Hair Cell and Auditory Nerve Functions, Properties of the Auditory Nerve. Block schematics of the Peripheral Auditory system.

Unit – II :

Time Domain models for Speech Processing:

Introduction – Window considerations, Short time energy, average magnitude, average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, pitch period estimation using a parallel processing approach, the short time autocorrelation function, average magnitude difference function, pitch period estimation using the autocorrelation function.

Linear Predictive Coding (LPC) Analysis :

Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance method, Solution of LPC Equations : Cholesky Decomposition Solution for Covariance Method, Durbin's Recursive Solution for the Autocorrelation Equations, comparison between the methods of solution of the LPC Analysis Equations, Applications of LPC Parameters : Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

Unit – III :

Homomorphic Speech Processing:

Introduction , Homomorphic Systems for Convolution : Properties of the Complex Cepstrum, Computational Considerations , The Complex Cepstrum of Speech, Pitch Detection , Formant Estimation, The Homomorphic Vocoder.

Speech Enhancement:

Speech enhancement techniques : Single Microphone Approach, Spectral Subtraction, Enhancement by re-synthesis, Comb filter, Wiener filter, Multi Microphone Approach.

Unit – IV:

Automatic Speech Recognition:

Basic pattern recognition approaches, parametric representation of Speech, Evaluating the similarity of Speech patterns, Isolated digit Recognition System, Continuous word Recognition system. Elements of HMM, Training & Testing of Speech using HMM.

Automatic Speaker Recognition:

Recognition techniques, Features that distinguish speakers, MFCC, delta MFCC, Speaker Recognition Systems: Speaker Verification System , Speaker Identification System, Performance Metrics.

Unit – V:

Audio Coding :

Lossless Audio Coding, Lossy Audio coding, Psychoacoustics , ISO-MPEG-1 Audio coding , MPEG - 2 Audio coding, MPEG - 2 Advanced Audio Coding, MPEG - 4 Audio Coding.

TEXT BOOKS:

1. Digital Processing of Speech Signals - L.R. Rabiner and S. W. Schafer. Pearson Education.
2. Digital Audio Signal Processing – Udo Zolzer, 2nd Edition, Wiley.
3. Speech & Audio Signal Processing- Ben Gold & Nelson Morgan, 1st Ed., Wiley

REFENCE BOOKS:

1. Discrete Time Speech Signal Processing: Principles and Practice - Thomas F. Quateri, 1st Ed., PE.
2. Digital Processing of Speech Signals. L.R Rabinar and R W Jhaung, 1978, PHI.
3. Speech Communications: Human & Machine - Douglas O'Shaughnessy, 2nd Ed., EEE Press.

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RADAR SIGNAL PROCESSING
(PG E- VII)

Prerequisite: Radar Systems

Course Objectives:
1. This course emphasis on the principles of Radar Systems and Signal Processing techniques.
2. Ability to understand the various parameters of Radar like pdf , prf.
3. Acquire knowledge about pulse compression Radar.
4. To study the phase coding Techniques.

Course Outcomes:
Upon the completion of this course, the student will be able to
1. Understand the principles of Radar Systems.
2. Learn the appropriate model, calculate system performance parameters and assess the limitations of particular systems.
3. Understand the concepts of pulse compression Radar.

UNIT -I:
Introduction
Radar, Radar Block Diagram, Radar Equation, Detection of Signals in Noise, Receiver Noise and the Signal to Ratio.

UNIT –II:
Radar Equation
Probability Density Function, Probability of Detection and False Alarm, Radar Cross Section of Targets, Transmitter Power, PRF and Antenna Parameters, CFAR Receiver.

UNIT –III:
Waveform Selection
Radar Ambiguity Function and Ambiguity Diagram – Principles and Properties; Specific Cases – Ideal Case, Single Pulse of Sine Wave, Periodic Pulse Train, Single Linear FM Pulse.

UNIT -IV:
Pulse Compression in Radar Signals
Introduction, Significance, Types, Linear FM Pulse Compression – Block Diagram, Characteristics, Reduction of Time Side lobes, Stretch Techniques, Generation and Decoding of FM Waveforms.

UNIT –V:
Phase Coding Techniques
Principles, Binary Phase Coding, Barker Codes, Maximal Length Sequences (MLS/LRS/PN), Block Diagram of a Phase Coded CW Radar.

TEXT BOOKS:
1. Radar Handbook - M.I. Skolnik, 2nd Ed., 1991, McGraw Hill.
2. Radar Design Principles: Signal Processing and the Environment - Fred E. Nathanson, 2nd Ed.,1999, PHI.
3. Introduction to Radar Systems - M.I. Skolnik, 3rd Ed., 2001, TMH.

REFERENCE BOOKS:
1. Radar Principles - Peyton Z. Peebles, Jr., 2004, John Wiley.
2. Radar Signal Processing and Adaptive Systems - R. Nitzberg, 1999, Artech House.
3. Radar Design Principles - F.E. Nathanson, 1st Ed., 1969, McGraw Hill.

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DISASTER MANAGEMENT
OPEN ELECTIVE-I

Pre Requisites: NIL

Course Objectives:
The subject provide different disasters, tools and methods for disaster management

Course Outcomes:
Estimate, perform quantity survey & valuate various engineering works

UNIT 1 : Understanding Disaster
Concept of Disaster
Different approaches
Concept of Risk
Levels of Disasters
Disaster Phenomena and Events (Global, national and regional)

Hazards and Vulnerability
Natural and man-made hazards; response time, frequency and forewarning levels of different hazards
Characteristics and damage potential or natural hazards; hazard assessment
Dimensions of vulnerability factors; vulnerability assessment
Vulnerability and disaster risk
Vulnerabilities to flood and earthquake hazards

UNIT 2 : Disaster Management Mechanism
Concepts of risk management and crisis managements
Disaster Management Cycle
Response and Recovery
Development, Prevention, Mitigation and Preparedness
Planning for Relief

UNIT 3: Capacity Building
Capacity Building: Concept
Structural and Nonstructural Measures
Capacity Assessment; Strengthening Capacity for Reducing Risk
Counter-Disaster Resources and their utility in Disaster Management
Legislative Support at the state and national levels

UNIT 4: Coping with Disaster
Coping Strategies; alternative adjustment processes
Changing Concepts of disaster management
Industrial Safety Plan; Safety norms and survival kits
Mass media and disaster management

UNIT 5: Planning for disaster management
Strategies for disaster management planning
Steps for formulating a disaster risk reduction plan
Disaster management Act and Policy in India
Organizational structure for disaster management in India
Preparation of state and district disaster management plans

Text Books

1. Alexander, D. Natural Disasters, ULC press Ltd, London, 1993.
2. Carter, W.N. Disaster Management: A Disaster Management Handbook, Asian Development Bank, Bangkok, 1991.
3. Manual on Natural Disaster Management in India, NCDM, New Delhi, 2001.

References

1. Abarquez I. & Murshed Z. Community Based Disaster Risk Management: Field Practitioner's Handbook, ADPC, Bangkok, 2004.
2. Goudie, A. Geomorphological Techniques, Unwin Hyman, London 1990.
3. Goswami, S.C Remote Sensing Application in North East India, Purbanchal Prakesh, Guwahati, 1997.
4. Chakrabarty, U.K. Industrial Disaster Management and Emergency Response, Asian Book Pvt. Ltd., New Delhi 2007.
5. Disaster Management in India, Ministry of Home Affairs, Government of India, New Delhi, 2011.
6. National Policy on Disaster Management, NDMA, New Delhi, 2009
7. Disaster Management Act. (2005), Ministry of Home Affairs, Government of India, New Delhi, 2005.
8. District Disaster Management Plan-Model Template, NIDM, New Delhi, 2005.
9. Disaster Management, Future challenge and opportunities, Edited by Jagbir singh, I.K. International publishing home Pvt, Ltd.

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NON CONVENTIONAL POWER GENERATION
OPEN ELECTIVE-I

Pre-requisite: Nil.

Objectives:

- To introduce various types of renewable technologies available.
- The technologies of energy conversion from these resources and their quantitative analysis.

Outcomes:

- The student will be able analyse solar thermal and photovoltaic systems and related technologies for energy conversion.
- Wind energy conversion and devices available for it.
- Biomass conversion technologies.
- Geo thermal resources and energy conversion principles and technologies.
- Power from oceans (thermal, wave, tidal) and conversion and devices.
- Fundamentals of fuel cells and commercial batteries.

UNIT - I

Fundamentals of Solar Energy-Solar spectrum- Solar Radiation on Earth's surface-Solar radiation geometry-Solar radiation measurements- Solar radiation data- Solar radiation on horizontal and tilted surfaces. Solar Thermal conversion- Flat plate collectors- concentrated collectors- construction and thermal analysis- Solar applications- Solar ponds- Heliostat systems-water heater-air heater-solar still.

UNIT - II

Solar-Electric Power generation- Photovoltaic cells- Equivalent circuit- V-I Characteristics-Photovoltaic modules – constructional details- design considerations- Tracking- Maximum power point tracking - Solar Thermo electric conversion.

UNIT - III

Wind Energy- Fundamentals of wind energy-power available in wind- Betz Limit-Aerodynamics of wind turbine- Wind turbines- Horizontal and vertical axis turbines –their configurations- Wind Energy conversion systems.

UNIT - IV

Energy from Bio Mass- Various fuels- Sources-Conversion technologies-Wet Processes – Dry Processes- Bio Gas generation – Aerobic and anaerobic digestion - Factors affecting generation of bio gas - Classification of bio gas plants-Different Indian digesters- Digester design considerations - Gasification process - Gasifiers – Applications. Geothermal Energy - sources- Hydrothermal convective - Geo-pressure resources - Petro-thermal systems (HDR) - Magma Resources-Prime Movers.

UNIT - V

OTEC Systems- Principle of operation - Open and closed cycles, Energy from Tides - Principle of Tidal Power - Components of tidal Power plants - Operation Methods - Estimation of Energy in Single and double basin systems - Energy and Power from Waves-Wave energy conversion devices - Fuel Cells - Design and Principle of operation - Types of Fuel Cells - Advantages and disadvantages - Types of Electrodes – Applications - Basics of Batteries - Constructional details of Lead acid batteries - Ni-Cd Batteries.

TEXT BOOKS

1. John Twidell & Wier, Renewable Energy Resouces, CRC Press, 2009.
2. G.D.Rai – Non Conventional Energy sources, Khanna publishers.

REFERENCE BOOKS

1. D.P .Kothari, Singal,Rakesh, Ranjan, Renewable Energy sources and Emerging Technologies, PHI, 2009.
2. F.C.Treble, Generating Electricity from Sun.
3. C.S.Solanki, Solar Photo volatics- Fundamentals- Principles and Applications, PHI 2009
4. S.P.Sukhatme, Solar Energy Principles and Application - TMH

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ELECTRICAL ENGINEERING MATERIALS
OPEN ELECTIVE-I

Pre-requisites: Nil

Objectives: To understand the importance of various materials used in electrical engineering and obtain a qualitative analysis of their behavior and applications.

OUTCOMES: Will be able to
1. Understand various types of dielectric materials, their properties in various conditions.
2. Evaluate magnetic materials and their behavior.
3. Evaluate semiconductor materials and technologies.
4. Materials used in electrical engineering and applications.

UNIT- I
DIELECTRIC MATERIALS: Dielectric as Electric Field Medium, leakage currents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNIT – II
MAGNETIC MATERIALS: Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials, special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. factors effecting permeability and hysteresis

UNIT – III
SEMICONDUCTOR MATERIALS: Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale integration techniques (VLSI)

UNIT – IV
MATERIALS FOR ELECTRICAL APPLICATIONS: Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNIT – V
SPECIAL PURPOSE MATERIALS: Refractory Materials, Structural Materials, Radioactive Materials, Galvanization and Impregnation of materials, Processing of electronic materials, Insulating varnishes and coolants, Properties and applications of mineral oils, Testing of Transformer oil as per ISI

TEXT BOOKS
1. R K Rajput: A course in Electrical Engineering Materials, Laxmi Publications. 2009
2. T K BasaK: A course in Electrical Engineering Materials:, New Age Science Publications 2009
3. TTTI Madras: Electrical Engineering Materials
4. Adrianus J.Dekker: Electrical Engineering Materials, THM Publication.

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NANO-TECHNOLOGY
OPEN ELECTIVE-I

Pre-requisites: Nil

OBJECTIVES:
To enable the student to understand fundamentals of nano materials and technologies for these materials and their manufacturing, applications in various fields.

OUTCOMES:
- To evaluate electronic structural studies of nano materials and different synthesis methods to obtain nano structures.
- Understand characterization techniques through various measurements to study electrical, mechanical,thermal properties of nano materials.
- Applications of nano materials for specific purposes like MEMS, NEMS, nano electronics, energy storage.

UNIT - I
Background of Nanotechnology: Scientific Revolutions, Nanotechnology and Nanomachines - The Periodic Table, Atomic Structure, Molecules and Phases, Energy, Molecular and Atomic size, Surfaces and Dimensional Space, Top down and Bottom up approach.

UNIT - II
Molecular Nanotechnology: Atoms by inference, Electron Microscopes, Scanning electron microscope, Modern transmission electron microscope, Scanning probe microscope-atomic force microscope, scanning, tunneling microscope, Self Assembly.

UNIT - III
Nanopowders and Nanomaterials: Preparation, Plasma arcing, chemical vapor deposition, Sol-gels, Electrodeposition, Ball milling, using natural nanoparticles, Applications of nanomaterials.

UNIT - IV
Nanoelectronics: Approaches to nanoelectronics, Fabrication of integrated circuits, MEMS, NEMS, Nano circuits, Quantum wire, Quantum well, DNA-directed assembly and application in electronics.

UNIT - V
Applications: MEMS, NEMS, Coatings, Optoelectronic Devices, Environmental Applications, Nanomedicine.

TEXT BOOKS
1. Introduction to Nanoscience and Nanotechnology Gabor L. Hornyak, *NanoThread, Inc., Golden, Colorado, USA*; H.F. Tibbals, *University of Texas Southwestern Medical Center, Dallas, USA*; Joydeep Dutta, *Asian Institute of Technology, Pathumthani, Thailand*; John J. Moore, *Colorado School of Mines, Golden, USA*
2. Introduction to Nanotechnology by Charles P. Poole Jr and Frank J.Owens Wiley India Pvt Ltd.
3. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N,
4. Introduction to nano tech by phani kumar
5. Introduction to Nano Technology by Charles P. Poole Jr and Frank J. Owens. Wiley India Pvt Ltd.
6. Introduction to Nanoscience and Nanotechnology, Chatopadhyaya.K.K, and Banerjee A.N, NANOTECHNOLOGY Basic Science and EmergingTsechnologies by Michael Wilson, Kamali Kannangara, Geoff Smith, Michelle Simmons, Burkhard Raguse**-** CHAPMAN & HALL/CRC PRESS 2002.

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OPERATIONS RESEARCH
OPEN ELECTIVE-I

Prerequisites: None

Objectives:
Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

Outcomes:
Understanding the problem, identifying variables & constants, formulas of optimization model and applying appropriate optimization Techniques

UNIT – I
Development – Definition– Characteristics and Phases – Types of models – Operations Research models – applications.
ALLOCATION: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT – II
TRANSPORTATION PROBLEM – Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.
Assignment problem – Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT – III
SEQUENCING – Introduction – Flow **–**Shop sequencing – n jobs through two machines – n jobs through three machines – Job shop sequencing – two jobs through 'm' machines-graphical model
REPLACEMENT: Introduction – Replacement of items that deteriorate with time – when money value is not counted and counted – Replacement of items that fail completely- Group Replacement.

UNIT – IV
THEORY OF GAMES: Introduction –Terminology– Solution of games with saddle points and without saddle points- 2 x 2 games –m x 2 & 2 x n games - graphical method – m x n games - dominance principle.
INVENTORY: Introduction – Single item, Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks –Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT – V
WAITING LINES: Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.
DYNAMIC PROGRAMMING:
Introduction – Terminology- Bellman's Principle of Optimality – Applications of dynamic programming-shortest path problem – linear programming problem.

TEXT BOOK :
1. Operation Research /J.K.Sharma/ MacMilan.
2. Operations Research/A.C.S.Kumar/Yesdee

REFERENCE BOOKS :
1. Operations Research: Methods and Problems / Maurice Saseini, Arhur Yaspan and Lawrence Friedman
2. Operations Research /A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi/Pearson Education.
3. Operations Research / Wagner/ PHI Publications.
4. Introduction to O.R/Hillier & Libermann (TMH).
5. Introduction to O.R /Taha/PHI

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BASICS OF THERMODYNAMICS
OPEN ELECTIVE-I

Pre-requisite: Engineering Chemistry and Physics

Course Objective: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

Course Outcomes:
At the end of the course, the student should be able to
- Understand and differentiate between different thermodynamic systems and processes
- Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes
- Understand and analyze the Thermodynamic cycles

UNIT – I
Introduction: Basic Concepts:
System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle, Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility

UNIT II
Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT – III
First and Second Laws of Thermodynamics: First Law: Cycle and Process, Specific Heats (cp and cv), Heat interactions in a Closed System for various processes, Limitations of First Law, Concept of Heat Engine (H.E.) and Reversed H.E. (Heat Pump and Refrigerator), Efficiency/COP, Second Law: Kelvin-Planck and Clausius Statements, Carnot Cycle, Carnot Efficiency, Statement of Clausius Inequality, Property of Entropy, T-S and P-V Diagrams

UNIT IV
Mixtures of perfect Gases – Mole Fraction, Mass friction Gravimetric and volumetric Analysis – Dalton's Law of partial pressure, Avogadro's Laws of additive volumes – Mole fraction , Volume fraction and partial pressure, Equivalent Gas const.
Atmospheric air - Psychrometric Properties – Dry bulb Temperature, Wet Bulb Temperature, Dew point Temperature, , Specific Humidity, Relative Humidity, saturated Air, Vapour pressure, Degree of saturation – Adiabatic Saturation ,Psychrometric chart.

UNIT - V
Power Cycles : Otto, Diesel cycles - Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis
Refrigeration Cycles:
Bell-Coleman cycle, Vapour compression cycle-performance Evaluation.

TEXT BOOKS :
1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Thermodynamics / C.P.Arora.

REFERENCE BOOKS:
1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Fundamentals of Classical Thermodynamics – G. Van Wylan & R.E. Sonntag – John Wiley Pub.
3. Thermodynamics – J.P.Holman / McGrawHill
4. Engineering Thermodynamics – Jones & Dugan
5. Thermodynamics & Heat Engines – Yadav – Central Book Depot, Allahabad.

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FABRICATION PROCESSES
OPEN ELECTIVE-I

Prerequisites: Nil

Objectives:
Understand the philosphipies of various Manufacturing process.

Outcomes:
For given product, one should be able identify the manufacturing process.

UNIT – I
Casting : Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands.
Methods of Melting - Crucible melting and cupola operation – Defects in castings;
Casting processes – Types – Sand moulding, Centrifugal casting, die- casting, Investment casting, shell moulding; Principles of Gating – Requirements – Types of gates, Design of gating systems – Riser – Function, types of Riser and Riser design.

UNIT – II
Welding: Classification – Types of welds and welded joints; Gas welding - Types, oxy-fuel gas cutting. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.
Inert Gas Welding _ TIG Welding, MIG welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non-destructive testing of welds.

UNIT – III
Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth.
Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.
Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – IV
Extrusion of Metals : Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion

UNIT – V
Forging Processes : Forging operations and principles – Tools – Forging methods – Smith forging, Drop Forging – Roll forging – Forging hammers : Rotary forging – forging defects – cold forging, swaging, Forces in forging operations.

TEXT BOOKS :
1. Manufacturing Technology / P.N. Rao/TMH

REFERENCE BOOKS :
1. Production Technology / R.K. Jain
2. Metal Casting / T.V Ramana Rao / New Age
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Parmar /
5. Production Technology /Sarma P C /
6. Manufacturing Engineering and Technology/Kalpakjin S/ Pearson Edu.

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ELECTRONIC MEASURING INSTRUMENTS
OPEN ELECTIVE-I

Note: No detailed mathematical treatment is required.

Prerequisite : Nil

Course Objectives:

- It provides an understanding of various measuring systems functioning and metrics for performance analysis.
- Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
- Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

Course Outcomes:

On completion of this course student can be able to

- Identify the various electronic instruments based on their specifications for carrying out a particular task of measurement.
- Measure various physical parameters by appropriately selecting the transducers.
- Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.

Unit-I:

Block Schematics of Measuring Systems and Performance Metrics: Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag.

Unit-II:

Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, and Specifications.

Unit-III:

Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments. CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes.

Unit-IV:

Recorders: X-Y Plotter, Curve tracer, Galvanometric Recorders, Servo transducers, pen driving mechanisms, Magnetic Recording, Magnetic recording techniques.

Unit-V:

Transducers: Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers.

TEXT BOOKS:

1. Electronic Measurements and Instrumentation: B.M. Oliver, J.M. Cage TMH Reprint 2009.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2nd Edition 2004.

REFERENCES:

1. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
2. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbincs, W.D. Cooper: PHI 5th Edition 2003.

3. Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.
4. Industrial Instrumentation: T.R. Padmanabham Springer 2009.

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OBJECT ORIENTED PROGRAMMING THROUGH JAVA
OPEN ELECTIVE-I

Prerequisites
1. A course on "Computer Programming & Data Structures"

Objectives
1. Introduces object oriented programming concepts using the Java language.
2. Introduces the principles of inheritance and polymorphism; and demonstrates how they relate to the design of abstract classes
3. Introduces the implementation of packages and interfaces
4. Introduces exception handling, event handling and multithreading
5. Introduces the design of Graphical User Interface using applets and swings

Outcomes
1. Develop applications for a range of problems using object-oriented programming techniques
2. Design simple Graphical User Interface applications

UNIT I:
Object oriented thinking and Java Basics- Need for OOP paradigm, summary of OOP concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

UNIT II:
Inheritance, Packages and Interfaces – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.
Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces, Exploring java.io.

UNIT III:
Exception handling and Multithreading-- Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.
String handling,Exploring java.util.Differences between multi threading and multitasking, thread life cycle, creating threads, thread priorities, synchronizing threads, inter-thread communication, thread groups, daemon threads, Enumerations, auto boxing, annotations, generics.

UNIT IV:
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes. The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, dialogs, menu bar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

UNIT V:

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Swing – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

TEXT BOOKS:

1. Java the complete reference, 7th editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Education.

REFERENCES:

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & Sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development, R.A. Johnson-Thomson.

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COMPUTER GRAPHICS
OPEN ELECTIVE-I

Prerequisites
1. Familiarity with the theory and use of coordinate geometry and of linear algebra such as matrix multiplication.
2. A course on "Computer Programming and Data Structures"

Objectives
1. The aim of this course is to provide an introduction of fundamental concepts and theory of computer graphics.
2. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection;

Outcomes
1. Acquire familiarity with the relevant mathematics of computer graphics.
2. Be able to design basic graphics application programs, including animation
3. Be able to design applications that display graphic images to given specifications

UNIT-I:
Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices
Output primitives: Points and lines, line drawing algorithms (Bresenham's and DDA Algorithm), mid-point circle and ellipse algorithms
Filled area primitives: Scan-line polygon fills algorithm, boundary-fill and flood-fill algorithms

UNIT-II:
2-D geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems
2-D viewing: The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm, Polygon Filling

UNIT-III:
3-D object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods.

UNIT-IV:
3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.
3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT-V:
Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications.
Visible surface detection methods: Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods

Text Books:

1. "Computer Graphics *C version*", Donald Hearn and M.Pauline Baker, Pearson Education
2. "Computer Graphics Principles & practice", second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
3. Computer Graphics, Steven Harrington, TMH

References:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Principles of Interactive Computer Graphics", Neuman and Sproul, TMH.
3. Principles of Computer Graphics, Shalini Govil, Pai, 2005, Springer.

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ENGINEERING MATERIALS
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:
1. To gain an knowledge about the uses and application of various ferrous metals and alloys.
2. To gain an knowledge about the uses and application of various non ferrous alloys.
3. To gain an knowledge about the uses and application of various ceramics, polymers and composites for different engineering applications.

Course Outcomes:
At the end of the course, student would be able to recommend
1. Ferrous metals and alloys for a given engineering applications and service condition.
2. Non ferrous alloys for a given engineering applications and service condition.
3. Ceramics, Polymers and composites for a given engineering applications and service condition.

UNIT-I
FERROUS ALLOYS: Introduction, Designations and classifications for steels, Simple Heat Treatments, Effect of Alloying Elements.

UNIT-II
NONFERROUS ALLOYS: Introduction, properties and applications, Aluminum Alloys, Magnesium Alloys, Copper Alloys and Titanium Alloys.

UNIT-III
CERAMIC MATERIALS: Introduction, Properties and Applications of Ceramics, Glasses and Refractories.

UNIT-IV
POLYMERS: Introduction, Classification of Polymers, Polymerization, Degree of Polymerization, Typical Thermoplastics and Thermosets.

UNIT-V
COMPOSITES: Introduction, Classification, Properties and Applications of Polymer matrix, Metal Matrix Ceramic Matrix and Laminar composites.

TEXT / REFERENCE BOOKS:
1. Donald R. Askland, Pradeep P. Phule, The Science and Engineering of Materials (4th Edition), Thomson Publishers, 2003.
2. William D. Callister Introduction to Material Science and Engineering, John Wiley and Sons, 2007.
3. W.F.Smith, Principles of Materials Science and Engineering, Mc Graw Hill, New York, 1994.

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METALLURGY FOR NON METALLURGISTS
OPEN ELECTIVE-I

Pre requisites: Nil

Course Objectives:
1. To describe the basic principles of metallurgy and the importance of metallurgy in various discipline of engineering.
2. Gain a thorough knowledge about heat treatment of steels.
3. Gain a knowledge about properties and uses of cast irons and non ferrous metals.
4. Gain a working knowledge of basic testing methods for metals.

Course Outcomes:
At the end of the course Student would be able
1. To use and apply metallurgy in his own branch of engineering.
2. The student will be able to justify the various testing methods adopted for metals.

UNIT-I
Introduction: Crystal structure and defects, Crystal structure of metals, Classification of steels, Carbon steels

UNIT-II
Heat Treatment of Steels: The Iron carbon systems, Common phases in steels, Annealing, Normalizing, Hardening and tempering

UNIT-III
Cast irons: Properties and applications of Ductile irons, Malleable irons, Compacted graphite iron.

UNIT-IV
Non Ferrous Metals: Properties and applications of Light Metals (Al , Be, Mg, Ti), Super alloys

UNIT-V
Testing of Metals: Hardness testing, Tensile Testing, Impact Testing, Fatigue Testing.

TEXT BOOKS
1. Materials Science and Engineering, An introduction. WD Callister, Jr., Adapted by R. Balasubramaniam, John Wiley & Sons, NY, Indian edition, 2007
2. Introduction to Physical Metallurgy – SH Avner, TATA Mc GRAW HILL ,1997
3. Metallurgy for Engineers- Clark and Varney
4. Mechanical Metallurgy – G. E. Dieter

REFERENCE BOOKS
1. Engineering Physical Metallurgy and Heat treatment – Y Lakhtin
2. C. Suryanarayana, Experimental Techniques in Mechanics and Materials, John Wiley, John Wiley, NJ, USA,2006
Foundations of Materials Science and Engineering – WF Smith

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IDP (B.Tech. ECE & M.Tech. /MBA) III Year I-Sem

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INDUSTRIAL POLLUTION CONTROL ENGINEERING
OPEN ELECTIVE-I

Objective:
To expose the students to various types of industrial pollutions and controlling techniques.

OUTCOME:
The student will be able learn the sources of air, water pollution and also their treatment methods

UNIT-I
Introduction to industrial pollution and types of pollution from chemical industries, Effects of pollution as environment and ecosystems-global warming-green house effect; Environmental legislatures-standards and guidelines.

UNIT –II
Air pollution- Meteorological aspects of pollution dispersion-adiabatic lapse rate-Environmental lapse rate-Turbulence and stability of atmosphere, Richardson number-Plume raise-plume behavior and characteristics, effective stack height. Major air pollutants and their sources, measurement of air pollutants

UNIT -III
General methods of control air pollutants removal of sulphur dioxide, oxides of nitrogen and organic vapors from gaseous effluents; Removal of particulate matter – principle and working of setting chambers, cyclone separators, fabric and fibre filters – electro static precipitators, Treatment of gaseous effluents.

UNIT -IV
Introduction to water pollution – water pollutants classification – characteristics of liquid effluents from fertilizer, pulp & paper and petroleum industries, estimation of oxygen demands – DO, BOD, COD, TOC – BOD curves, oxygen sag curve – modeling of BOD curves
Biological treatment of waste waters – aerobic and anaerobic methods – suspended and attached growth processes – bacteria – Reproduction in bacterial – Bacterial growth crushes, conventional activated sludge process – Trickling filters, Aerated lagoons – stabilization ponds – fluidized bed contractors.

UNIT -V
Physical Treatment methods : Principle and working of screening – sedimentation – flotation – filtration – flocculation, Tertiary Treatment methods – carbon adsorption – Ion exchange – Reverse Osmosis, Boralin Chlorinating – Ultra filtration, Sludge treatment and disposal , removal of chromium and phenol from liquid effluents.
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Text books:
1. Pollution control in process industries by S.P. Mahajan TMH.,1985
2. Waste water treatment by M.Narayana Rao and A.K.Datta,Oxford and IHB publ. New Delhi

References:
1. Environmental pollution and control engineering by Rao C. S. – Wiley Eastern Limited, India, 1993.
2. Air pollution control by P.Prathap mouli and N.Venkata subbayya. Divya Jyothi Prakashan, Jodhpur.

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ESTIMATION, QUANTITY SURVEY & VALUATION
OPEN ELECTIVE -II

Pre Requisites:
Concrete Technology, RC Design, Desgin of Steel Structure

Course Objectives:
The subject provide process of estimations required for various work in construction. To have knowledge of using SOR & SSR for analysis of rates on various works .

Course Outcomes:
Able to provide control steps for disaster mitigation steps

UNIT – I
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

UNIT – II
Detailed Estimates of Buildings - Reinforcement bar bending and bar requirement schedules

UNIT – III
Earthwork for roads and canals.

UNIT – IV
Rate Analysis – Working out data for various items of work over head and contigent charges.

UNIT-V
Contracts – Types of contracts – Contract Documents – Conditions of contract, Valuation -Standard specifications for different items of building construction.

NOTE : NUMBER OF EXERCISES PROPOSED :
1. Three in flat Roof & one in Sloped Roof
2. Exercises on Data – three Nos.

Text Books:
1. Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2. Estimating and Costing by G.S. Birdie

Reference books:
1. Standard Schedule of rates and standard data book by public works department.
2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works – B.I.S.)
3. Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.

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DESIGN ESTIMATION AND COSTING OF ELECTRICAL SYSTEMS
OPEN ELECTIVE-II

Pre-requisite: Power systems-I and Power Systems-II

Objectives:
Objectives of this course are
- To emphasize the estimating and costing aspects of all electrical equipment, installation and designs to analyze the cost viability.
- To design and estimation of wiring,
- To design overhead and underground distribution lines, substations and illumination design.

OUTCOMES:
Students are in a position to Understand the design considerations of electrical installations.
- To design electrical installation for buildings and small industries.
- To identify and design the various types of light sources for different applications.

UNIT - I
DESIGN CONSIDERATIONS OF ELECTRICAL INSTALLATIONS: Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections , Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT - II
ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES: Electrical installations for residential buildings – estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT - III
OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES: Introduction, Supports for transmission lines, Distribution lines – Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT - IV
SUBSTATIONS: Introduction, Types of substations, Outdoor substation – Pole mounted type, Indoor substations – Floor mounted type.

UNIT – V
DESIGN OF ILLUMINATION SCHEMES: Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes LED, CFL and OCFL differences.

TEXT BOOKS
1. Electrical Design Estimating and Costing, K. B. Raina, S. K. BhattAcharya, New Age International Publisher.
2. Design of Electrical Installations, Er. V. K. Jain, Er. Amitabh Bajaj, University Science Press.

REFERENCE BOOKS

1. Code of practice for Electrical wiring installations,(System voltage not exceeding 650 volts), Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS: 4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS: 2032.
4. Code of Practice for selection, Installation of Maintenance of fuse (voltage not exceeding 650V), Indian Standard Institution, IS: 3106-1966.
5. Code of Practice for earthling, Indian Standard Institution, IS:3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Electrical Installation, estimating and costing, Gupta J. B., Katson, Ludhiana.

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ENERGY STORAGE SYSTEMS
OPEN ELECTIVE-II

Pre-requisite: None

Objectives:
Objectives of this course are
- To enable the student to understand the need for energy storage, devices and technologies available and their applications.

OUTCOMES: After this course, the student
- Can analyze the characteristics of energy from various sources and need for storage
- Can classify various types of energy storage and various devices used for the purpose
- Can apply the same concepts to real time problems.

UNIT - I
Electrical Energy Storage Technologies: Characteristics of electricity, Electricity and the roles of EES, High generation cost during peak-demand periods, Need for continuous and flexible supply, Long distance between generation and consumption, Congestion in power grids, Transmission by cable.

UNIT - II
Needs for Electrical Energy Storage: Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The roles of electrical energy storage technologies, The roles from the viewpoint of a utility, The roles from the viewpoint of consumers, The roles from the viewpoint of generators of renewable energy.

UNIT - III
Features of Energy Storage Systems: Classification of EES systems , Mechanical storage systems, Pumped hydro storage (PHS), Compressed air energy storage (CAES), Flywheel energy storage (FES), Electrochemical storage systems, Secondary batteries, Flow batteries, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG).

UNIT - IV
Types of Electrical Energy Storage systems: Electrical storage systems, Double-layer capacitors (DLC) ,Superconducting magnetic energy storage (SMES),Thermal storage systems ,Standards for EES, Technical comparison of EES technologies.

UNIT - V
Applications: Present status of applications, Utility use (conventional power generation, grid operation & service) , Consumer use (uninterruptable power supply for large consumers), New trends in applications ,Renewable energy generation, Smart Grid, Smart Micro grid, Smart House, Electric vehicles, Management and control hierarchy of storage systems, Internal configuration of battery storage systems, External connection of EES systems , Aggregating EES systems and distributed generation (Virtual Power Plant), Battery SCADA– aggregation of many dispersed batteries.

TEXT BOOKS
1. Energy Storage Benefits and Market Analysis' by James M. Eyer, Joseph J. Iannucci and Garth P. Corey.
2. The Electrical Energy Storage by IEC Market Strategy Board.

REFERENCE BOOKS:

1. Jim Eyer, Garth Corey: Energy Storage for the Electricity Grid: Benefits and Market Potential Assessment Guide, Report, Sandia National Laboratories, Feb 2010.

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MECHATRONICS
OPEN ELECTIVE-II

UNIT – I

INTRODUCTION: Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Registors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II

PRECISION MECHANICAL SYSTEMS: Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

ELECTRONIC INTERFACE SUBSYSTEMS: TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers, over current sensing, resetable fuses, thermal dissipation - Power Supply - Bipolar transistors / MOSFETs

UNIT – III

ELECTROMECHANICAL DRIVES: Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

MICROCONTROLLERS OVERVIEW: 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming – Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV

PROGRAMMABLE LOGIC CONTROLLERS: Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input/output - PLC Selection - Application.

UNIT – V

PROGRAMMABLE MOTION CONTROLLERS: Introduction - System Transfer Function – Laplace transform and its application in analyzing differential equation of a control system - Feedback Devices: Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive, Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics by M.D.Singh, J.G.Joshi PHI.
3. Mechatronics HMT

REFERENCE BOOKS

1. "Designing Intelligent Machines". open University, London.
2. Michel B. Histand and David G. Alciatore,"
3. Introduction to Mechatronics and Measurement systems, "Tata MC Graw Hill
4. I. C.W. Desi ha, "Control sensors and actuators," Prentice Hall.
5. Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
6. Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
7. Mechatronics System Design / Devdas shetty /Richard / Thomson.

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JET PROPULSION AND ROCKET ENGINEERING
OPEN ELECTIVE-II

Prerequites: None

Course outcomes:
After doing this course, student should be in position to
1. Understand Turbo Jet Propulsion System
2. Analyze the flight performance
3. Understand Principles of Jet Propulsion and Rocketry & Nozzle Theory and Characteristics
4. Learn the Aero thermo chemistry of the combustion products
5. Understand the physics of Solid propellant rocket engine, Liquid Rocket Propulsion System & Ramjet and Integral Rocket Ramjet Propulsion System**:**

Unit - I:
Turbo Jet Propulsion System:
Gas turbine cycle analysis – layout of turbo jet engine. Turbo machinery- compressors and turbines, combustor, blade aerodynamics, engine off design performance analysis.
Flight Performance:
Forces acting on vehicle – Basic relations of motion – multi stage vehicles.

Unit - II:
Principles of Jet Propulsion and Rocketry:
Fundamentals of jet propulsion, Rockets and air breathing jet engines – Classification – turbo jet , turbo fan, turbo prop, rocket (Solid and Liquid propellant rockets) and Ramjet engines.
Nozzle Theory and Characteristics Parameters:
Theory of one dimensional convergent – divergent nozzles – aerodynamic choking of nozzles and mass flow through a nozzle – nozzle exhaust velocity – thrust, thrust coefficient, A_c / A_t of a nozzle, Supersonic nozzle shape, non-adapted nozzles, summer field criteria, departure from simple analysis – characteristic parameters – 1) characteristic velocity, 2) specific impulse 3) total impulse 4) relationship between the characteristic parameters 5) nozzle efficiency, combustion efficiency and overall efficiency.

Unit - III: Aero Thermo Chemistry of The Combustion Products:
Review of properties of mixture of gases – Gibbs – Dalton laws – Equivalent ratio, enthalpy changes in reactions, heat of reaction and heat of formation – calculation of adiabatic flame temperature and specific impulse – frozen and equilibrium flows.
Solid Propulsion System:
Solid propellants – classification, homogeneous and heterogeneous propellants, double base propellant compositions and manufacturing methods. Composite propellant oxidizers and binders. Effect of binder on propellant properties. Burning rate and burning rate laws, factors influencing the burning rate, methods of determining burning rates.

Unit - IV:
Solid propellant rocket engine – internal ballistics, equilibrium motor operation and equilibrium pressure to various parameters. Transient and pseudo equilibrium operation, end burning and burning grains, grain design. Rocket motor hard ware design. Heat transfer considerations in solid rocket motor design. Ignition system, simple pyro devices.
Liquid Rocket Propulsion System:
Liquid propellants – classification, Mono and Bi propellants, Cryogenic and storage propellants, ignition delay of hypergolic propellants, physical and chemical characteristics of liquid propellant. Liquid propellant rocket engine – system layout, pump and pressure feed systems, feed system components. Design of combustion chamber, characteristic length, constructional features, and chamber wall stresses. Heat transfer and cooling aspects. Uncooled engines, injectors – various

types, injection patterns, injector characteristics, and atomization and drop size distribution, propellant tank design.

Unit - V: Ramjet and Integral Rocket Ramjet Propulsion System:
Fuel rich solid propellants, gross thrust, gross thrust coefficient, combustion efficiency of ramjet engine, air intakes and their classification – critical, super critical and sub-critical operation of air intakes, engine intake matching, classification and comparison of IIRR propulsion systems.

TEXT BOOKS:
1. Gas Turbines and propulsive systems-P.Khajuria& S.P.Dubey/Dhanpatrai pub.
2. Gas Dynamics & Space Propulsion M.C.Ramaswamy / Jaico Publishing House.

REFERENCE BOOKS:
1. Rocket propulsion –Sutton
2. Gas Turbines /Cohen, Rogers & Sarvana Muttoo/Addision Wesley & Longman.
3. Gas Turbines-V.Ganesan /TMH.

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ERGONOMICS
OPEN ELECTIVE-II

Prerequists: None

Objectives:
Provide a broad based introduction to ergonomic principles and their application in the design of work, equipment and the workplace. Consideration is given to musculo-skeletal disorders, manual handling, ergonomic aspects of the environment as well as to the social and legal aspects.

Course Outcomes:
On completing this course successfully the student will be able to:
- understand and apply ergonomic principles to the creation of safer, healthier and more efficient and effective activities in the workplace;
- understand ergonomic risk assessments and appropriate control measures;
- understand the causes of upper limb disorders and how to reduce them;
- appreciate workplace layout and equipment design;
- appreciate environmental aspects of good ergonomic design.

UNIT I
Introduction to Ergonomics, Human, Machine Systems, Basic Work Systems, Human Relations and Occupational Psychology, Hawthrone Experiments, Participation, Occupational Medicine, Human Performance Psychology, FMJ versus FJM, Human Factors and Ergonomics. Modern Work Systems and Neo, Taylorism, Attempts to Humanize Work, Generic Tools in Ergonomics, Effectiveness and Cost Effectiveness of Ergonomics in General.

UNIT II
Design and Evaluation of Manual Handing Tasks, Anatomy and Biomechanics of Manual Handling, Prevention of Manual Handling Injuries in the Workplace, Design of Manual Handling Tasks.
Body Mechanics at Work: Risk Assessment and Design, Low Back Pain, Biomechanics of Spinal Loading, Ergonomics and Musculoskeletal System in General, Effectiveness and Cost Effectiveness.

UNIT III
Physically Demanding Work: Stress and Fatigue, Physically and Psychologically Demanding Work, Muscles, Structure and Function, and Capacity, Physical work capacity.
User, Cantered Workspace Design Anthropometric Data, Statistical Essentials, Types of Anthropometric Data, Applications Of Anthropometry in Design, Multiple Workspace Configurations, Status of Anthropometry in Ergonomics.

UNIT IV
Human Error, Accidents, and Safety, Micro ergonomics, Human Error, and Accidents, Prevention of Error in Human, Machine Interaction, Macroergonomices: Performance Shaping Factors.

UNIT V
Visual Environment: Measurements and Design, Vision and the Eye, Measurement of Light, Lighting Design Considerations, Visual figure, Eyestrain, and Near Work, Status of Methods in Risk Assessment and Task design.
Hearing, Sound, Noise and Vibration, Measurement of Sound, Hearing Protection, Design of Acoustic Environment.

Text books
1. Introduction to Ergonomics(Third Edition)/ R.S.Bridger/CRC Press , Taylor & Francis Group

References
1. Human factors in Engineering and Design/E.J.McCormick/ TMH Edison
2. Motion and Time Design and Measurement of work/ Barnes Ralph., / John Wiley & sons Newyork, 2002

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MECHATRONICS
OPEN ELECTIVE-II

Pre-requisites: None.

Course objectives:
- They should be able to link up mechanical and electronics.

Outcomes:
- Develop a relationship between mechanical elements and electronics elements for proper functioning of mechanical systems.

UNIT – I
INTRODUCTION: Definition – Trends - Control Methods: Standalone , PC Based (Real Time Operating Systems, Graphical User Interface , Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

SIGNAL CONDITIONING : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Registors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II
PRECISION MECHANICAL SYSTEMS :
Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.
Note: (text book: Mechatronics HMT – chapter 5)

ELECTRONIC INTERFACE SUBSYSTEMS : TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resetable fuses , thermal dissipation - Power Supply - Bipolar transistors / mosfets

UNIT – III
ELECTROMECHANICAL DRIVES : Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.
MICROCONTROLLERS OVERVIEW : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV
PROGRAMMABLE LOGIC CONTROLLERS : Basic Structure - Programming : Ladder diagram - Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling - Analog input / output - PLC Selection - Application.

UNIT – V
PROGRAMMABLE MOTION CONTROLLERS : Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis

Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS :

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering by W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics/M.D.Singh/J.G.Joshi/PHI.

REFERENCE:

1 “Designing Intelligent Machines”. open University, London.
2 Michel B. Histand and David G. Alciatore,”
3 Introduction to Mechatronics and Measurement systems, “Tata MC Graw hill
4 I. C.W. Desi ha, “Control sensors and actuators,” Prentice Hall.
5 Mechatronics Source Book by Newton C Braga, Thomson Publications, Chennai.
6 Mechatronics – N. Shanmugam / Anuradha Agencies Publisers.
Mechatronics System Design / Devdas shetty/Richard/Thomson.

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PRINCIPLES OF ELECTRONIC COMMUNICATIONS
OPEN ELECTIVE-II

Prerequsite : Nil

Course Objectives:
The objective of this subject is to:
- Introduce the students to modulation and various analog and digital modulation schemes.
- They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes:
By completing this subject, the student can
- Work on various types of modulations.
- Should be able to use these communication modules in implementation.
- Will have a basic understanding of various wireless and cellular, mobile and telephone communication systems.

Unit 1:
Introduction: Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

Unit 2:
Simple description on Modulation: Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

Unit 3:
Telecommunication Systems: Telephones Telephone system, Paging systems, Internet Telephony.
Networking and Local Area Networks: Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

Unit 4:
Satellite Communication: Satellite Orbits, satellite communication systems, satellite subsystems, Ground Stations Satellite Applications, Global Positioning systems.
Optical Communication: Optical Principles, Optical Communication Systems, Fiber –Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

Unit 5:
Cellular and Mobile Communications: Cellular telephone systems, AMPS, GSM, CDMA, WCDMA.
Wireless Technologies: Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

Text Books:
1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennady, Davis, Electronic Communications systems, 4e, TMH, 1999

Reference Books:
1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.
4. Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

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CYBER SECURITY
OPEN ELECTIVE -II

Prerequisites
1. A Course on "Network Security and Cryptography"

Objectives
1. The purpose of the course is to educate on cyber security and the legal perspectives of cyber crimes and cyber offenses.
2. Introduce tools and methods for enhancing cyber security.
3. Topics include- cyber crimes, cyber offenses, cyber crimes on mobile and wireless devices, tools and methods to prevent cyber crimes, legal perspectives of cyber crimes and cyber security, computer forensics, Intellectual Property Rights and cyber terrorism

Outcomes
1. Demonstrate the knowledge of cyber security and understand the Indian and Global Act concerning cyber crimes
2. Employ security and privacy methods in the development of modern applications such that personal data is protected; and provide safe Internet usage.

UNIT-I

Introduction to Cybercrime:
Introduction, Cybercrime and Information security, who are cyber criminals, Classification of Cyber crimes, Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cyber crimes.

Cyber offenses : How Criminals Plan Them
Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

UNIT-II

Cybercrime: Mobile and Wireless Devices
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

Tools and Methods Used in Cyber Crime:
Introduction, Proxy services and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks.

UNIT III

Cyber crimes and Cyber Security: the Legal Perspectives Introduction
Cyber Crime and Legal Landscape around the world, Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario In India, Digital signatures and the Indian IT Act, Amendments to the Indian IT Act, Cybercrime and Punishment Cyber law, Technology and Students: Indian Scenario.

Understanding Computer Forensics
Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Chain of Custody concept, Network Forensics, Approaching a computer, Forensics Investigation, Challenges in Computer Forensics, Special Tools and Techniques Forensics Auditing

UNIT IV

Cyber Security: Organizational Implications

Introduction, cost of cyber crimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

Cybercrime and Cyber terrorism: Introduction, intellectual property in the cyberspace, the ethical dimension of cyber crimes the psychology, mindset and skills of hackers and other cyber criminals

UNIT V

Cybercrime: Illustrations, Examples and Mini-Cases

Examples:

Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances.

Mini-Cases:

The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Illustrations of Financial Frauds in Cyber Domain, Digital Signature-Related Crime Scenarios.

Text book:

1. **Cyber Security**: *Understanding Cyber Crimes, Computer Forensics and Legal Perspectives*, Nina Godbole and Sunil Belapure, Wiley INDIA.

Reference book:

1. **Cyber Security Essentials**, James Graham, Richard Howard and Ryan Otson, CRC Press.

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IDP (B.Tech. ECE & M.Tech. /MBA) III Year II-Sem

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DATABASE MANAGEMENT SYSTEMS
OPEN ELECTIVE-II

Prerequisites
1. A course on "Advanced Data Structures"

Objectives
1. To understand the basic concepts and the applications of database systems.
2. To master the basics of SQL and construct queries using SQL.
3. Topics include data models, database design, relational model, relational algebra, transaction control, concurrency control, storage structures and access techniques.

Outcomes
1. Gain knowledge of fundamentals of DBMS, database design and normal forms
2. Master the basics of SQL for retrieval and management of data.
3. Be acquainted with the basics of transaction processing and concurrency control.
4. Familiarity with database storage structures and access techniques

UNIT I:
Database System Applications: database system Vs. file system, view of data, data abstraction, instances and schemas, data models, the ER model, relational model, other models, database languages, DDL, DML, database access for application programs, database users and administrator, transaction management, database system structure, storage manager, the query processor, history of data base systems, data base design and ER diagrams, beyond ER design entities, attributes and entity sets, relationships and relationship sets, additional features of ER model, concept design with the ER Model, conceptual design for large enterprises.

UNIT II:
Introduction to the Relational Model: integrity constraint over relations, enforcing integrity constraints, querying relational data, logical data base design, introduction to views, destroying/altering tables and views, form of basic SQL query, examples of basic SQL queries, introduction to nested queries, correlated nested queries, set comparison operators, aggregation operators, NULL values, comparison using null values, logical connectivity's, AND, OR and NOT, impact on SQL constructs, outer joins, disallowing NULL values, complex integrity constraints in SQL, triggers and active data bases, Oracle, SQL Server, DB2.

UNIT III:
Relational Algebra: Selection and projection, set operations, renaming, Joins, Division, Examples of Algebra overviews, Relational calculus, Tuple relational Calculus, Domain relational calculus, Expressive Power of Algebra and calculus.
Schema refinement: Problems caused by redundancy, decompositions, problems related to decomposition, reasoning about functional dependencies, FIRST, SECOND, THIRD normal forms, BCNF, lossless join decomposition, dependency preserving decomposition, schema refinement in database design, multi valued dependencies, FOURTH normal form, FIFTH normal form.

UNIT IV:
Transaction Concept, Transaction State, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Implementation of Isolation, Testing for serializability, Lock Based Protocols, Timestamp Based Protocols, Validation- Based Protocols, Multiple Granularity. Recovery and Atomicity, Log–Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with loss of nonvolatile storage, Advance Recovery systems, Remote Backup systems.

UNIT V:
Data on External Storage, File Organization and Indexing, Cluster Indexes, Primary and Secondary Indexes, Index data Structures, Hash Based Indexing, Tree base Indexing, Comparison of File Organizations, Indexes and Performance Tuning, Intuitions for tree Indexes, Indexed Sequential Access Methods (ISAM), B+ Trees: A Dynamic Index Structure.

Text Books:
1. Database Management Systems, Raghurama Krishnan, Johannes Gehrke, Tata Mc Graw Hill 3rd Edition
2. Database System Concepts, Silberschatz, Korth, Mc Graw hill, V edition.

References:
1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, Elmasri Navrate Pearson Education
3. Introduction to Database Systems, C.J. Date Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah,PHI.
6. Fundamentals of Database Management Systems, M. L. Gillenson, Wiley Student Edition.

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CORROSION ENGINEERING
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:
1. To demonstrate electrometallurgy principles in deposition winning and the efficiency of the bath.
2. To determine corrosion rate/ resistance of metals and alloys.
3. To explain corrosion protection methods and tests.

Course Outcomes:
At the end of the course the student will be able:
1. To gain knowledge in various types of electrolytic cells and the processes taking place in them.
2. To obtain knowledge about the importance of controlling corrosion and its prevention measures.
3. The course is useful for higher studies, R&D, and also for getting into jobs in industries.

UNIT - I
Introduction, Electro Chemistry principles, electrochemical reactions, Polarization, passivity, environmental effects (oxygen, oxidizers, velocity, temperature, corrosive concentration, Galvanic coupling).

UNIT - II
Corrosion, Introduction, Definition, classification, Forms of corrosion, uniform corrosion,
Two metal corrosion: Sacrificial anode, EMF and Galvanic Series, Environmental effects,
Pitting corrosion: Pit shape and growth, Autocatalytic Nature of pitting, Crevice corrosion.

UNIT - III
Intergranular corrosion: Sensitization, weld decay, Knife-Line attack, Stress corrosion cracking: crack morphology, stress effects, environmental factors, metallurgical factors, Erosion corrosion: cavitation damage, fretting corrosion, Corrosion fatigue.

UNIT - IV
Corrosion prevention methods: Alteration of Environment (Inhibitors), Design, Coatings, cathodic and anodic protection. Material selection, Metallurgical aspects, Hydrogen damage (hydrogen blistering, Hydrogen embrittlement, Prevention).

UNIT - V
Modern theory and applications of corrosion: Introduction, free energy, cell potentials, emf series, applications of thermodynamics to corrosion, Corrosion rate expressions and measurements, corrosion testing.

Text / Reference Books:
1. Theory of Corrosion and Protection of Metals, N. D. Tomashov, Macmillan, 1967.
2. Corrosion Engineering, M. G. Fontana, 3rd edition, McGraw-Hill, 1985.
3. Corrosion and Corrosion Control, H. H. Uhlig, Wiley, 1985.

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TESTING OF MATERIALS
OPEN ELECTIVE-II

Pre-requisites: NIL

Course Objectives:
1. To gain and understanding of the response of various metals under the application of stress and/or temperature.
2. To build necessary theoretical back ground of the role of lattice defects in governing bot;h elastic and plastic properties of metals will be discussed.
3. Obtain a working knowledge of various hardness testing machines BHN, VHN, RHN
4. Obtain a working knowledge of creep and fatigue and analysis of data.

Course Outcomes:
At the end of the course the student will be able to:
1. Classify mechanical testing of ferrous and non-ferrous metals and alloys.
2. Recognize the importance of crystal defects including dislocations in plastic deformation.
3. Identify the testing methods for obtaining strength and hardness.
4. Examine the mechanisms of materials failure through fatigue and creep

UNIT – I
Introduction, Importance of testing
Hardness Test: Methods of hardness testing – Brinell, Vickers, Rockwell hardness tests.
The Impact Test: Notched bar impact test and its significance, Charpy and Izod Tests, fracture toughness testing - COD and CTOD tests, significance of transition temperature curve.

UNIT - II
The Tension Test: Engineering stress-strain and True stress-strain curves. Tensile properties, conditions for necking. Stress-Strain diagrams for steel, Aluminum and cast iron.

UNIT - III
Fatigue Test: Introduction, Stress cycles, S-N Curve, Effect of mean stress, Mechanism of fatigue failure, Effect of stress concentration, size, surface condition and environments on fatigue.

UNIT – IV
Creep and Stress Rupture: Introduction, The creep curve, Stress-rupture test, Structural changes during creep, Mechanism of creep deformation, theories of creep. Fracture at elevated temperature.

UNIT – V
NDT: Principle, Operation, Advantages and Limitations of Liquid Penetrant, Magnetic Particle, Radio graphy and Ultrasonic tests.

TEXT / REFERENCE BOOKS:
1. Mechanical Metallurgy – G. E. Dieter
2. Mechanical behavior - Ed. Wulf.
3. Mechanical Metallurgy – White & Lemay.
4. Testing of Materials - A.V.K. Suryanarayana

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SOLID WASTE MANAGEMENT
OPEN ELECTIVE-II

Objectives:
- To know the Classification of solid waste and characterization of the same
- Understand the sense of onsite handling storage and collection systems including transportation
- Understand the different processing technologies of solid waste.

Outcomes:
The student will be able to
- Apply the knowledge of characterization of waste and develop a suitable management plan
- Assess the cost of transportation and laboratory processing of solid waste
- Identify hazardous nature of waste if any and can suggest suitable dumping methods.
- Suggest processing waste for material for energy recovery.

Unit I
Introduction: Definition, characteristics and perspectives of solid waste. Types of solid waste. Physical and chemical characteristics. Variation of composition and characteristics. Municipal, industrial, special and hazardous wastes.

General aspects: Overview of material flow in society. Reduction in raw material usage. Reduction in solid waste generation. Reuse and material recovery. General effects on health and environment. Legislations.

Unit II
Engineered systems: Typical generation rates.Estimation and factors effecting generation rates. On site handling.Storage and processing. Collection systems and devices. Transfer and transport.

Unit III
Processing Techniques: Mechanical volume reduction. Thermal volume reduction. Component separation. Land filling and land forming. Deep well injection.

Unit IV
Material recovery: Mechanical size alteration. Electromagnetic separation. Drying and dewatering. Other material recovery systems. Recovery of biological conversion products. Recovery of thermal conversion products.
Energy recovery: Energy recovery systems and efficiency factors. Determination of output and efficiency. Details of energy recovery systems. Combustion incineration and heat recovery. Gasification and pyrolysis. Refuse derived fuels (RDF).

Unit V
Case studies: Major industries and management methods used in typical industries – Coal fired power stations, textile industry, oil refinery, distillery, sugar industry, and radioactive waste generation units.

Text Books:
1. Howard S. Peavy, Environmental Engineering, McGraw Hill International Edition, 1986.
2. Dutta, Industrial Solid Water Management and Land Filling Practice, Narose Publishing House, 1999.

Reference Books:
1. Sastry C.A., Waste Treatment Plants, Narose Publishing House, 1995.
2. Lagrega, Hazardous Waste Management, McGraw Hill, 1994.

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MARKETING MANAGEMENT
PG CORE-I

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim: The aim of the Marketing Management Course is to provide students the marketing skills and enable them .

- T o understand the basic marketing trends through case studies.
- To familiarise with basic concepts of marketing mix and strategies
- To get oriented to the tools required to help develop and implement marketing strategies.

Learning outcome:
The students would be able to describe key marketing concepts, theories and techniques for analyzing a variety of marketing situations
By reading text and relating the concepts through cases the student would be able to understand the importance and role of marketing in a global environment
They will be able to analyze markets and design customer driven strategies and will be able to communicate the decisions towards business development with superior customer value.

1. Introduction to World of Marketing: Importance, scope of Marketing, Core Marketing Concepts, Marketing Philosophies, Marketing Environment, Marketing Strategies & Plans, Developed Vs Developing Marketing. Market Research-Definition of MR, MIS, Commissioning MR, MR Process, MR Online, MR & Ethics, International MR.
   Case 1: Bata (Rajendra.P Maheshwari page no: 03)
   Case 2: Mahindra Scooters (Arun Kumar page no: 89).
   Case 3: Ready Meal Manufactures (Adrian palmer, page no: 70).
   Case 4: Santoor –(lamb Hair– page no : 238).
   Case 5: Drawing on data, searching for insight (Adrian palmer – Page no: 175).

2. Analyzing Marketing Opportunities, Customer Value and Marketing Mix : Consumer Decision Making, Creating Customer Value, Analyzing Consumer Markets – Consumer Behavior – cultural, Social & Personal Factors, developing products & brands – product levels; classifying products, product range, line & mix, PLC, new product development.
   Case 1: Small New Phones (Adrian palmer- page no: 296).

3. Designing a Customer Driven Strategy: Market segmentation- segmentation of consumer market, business market, requirement for effective segmentation, market targeting – evaluating market segmentation, selecting target market segmentation, positioning – positioning maps, positioning strategy.
   Case 1: (Segmentation) Zee TV (lamb, Hair page no 212).
   Case 2: (Targeting) Kellogg's (lamb, Hair page no 300)
   Case 3: (Positioning) Nimbooz (S. Neelamegham page no 225).
   Case 4 :(Positioning) Dalda (Arun Kumar page no:195).

4. Distribution Decisions, Promotion & Communication Strategies : Marketing Channels, Channel intermediates and functions, channel structure, channel for consumer products, business and industrial products, alternative channel, channel strategy decisions. The promotional mix, advertising, public relations, sales promotion, personal selling, marketing communication- communication process, communication promotion mix, factors effecting the promotion mix
   Case 1: Barista (Arun Kumar – page no:33).
   Case 2: Nano Car (lamb, Hair – page no:52)
   Case 3: Indigo (lamb, Hair – page no:356).
   Case 4: TESCO (Adrian palmer page no : 388)

Case 5: Hero Motor Corp (lamb, Hair Page no:446)
Case 6: Avon Cosmetics (lamb, Hair Page no:497).
Case 7: Eureka (Arun – Page no: 711).
Case 8: Home Shop (Arun – page no: 639).

5. Pricing Decisions & Personal Communication - Importance of price, cost determinant of price, markup pricing, profit maximization pricing, break even pricing, pricing strategy, ethics of pricing strategy, product line pricing, WOM, Rural marketing, BOP, relationship Marketing, Digital marketing, Social marketing, post modern marketing, market sustainability and ethics, Global marketing.
   Case 1: Coca Cola(lamb, Hair – page no: 112).
   Case 2: I phone (lamb, Hair – page no: 534).
   Case 3: Akash Tablet (lamb, Hair – page no: 557).
   Case 4: Compact car (Arun Kumar page no :369)
   Case 5: Chick (lamb,Hair Page no:650)
   Case 6: Nokia (Neelamegham page no– 645).
   Case 7: Shakti (Rajendra .P Maheswari – Page no:408).
   Case 8: Airtel (Arun – page no: 901)
   Case 9: Beer Marketing (Adrian palmer page no:529)

Textbook:

1. Lamb, Hair, Sharma, Mc Daniel: MKTG, A South Asian Perspective, Cengage Learning, 2012.
   Journal : MICA Communications Review – A Marketing Communications Journal, Mudra Institute of Communications, Ahmedabad.

   Business Game
   Music2Go Marketing: (Marketing Management Simulation Game), TMH, 2013. You can play on any computer with internet (Rs.150/- per year-better buy and play).

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HUMAN RESOURCE MANAGEMENT
PG CORE-II

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
To understand various terms in HRM and be able to manage the human resources of an organization effectively and efficiently.

Learning Outcome:
Students should be able to understand the basic HR concepts. They will be able to understand the process of recruitment, selection, performance appraisal, training & development, compensation and employee retention approaches and strategies.

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Unit-I:
Introduction of HRM: Introduction to HRM –Line Managers –HR Duties –New Approaches to Organizing HR –Globalization & Competition Trends Technological Trends –Trends in Nature of Work –Workforce and Demographic Trends –Economic Challenges –HRM in India –High Performance Work System's–Labor Legislation in India –Equal Employment Opportunity 1990-1991 –HR Score Card developed by TVRLS India.

Case: Social Surveyors in Flood-hit Areas (Gary Dessler page no 160)
Case: Finding people who are passionate about what they do (Gary Desslerpage no 195)
Case: HR, CULTURE and Business Results Success at Google, Scripps and UPS (Robert L Mathis P.No. 35)
Case: Religious Accommodation (Robert L Mathis P. No. 118)
Case: Mitsubishi Believes in EEO-Now (Robert L Mathis P. No. 119)

Unit-II: Recruitment and Placement: Basics of Job Analysis –Methods for Collecting Job Analysis Information –Job Descriptions –Job Satisfaction –Job Enlargement, Job Enrichment, Job Rotation, HRP –Recruitment & Selection Process –Planning & Forecasting –Sources of Recruitment –Recruitment of Diverse Work Force –Employee Testing & Selection –Basic types of Interviews –Errors in Interviews –Translating Strategy into HR-Policies & Practices.

Case:Reinventing the wheel at apex door Company (Gary Dessler page no 309)
Case: Xerox Focuses on HR (Robert L Mathis P. No. 79)
Case: where do you find the Bodies? (Robert L Mathis P. No. 79)
Case: The Reluctant Receptionist (Robert L Mathis P. No. 159)
Case: Accenture –Retaining for Itself (Robert L Mathis P. No.193)
Case: Recruiting at Kia (Robert L Mathis P. No. 231)
Case: Strategic Selection: A Review of Two Companies (Robert L Mathis P. No.267)

Unit-III:
Performance Appraisal and Training & Development of Employees –Concept of Performance, Management Appraisal –Techniques for Performance Appraisal –Career Management –Employer Life Cycle –Career Management & Talent Management, Analyzing Training needs & Designing the program –Implementing different training program –Implementing Management Development Programs –Evaluating the Training Programs .

Case: Training Crucial for Hotels (Robert L Mathis P. No. 307)
Case: performance management improvements for Bristol-Myers Squibb (Robert L Mathis P. No. 393)
Case: Just Another Job (Robert L Mathis P. No. 647)
Case: The Dilemma Within (Robert L Mathis P. No. 667)
Case: Performance Appraisal at Cola Magic Drinks (Robert L Mathis P. No. 671)

Case: Appraising the secretaries at Sweet water U? (Gary Dessler page no 349)

Unit-IV: Compensation–Basic Factors in Determining pay structure –Establishing pay rates –Pricing Managerial and Professional Jobs –Special Topics in Compensation –Benefits –Insurance –Retirement Benefits –Personal Services & Family friendly benefits –Salient features of Workmen Compensation Act & Minimum Wages Act.

Case: Salary inequities at ACME Manufacturing (Gary Dessler page no 429)
Case: HR Contributes at CSSCO (Robert L Mathis P. No. 36)
Case: Compensation changes at JC Penny (Robert L Mathis P. No. 435)
Case: Benefiting Connie (Robert L Mathis P. No. 507)

Unit-V: Employee Relation–Labour Movement –Collective Bargaining Process –Grievances –Managing Dismissals –Employee Safety and Health –Occupational Safety Law –Work Place Health Hazards Problems & Remedies –Salient features of Industrial Disputes Acts 1947 –Factories Act, Mines Act.

Case : The New Safety and Health Program (Gary Dessler page no 623)
Case : Full Disclosure on Sex Offenders? (Robert L Mathis P. No. 231)
Case : Wal-Mart and Watching Its “Union Prevention” (Robert L Mathis P. No. 629)

REFERENCES:

- Gary Dessler, “Human Resource Management”, 12thEdition, Pearson-2012.
- Robert L Mathis, John H Jackson, Manas Ranjan Tripathy “Human Resource Management-A South Asian Perspective ”, Cengage Learning2012.
- C.B.Mamoria & V.S.P.Rao, Personnel Management, HPH, 2012.
- K. Aswathappa, “Human Resource Management, Text and Cases”, TMH, 2011.
- Dipak Kumar Bhattacharyya “Human Resource Management”, Excel Books, 2012.
- R.Wayne Mondy, “Human Resource Management” Pearson, 2009

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SALES AND DISTRIBUTION

PG Elective-I (Marketing)

(Students must read textbook. Faculty are free to choose any other cases)

Aim: The aim of this course is to enable students to the sales and distribution processes with particular focus on Sales Management and Sales Personnel, the role of Distribution Channels and enabling them to manage Channel partners.

To expose students to the tools and strategies necessary for designing, motivating and evaluating sales & distribution management systems.

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Learning outcomes:

- The student should be able to manage the sales force and distribution processes through sales planning and Budgeting .
- The Students should be able to understand & appreciate the diverse variables affecting the sales & distribution function and analyse their impact on the sales and distribution processes.

1. **Introduction to Sales Management:** Evolution of Sales Management, importance of Sales Management, types of Selling, difference between Selling and Marketing, Modern Day Sales Activities, Selling Skills, Selling Strategies, Selling Process.
   Case: Plastic Industries, Inc., The role of Personal Selling in creating Market. (Richard R.Still page no 104,105)
   Case: United air flow manufacturer of households appliances sales persons job. (Richard R.Still page no 115 to 118)

2. **Sales Planning and Budgeting:** Sales planning process, sales forecasting methods, sales budgeting process, methods used for deciding sales budget, types of quotas and quota setting procedure, reasons for establishing or revising sales territories, routing and scheduling sales persons, market cost analysis.
   Case: Augsberg Wiesel Ltd, manufacturer of table ware, establishment of sales territories (Richard R Still, Page no 603 to 605)
   Case: Midland office engineering, establishment of sales budgeting program, (Richard R Still, page no 588 to 589)

3. **Sales Force Management:** Recruitment and selection of the sales force, training the sales force, sales force motivation, sales force compensation, sales force control and evaluation.
   Case: 1 Adjusting Compensation Plan to Motivate Sales Representatives (K.Sridhara Batt, page no 576 to 577)
   Case: 2 Sales Force Strategy at Life Insurance Corporation (K.Sridhara Batt, page no 579)

4. **Introduction to Distribution Management**
   Definition of Distribution Management, need for Distribution Channels, Distribution Channels for Rural Markets, designing the Marketing Channels, Motivating and Evaluating Channel Members, Capturing the Customer requirements
   Case: 1 Fed Ex's Value Chain Solutions, (K.Sridhara Batt page no 618 to 620)
   Case: 2 The National Handloom Development Corporation. (Tapan K. Panda, Sunil Sahadev page no. 504)

5. Managing Channel Institutions

Managing Channel Information Systems, Managing Retailers, Wholesalers, Franchisers, Designing Channel Systems, reasons for Channel Conflicts, Managing Conflict, Managing International Channel of Distribution, Ethical issues in Sales and Distribution Management

Case: 1 Kinetic Engineering Company, Handling Channel Conflict, (Krishna K Havaldar, Vasant page no 461)

Case: 2 Indian Ayurveda Pharmacy Limited, (Tapan K. Panda,Sunil Sahad page no 719)

Textbook

Krishna K Havaldar, Vasnt M Cavale, Sales and Distribution Management, 2nd edition, TMH, 2011.

Journal : MICA Communications Review – A Marketing Communications Journal, Mudra Institute of Communications, Ahmedabad.

Business Game : Music2Go Marketing: (Marketing Management Simulation Game), TMH, 2013. You can play on any computer with internet (Rs.150/- per year-better buy and play)**.**

Music2Go is a **Principles of Marketing/Marketing Management** simulation game, where the students are required to formulate and implement their own Sales and Marketing Campaign. This helps the students to have a hands – on business experience in the classroom – experiential learning at its best.

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TRAINING & DEVELOPMENT
PG Elective – I (HR)

(Students must read textbook. Faculty are free to choose any other cases)

Course Objectives:
1. To provide the students information on the Career opportunities in training, important concepts and meanings, Integrating strategy and training.
2. To enable the students to understand the design of training, implementation
3. To introduce the knowledge of evaluation of training programs in the organization.

Learning Outcome:
1. The student will be familiar with how to do training need analysis
2. Students will be able to learn various training methods, design training programs, implement training programs.
3. They also gain the knowledge to evaluate the effectiveness of training programs.

1. **Training in organizations:** Trends in training, Career opportunities in training, important concepts and meanings, Integrating OD, strategy and training, understand motivation and performance, aligning training design with learning process.
   Case : Taking Charge at Domtar : What it takes for a turnaround? (Nick Blanchard)
   Case :LG Electronics ((Nick Blanchard)
   Case : The wilderness training lab((Nick Blanchard)
2. **Need Analysis and Training design:** The Training Need Analysis (TNA) Model, TNA and Design, organizational constraints, developing objectives, Facilitation of learning and training transfer to the job, design theory.
   Case : Developing a training package at westcan (Nick Blanchard)
   Case : The Training program (Fabrics Inc.) (Nick Blanchard)
3. **Training methods:** Matching methods with outcomes, lectures and demonstrations , games and simulations, OJT, computer based training.(CBT).
   Case : Training & Development at Godrej. (Nick Blanchard)
4. **Implementation & Evaluation of Training:** Development of training, implementation, transfer of training, major players in training & development, rational for evaluation, resistance to training evaluation, types of evaluation.
   Case : Jack goes to training. (Nick Blanchard)
   Case 3 : Training designed to change behavior and attitude. (Nick Blanchard)
5. **Areas of organizational Training:** Orientation training, diversity training, sexual harassment training, team training, cross functional teams, cross cultural training, training for talent management and competency mapping.
   Case 4: The competent employee. (Nick Blanchard)

Textbook:
- **P.Nick Blanchard, James W. Thacker, A.Anand Ram, " Effective Training" 4e, Pearson, 2012.**

References:
1. Anjali Ghansekar "Training & Development" Everest, 2013.
2. Raymond A Noe, Amitabh Deo Kodwani, "Employee Training and Development" McGraw Hill, 2012.
3. B,Rathan Reddy " Effective Human Resource Training & Developing Strategy " Himalaya,2012 .
4. Rolf Lynton, Uday Pareek "Training for Development" Sage, 2012.
5. G Pandu Naik "Training & Development "Excel Books, 2012.
6. R K Sahu "Training for Development" Excel Books, 2012.
7. P L Rao : HRD Trainer's Handbook of Management Games, Excel, 2013

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FINANCIAL MANAGEMENT
PG Elective-I (Finance)

(Students must read textbook. Faculty are free to choose any other cases)
***The students need Discounting Table and Annuity tables for the examination**

Course Aim: To give an overview of the functions of a financial manager in the commercial world with a particular focus on the concepts and theories of corporate finance.

Learning Outcome:
The students will gain skills to understand, evaluate and resolve the problems confronted by the financial managers. They will gain in insight into the decision making process of a financial manager based on timely, relevant and reliable financial and non-financial information. This course will further help the students to understand the deligent use of resources efficiently, effectively and economically.

1 **The Finance Function**: Nature and Scope; Evolution of finance function – Its new role in the contemporary scenario –Goals of finance function – maximizing vs. satisfying; Profit vs. Wealth vs. Welfare; the Agency relationship and costs; Risk-Return trade off; Concept of Time Value of Money – Future Value and Present value and the basic valuation model.

2. **The Investment Decision**: Investment decision process- Project generation, project evaluation, project selection and project Implementation. Developing Cash Flow; Data for New Projects; Capital Budgeting Techniques –Traditional and DCF methods. The NPV vs. IRR Debate; Approaches for reconciliation. Capital budgeting decision under conditions of risk and uncertainty. Cost of capital: Concept and measurement of cost of capital, Debt vs. Equity, cost of equity, preference shares, equity capital and retained earnings, weighted average cost of capital and marginal cost of capital. Importance of cost of capital in capital budgeting decisions.

3. **Capital Structure Decisions**: Capital structure vs. financial structure - Capitalization, financial leverage, operating leverage and composite leverage. EBIT-EPS Analysis, Indifference Point/Break even analysis of financial leverage, Capital structure Theories –The Modigliani Miller Theory, NI, NOI Theory and Traditional Theory –A critical appraisal.

4. **Dividend Decisions**: Dividends and value of the firm - Relevance of dividends, the MM hypothesis, Factors determining Dividend Policy-dividends and valuation of the firm-the basic models. Declaration and payment of dividends. Bonus shares. Rights issue, share-splits, Major forms of dividends – Cash and Bonus shares. The theoretical backdrop – Dividends and valuation; Major theories centered on the works of GORDON, WALTER and LITNER. A brief discussion on dividend policies of Indian companies. Working Capital Management: Components of working capital, gross vs. net working capital, determinants of working capital needs, the operating cycle approach. Planning of working capital, Financing of working capital through Bank finance and Trade Credit – Recommendations of Tandon and Daheja Committee on Working Capital. Cases.

5. **Management of Current Assets**: Management of cash, – Basic strategies for cash management, cash budget, cash management techniques/processes. Marketable securities: characteristics, selection criterion, Marketable security alternatives; Management of receivables and Management of inventory- The importance of current assets management in working capital planning. Corporate Restructuring: Corporate Mergers, Acquisitions and Takeovers: Types of Mergers, Economic rationale of Mergers, motives for Mergers; Financial evaluation of Mergers.

Textbook

1. IM Pandey, Financial Management, 10th Edition, Vikas , 2013.

References:

1. M.Y Khan, P K Jain: "Financial Management-Text and Problems", 6th Edition, TMH, 2012.
2. P.C.Tulsian,C.A. Bharat Tulsian , "Financial Management" S.Chand Publications,2012
3. Prasanna Chandra, "Financial Management Theory and Practice", 8th Edition. TMH ,2012
4. Shashi K.Gupta, R.K.Sharma , "Financial Management" Kalyani Publishers ,2012
5. Rajiv Srivastava, Anil Mishra , Financial Management" Oxford University Press, New Delhi, 2012
6. James C Van Horne, Sanjay Dhamija, "Financial Management and Policy" Pearson Education, 2012 .
7. IM Pandey, Cases in Financial Management, TMH 2/e 2012

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MANAGEMENT INFORMATION SYSTEM (MIS)
PG Elective – I (SYSTEMS)

Course Objectives
1. To provide students basic concepts of MIS and IS models
2. To explain integration process of MIS with Enterprise Resource Planning (ERP)
3. To provide a practical framework for Information System operations and management

Learning Outcomes
1. Students learn different models of MIS and their applicability in various business resource requirement plans
2. Students learn user training, operations, control, troubleshooting and maintenance aspects of MIS
3. Students will appreciate what is the successful design and implementation of MIS in business departments and operations

1. UNIT- I Introduction to IS Models – Nolan Stage Hypothesis, IS Strategic Grid, Wards Model, Earl's Multiple Methodology, Critical Success Factors, Soft Systems Methodology, Socio-Technical Systems Approach (Mumford), System Develop Life Cycle, Prototype and End User Computing, Application Packages, Outsourcing, Deciding Combination of Methods.

2. UNIT-II Types of Information Systems– Transactions Processing System, Knowledge Work Systems, Office Automation System, Management Information System, Decision Support System, Expert System, Strategic Information System. IS Security, Control and Audit - System Vulnerability and Abuse, business value of security and control, Need for Security, Methods of minimizing risks, IS Audit, ensuring system quality.

3. UNIT- III Induction to ERP**:** Overview of ERP, MRP, MRPII and Evolution of ERP, Integrated Management Systems, Reasons for the growth of ERP, Business Modeling, Integrated Data Model, Foundations of IS in Business, Obstacles of applying IT. Advantages and limitations of ERP.

4. UNIT –IV ERP Modules: Finance, Accounting Systems, Manufacturing and Production Systems, Sales and Distribution Systems, , Human Resource Systems, Plant Maintenance System, Materials Management System, Quality Management System, ERP System Options and Selection, ERP proposal Evaluation.

5. UNIT –V ERP Implementation and Maintenance: Implementation Strategy Options, Features of Successful ERP Implementation, Strategies to Attain Success, User Training, Maintaining ERP & IS**.** Case Studies.

References
1. C Laudon and Jane P.Laudon, et al: Management Information Systems, Pearson Education, 2009.
2. Alexis Leon, ERP (Demystified), 5/E, Tata McGraw-Hill, 2009.
3. David L Olson, Managerial Issues of Enterprise Resource Planning Systems, McGraw Hill, International Edition-2009.
4. Vaman, ERP in Practice, Tata McGraw-Hill , 2009
5. Gordon B. Davis & Margrethe H.Olson: Management Information Systems, Tata McGraw-Hill , 2009.
6. W S Jawadekar: Management Information Systems, Tata McGraw-Hill , New Delhi, 2009
7. James A. Obrein: Management Information Systems, Tata McGraw-Hill , 2008
8. Gerald V.Post, David L Anderson: Management Information Systems, Irvin McGraw Hill, 2009.
9. C.S.V.Murthy: Management Information System, Himalaya publishing House ,2009

10. Rainer, Turban, Potter, Introduction to Information Systems, WILEY-India, 2009.
11. Dharminder and Sangeetha, Management Information Systems, Excel books, 2009
12. Monk, Concepts in ERP, Cengage, 2009.
13. Ashim Raj Singla, Enterprise Resource Planning, Cengage, 2008.
14. Vinod Kumar Garg, et al., Enterprise Resource Planning, PHI, 2007.

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SOFT SKILLS LAB
(Activity-based)

- To improve the fluency of students in English
- To facilitate learning through interaction
- To illustrate the role of skills in real-life situations with case studies, role plays etc.
- To train students in group dynamics, body language and various other activities which boost their confidence levels and help in their overall personality development
- To encourage students develop behavioral skills and personal management skills
- To impart training for empowerment, thereby preparing students to become successful professionals

INTRODUCTION
Definition and Introduction to Soft Skills – Hard Skills vs Soft Skills – Significance of Soft/Life/Self Skills – Self and SWOT Analysis *and*

1. **Exercises on Productivity Development**
   - Effective/ Assertive Communication Skills (Activity based)
   - Time Management (Case Study)
   - Creativity & Critical Thinking (Case Study)
   - Decision Making and Problem Solving (Case Study)
   - Stress Management (Case Study)

2. **Exercises on Personality Development Skills**
   - Self-esteem (Case Study)
   - Positive Thinking (Case Study)
   - Emotional Intelligence (Case Study)
   - Team building and Leadership Skills (Case Study)
   - Conflict Management (Case Study)

3. **Exercises on Presentation Skills**
   - Netiquette
   - Importance of Oral Presentation – Defining Purpose- Analyzing the audience- Planning outline and preparing the Presentation- Individual & Group Presentation- Graphical Organizers- Tools and Multi-media Visuals
   - One Minute Presentations (Warming up)
   - PPT on Project work- Understanding the Nuances of Delivery- Body Language – Closing and Handling Questions – Rubrics for Individual Evaluation (Practice Sessions)

4. **Exercises on Professional Etiquette and Communication**
   - Role-Play and Simulation- Introducing oneself and others, Greetings, Apologies, Requests, Agreement & Disagreement….etc.
   - Telephone Etiquette
   - Active Listening
   - Group Discussions (Case study)- Group Discussion as a part of Selection Procedure- Checklist of GDs
   - Analysis of Selected Interviews (Objectives of Interview)
   - Mock-Interviews (Practice Sessions)
   - Job Application and Preparing Resume
   - Process Writing (Technical Vocabulary) – Writing a Project Report- Assignments

5. Exercises on Ethics and Values

Introduction — Types of Values - Personal, Social and Cultural Values - Importance of Values in Various Contexts

- Significance of Modern and Professional Etiquette – Etiquette (Formal and Informal Situations with Examples)
- Attitude, Good Manners and Work Culture (Live Examples)
- Social Skills - Dealing with the Challenged (Live Examples)
- Professional Responsibility – Adaptability (Live Examples)
- Corporate Expectations

Note:

- Hand-outs are to be prepared and given to students.
- Training plan will be integrated in the syllabus.
- Topics mentioned in the syllabus are activity-based.

SUGGESTED SOFTWARE:

The following software from '**train2success.com**'

- Preparing for being Interviewed,
- Positive Thinking,
- Interviewing Skills,
- Telephone Skills,
- Time Management
- Team Building,
- Decision making

SUGGESTED READING

1. Alex, K. 2012. *Soft Skills.* S. Chand Publishers
2. *Management Shapers*. 2011. Collection of 28 Books by different Authors. Universities Press.
3. Sherfield, Robert M. *2005. et al Cornerstone: Developing Soft Skills*. Pearson
4. Suresh Kumar,E; Sreehari, P. & Savithri, J. 2011. *Communication Skills and Soft Skills- An Integrated Approach.* New Delhi: Pearson
5. The ACE of Soft Skills by Gopalaswamy Ramesh & Mahadevan Ramesh. 2013. Pearson Publishers. New Delhi.
6. Patnaik, P. 2011. *Group Discussion and Interview Skills.* New Delhi: Foundation
7. Sudhir Andrews. 2009. *How to Succeed at Interviews.* New Delhi: Tata McGraw Hill
8. Sasikumar, V & Dhamija, P.V. 1993. *Spoken English - A Self-Learning Guide to Conversation Practice.* New Delhi: Tata McGraw-Hill
9. *Dixson, Richard J. Everyday Dialogues in English. Prentice Hall India Pvt Ltd*
10. Mukhopadhyay. L *et al. 2012. Polyskills. New Delhi: CUP India Pvt Ltd*
11. Rizvi, M. A. 2005. *Effective Technical Communication.* New Delhi: Tata McGraw Hill
12. *The Hindu Speaks on Education* by the Hindu Newspaper
13. Naterop, B. Jean and Revell, Rod. 2004. *Telephoning in English*. Cambridge: CUP

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RESEARCH METHODOLOGY & STATISTICAL ANALYSIS
PG CORE-III

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim: To understand the basic statistical tools for interpretation of quantitative and qualitative data.

Learning Outcome: Students will be able to apply the principles of research methodology for the research design for the various mini and major projects of the MBA programme. They will be able to analyse the data statistically.

1. **Research Methodology**: Introduction-Topic-Review of Literature-Research Gaps-Research Questions-Objectives-Hypotheses-Scope of the study-Period of the study-Sampling Techniques-Data Collection-Primary data –Questionnaire design-Secondary data-Data Analysis-Limitations of the study-Appendix-References.

2. **Tabulation, Graphical presentation of data**: Histogram, Diagrammatic representation of data: Bar diagram, Multiple Bar diagram, Sub-divided Bar Diagram, Pie Diagram, Measures of Central Tendency: Mean, Median and Mode. Measures of Dispersion: Range, Standard deviation and Variance, Coefficient of variation, Measure of Skewness.

3. **Linear Correlation and Regression Analysis**: Covariance, Pearson's Correlation Coefficient, Scatter plot, Spearman's rank Correlation Coefficient, Regression lines.

4. **Parametric and Non- Parametric Hypothesis Testing**: Procedure for Testing of Hypothesis, One Sample t-test for the Population Mean, Two Sample t-test for independent Samples, Paired Sample t-test. F-test for two population Variances (Variance ratio test), ANOVA One Way Classification, ANOVA two way Classification, Chi Square test of association, Chi Square test of independence.

5. **Time Series and Data Analysis**: Fitting a trend line to a time series, Method of least Squares and Method of Moving Averages, Measure of Seasonal Variation.

Textbook

1. Glyn Davis & Branko Pecar "Business Statistics Using Excel" Oxford University Press, 2012.

References:

1. P N Arora" Comprehensives Statistics Methods" S. Chand, 2012.
2. Sharma" Business Statistics" Pearson, 2012.
3. David Cooper, Business Research Methods, TMH, 9/e 2013.
4. Zikmund, Business Research Methods, Cengage, 2012.
5. S C Gupta, "Fundamentals of Statistics", HPH, 2012
6. C B Gupta " An introduction to Statistical Methods" Vikas, 2012
7. S L Gupta 'Business Research Methods" TMH, 2012.
8. Pannerselvam" Research Methodology" PHI, 2012.
9. Ranjit Kumar "Research Methodology" Sage, 2012.
10. R P Hooda "Statistics" Vikas, 2012
11. Newbold" Statistics for Business and Economics" Pearson, 2012.
12. Levin, Rubin, Rastogi & Siddiqui, "Statistics for Management" Pearson, 2013
13. Mukul Gupta & Deepa Gupta "Research Methodology" PHI, 2013.
14. Bhardwaj : Mathematics and Statistics for Business, Excel, 2013.

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BUSINESS LAW AND REGULATION
PG CORE-IV

(Students must read textbook along with cases. Faculty are free to choose any other cases)

Course Aim: The aim of this course is to enable students understand legal and regulatory framework for doing business in India.

Learning Outcome: After going through the text and case lets in terms of various court judgements, the students should be able to understand the formalities involved in incorporating a company and the nuances related to the Law of Contract. The student will also be able to know the implications of direct and indirect taxes, negotiable instruments Act and also about the cyber laws.

1. Companies Act, 1956: Steps and procedure for incorporation of the company, Appointment of Directors, Powers, duties, & liabilities of Directors, Company Meetings, Resolutions, Winding-up of a Company.

2. Law of Contract: Nature of contract and essential elements of valid contract, Offer and Acceptance, Consideration, Capacity to contract and free consent, Legality of object. Unlawful and illegal agreements, Contingent contracts, Performance and discharge of contracts, Remedies for breach of contract. Contracts-II: Indemnity and guarantee, Contract of Agency, Sale of goods Act -1930: General Principles, Conditions & Warranties, Performance of Contract of Sale.

3. Direct and Indirect Tax: Income Tax Act -1961 - Important Provisions of Income Tax Act: Assessment year –Assesee, Gross Total Income, Procedure for advance payment of tax and tax deducted at source. Assessment procedure. Central Excise Act -1944: .Basic concepts related to excisable goods, classification of goods, and Basic concept of VAT.

4. Negotiable Instruments Act - 1881: Negotiable Instruments- Promissory Note, Bills of Exchange, & Cheque, and their definitions and characteristics, Types of endorsements, Holder- Holder in due course, Discharge of Parties.

5. Cyber Crime and the Legal Landscape-the world-Why do we need cyber laws in tha indian context-The indina IT act-challenges to indian Law and cyber crime scenarion in india. (Refer Nina Godbole & Sunit Belapure)

Textbook:
1. **RSN Pillai, Bagavathi, Business Law, S.Chand, 2013.**

References
1. Akhileshwar Pathak: Legal Aspects of Business, TMH, 4/e, 2013.
2. Nina Godbole & Sunit Belapure " Cyber Security" Wiley India 2012.
3. K.R. Bulchandani: Business Law for Management, 5/e, Himalaya Publishing House (HPH), 2012
4. Ravinder Kumar "Legal Aspects of Business", 2nd Edition Cengage Learning, 2012.
5. Kuchal: Business Law, Vikas, 2011
6. Tulsian:Business Law, TMH, 2012.
7. S S Gulshan, Business Law, 4th edition, Excel Books, 2012
8. S.N. Maheshwari, S K Maheshwari, A Manual of Business Laws, Himalaya Publishing House (HPH), 2013.
9. C L Bansal, Business and Corporate Laws, Excel Books, 2011.
10. Tejpal Sheth, Business Law, Pearson, 2012
11. P.K.Padhi, Legal Aspects of Business, PHI, 2013

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INTEGRATED MARKETING COMMUCATION
PG Elective-II (Marketing)

(Students must read textbook. Faculty are free to choose any other cases)

Aim: The aim of this course is to a) enable students to understand management of marketing communication, marketing mix and ethical aspects of marketing communication b) choose a marketing communications mix to achieve the communications and behavioral objectives of the IMC campaign plan.

Learning outcome

- The student should be able to design innovative integrated marketing communication strategies for a given product or service using social media
- Students will able to create an integrated marketing communications plan to promote IMC strategies and to measure their effectiveness.

1. **Understanding Integrated Marketing Communication**: Understanding Marketing Communication, Integrated Marketing Communication, Integrated Marketing Communication as an Integral part of Marketing, Understanding Consumer Behaviour, Understanding the Communication process, Communication Mix.
   Case : Cadbury Manages a Crisis with Integrated Marketing Communications (Kruti Shah page no 59)

2. **Budgeting, Objectives and Evaluation of IMC**: Setting Communication Objectives, DAGMAR Approach to setting objectives and measuring advertising effectiveness, allocating the Marketing Communication Budget, Conducting research to measure communication effectiveness, Post-Testing tools and techniques, Evaluating other promotional tools and IMC.
   Case : The Premium Milk Food Private Ltd. (Kruti Shah page no 820)
   Case : Archias, Advertizing (Jaishri Jethwaney, Shruthi Jain, Oxford, page no 195)

3. **Marketing Communication Mix I:**
   Creative Execution in Advertising, Decision in Print, Execution on Radio, Execution on online and television, getting that 'Big Idea' of creativity.
   Case : Tata Salt (Part I,II,III) (Kruti Shah page no 282,284,310-311,367-372)

4. **Marketing Communication Mix II**:
   Sales Promotion, Direct Marketing, Personal Public Relations, Publicity and Corporate Advertising, Unconventional Promotional Media: Sponsorships, Mobile Advertising, Word Of Mouth, Village Farmers, Out of Home Media, World Wide Web Communications.
   Case : Amul taste of India (Kruti Shah page no 793)
   Case : Rasha Prankees promotion (Kruti Shah page no 600)

5. **Regulation, Social and Ethical Aspects of Advertising and Promotion**:-
   Federal Regulation of Advertising, regulations of Advertising and Promotion in India, regulation of other Promotional Areas, Social and Ethical Criticisms of Advertising, ethical aspects of Advertising – Truth in Advertising, Advertising to children, Advertising controversial products, Social Aspects of Advertising.
   Case : Surrogate advertising(Jai shri Jethwaney page no 475-480)
   Case : The Unilever experience (Jai shri Jethwaney page no 606)

Textbook:

- **Krutishah, Alan D'Souza, Advertising and promotions on IMC Perspective, TMH, 2012**.

Journal : MICA Communications Review – A Marketing Communications Journal, Mudra Institute of Communications, Ahmedabad.

Businesss Game : AdSim Advertising: (Advertising & Promotion Simulation Game), TMH, 2013. You can play on any computer with internet (Rs.150/- per year-better buy and play)**.**
AdSim is a simulation game for the **Advertising & Promotion** course, where the students are required to formulate and implement their own Advertising and Promotion campaign. This helps the students to have an hands – on business experience in the classroom – experiential learning at its best.

References:

1. Jaishri Jethwaney, Shruthi Jain, Advertising Management, Oxford, Second edition, 2012.
2. George E Belch, Michael A Belch , Keyoor puravi , Advertising and Promotions – An Integrated Marketing Communications perspective , TMH, 2013.
3. Semenile , Allen, O Guinn , Kaufmann, Advetising and Promotions, An Integrated brand approach, Cengage, 6th edition , 2012.

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MANAGEMENT OF INDUSTRIAL RELATIONS
PG Elective – II (HR)

(Students must read textbook. Faculty are free to choose any other cases)

Course objectives:
1. The aim of the course is to enable HR elective students develop awareness towards labour laws.
2. The students will be introduced, how to deal with legal problems emanating from employer and employee relations in organizations.
3. To introduce the students with the concept of collective bargaining, employee welfare, wage policy act.

Learning Outcomes:
1. The student understands the industrial relations, its importance in HR
2. Various Labour Laws like Factories Act, Wage and Bonus Act and Dispute Preventive and Corrective Mechanisms are learnt.
3. They will also understand the role of Trade Unions, Settlement of disputes, Collective Bargaining, Wage Policy.

1. Industrial Relations: Introduction, Dunlop's Industrial Relations Systems, Characteristics of Indian IR System; Trade Unions: Union Purpose. Trade Union , Functions, Methods, Politics, Types of Unions, Trade Unions in India: Union Structure and characteristics. Recognition of Unions: States provisions for Recognition. Rights of recognized Unions, Unfair Labour Practices:
   Case 1. Let us get back to work (p.no. 720, C.B.Mamoria)
   Case 2. A case of complicated multi-union manoeuvres (J.A. Kulkarni)

2. Settlement of Disputes: Role of state Dispute Settlement Machinery and its instruments, Legislation: Causes of disputes, Right to Strike, Major Strikers, Tripartite and Bipartite Bodies, Standing orders and Grievance Procedure.
   Case 1. Stop the shouting game please (p.no. 760, C.B.Mamoria)
   Case 2. The dish ends ltd. (p.no.07, J.A. Kulkarni)

3. Collective Bargaining, Conciliation, Arbitration, Adjudication, The Industrial Dispute Act 1947, Labour Welfare work, Labour Welfare officer, Worker's Participation.
   Case 1.who is to be blammed (p.no. 685, C.B.Mamoria)

4. Wage Policy and Wage Regulation Machinery, Wage Legislation, Payment of Wages Act 1936, The Payment of Bonus Act,1965
   Case 1. Rules and regulations still guide actions at UPS (p.no. 37, C.B.Mamoria)

5. The Factories Act 1948, Mines Act 1952, Industrial Relations and Technological Change.
   Case 1. Organizations and unions working as partners (p.no. 738, C.B.Mamoria)

Textbook:
- **Mamoria, Mamoria, Gankar "Dynamics of Industrial Relations" Himalaya Publishing House.2012.**

Cases:
1. **C.B.Mamoria, VSP Rao "personnel management- text & cases", Himalaya Publishers 13th edition, 2012.**
2. **J.A.Kulkarni, Asha Pachpande, Sandeep Pachpande, "case studies in amangement", pearson, 2011.**

References:

1. Dr K S Anandram “Cases in Personnel Management Industrial Relations and Trade Relations” Everest, 2012.
2. Arun Monappa,Ranjeet Nambudiri,Selvaraj “ Industrial Relations and Labour Laws” , TMH,2012
3. A.M.Sharma “Industrial Relations and Labour Laws”, Himalaya Publishing House,2013.
4. Ratna Sen “Industrial Relations-Text and cases “Macmillan Publishers,2011.
5. Kubendran.V,Kodeeswari.K “Industrial Relations and Labour Laws “Himalaya Publishing House,2011.
6. Punekar S.D,Deodhar S.B, Saras wathi Sankaren”Labour Welfare,Trade Unionism and Industrial Relations, “Himalaya Publishing House,2012.
7. B.D.Singh “Industrial Relations”Excel Books 2008.
8. S C Srivastava “Industrial Relations and Labor Laws” Vikas, 2012.
9. Padhi “ Labour and Industrial Relations” PHI, 2012.
10. Venkata Ratnam “Industrial Relations” Oxford, 2012.

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SECURITY ANALYSIS PORTFOLIO MANAGEMENT
PG Elective-II (Finance)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim: To Understand the investment alternatives, process and portfolio management
Learning Outcome: The objective of this course is to provide the conceptual and Practical understanding of Stock markets Equity & Bond Valuation , Cash market and also Mutual funds.

1. a) Investment Environment in India, overview of Indian financial system securities trading in stock markets, investment alternatives, the investment management process.
   b) Security Analysis: Fundamental Analysis, Technical Analysis, EMH (Efficient Market Hypothesis)

2. Portfolio Analysis: The returns and risks from investing- Markowitz portfolio Theory, Mean-variance approach, portfolio selection-efficient portfolios, The single index model-capital asset pricing model, arbitrage pricing theory.

3. Bond Analysis & Valuation & management: Types of bonds, Interest rates, Term Structure of interest rates, measuring bond yields, Yield to Maturity, Yield to Call, Yield to Maturity, Holding Period Return, Bond pricing theorems, bond duration, Active and Passive bond management Strategies, bond immunization, bond volatility, bond convexity.

4. (a) Equity Valuation : Equity Analysis & Valuation, Balance sheet Analysis equity valuation models, intrinsic value & market price, The P/E Ratio & Earnings multiplier Approach, CAGR, Price/Book value, Price/ Sales ratio, Economic Value Added (EVA) and MVA.
   (b) Derivatives: Overview of derivatives Markets, Option Markets, Option Strategies and option valuation forward & future markets, Strategies. Stock index futures, interest rate futures, Swaps contracts.

5. Mutual Funds: Types of Mutual Funds Schemes, Structure, NAV(Net Asset Value),Risk and Return, Performance Evaluation Models- Sharpe Model, Trey nor Model, Jensen Model, Fama's Decomposition. Trends in Indian Mutual Funds.

Textbooks:

1. **William. F.Sharpe, Gordon j Alexander & Jeffery V Bailey: Fundamentals of Investments, Prentice Hall,2012.**

Journals : Vikalpa, IIMA, IIMB Review, Decision, IIMC, Vision, MDI.

Business Game : Stock-Trak: (Finance Simulation Game), TMH, 2013- You can play on any computer with internet (Rs.150/- per year-better buy and play)**.**
Stock-Trak is the most comprehensive, Online investment simulation game for **Finance** students to trade on Stocks, bonds, mutual funds, options, futures, spots, future options and international stocks with virtual money. This game is created specifically for classroom use and students can play this game 24*7 to give them hands-on experience on Investments.

References:

1. Reilly, Brown: Analysis of Investment and Management of Portfolios, 10th Edition, Cengage, 2012.
2. ZVI Bodie, AlexKane, Alan J Marcus : Investments, TMH, 2012.
3. Donald E Fischer, Ronald J Jordan: Security Analysis and Portfolio Management, 6th Edition, Pearson, 2012.
4. Prasanna Chandra: Investment analysis and Portfolio Management" 4th Edition, TMH, 2012.

5. Punithavathi Pandian : Security Analysis and Portfolio Management, Vikas. 2012.
6. Jones: Invest Analysis and Management, Wiley.
7. M. Ranganatham, R. Madhumathi: Security Analysis and Portfolio Management, 2nd Edition , Pearson, 2012.
8. Edwin J Elton, Martin J Gruber, Stephen J Brown, William N.Goef Z Mann : Modern Portfolio
9. Theory and Investment Analysis. 2013.

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ENTERPRISE RESOURCE PLANNING
PG Elective – II (SYSTEMS)
(Students must read textbook. Faculty are free to choose any other cases)

Course Objectives
1. To provide students the foundations of ERP planning and system options
2. To provide framework of general and specialized modules of ERP
3. To provide students a risk-benefit analysis of ERP system

Learning Outcomes
1. Students understand a) integration of various ERP modules with each other and with Business Environment b) the issues in operation and implementation of a successful ERP system and c) how to face the challenges associated with the present and future ERP systems..

1. Introduciton to ERP- Foundation for Understanding ERP systems-Buisiness benefits of ERP-The challenges of impelmenting ERP system-ERP modules and Historical Developement.
   Case: Response top RFP for ban ERP system (Mary Sumner).

2. ERP system options & Selection methods-Measurement of project Inpact- information Technology Selection-ERP proposal evaluvation-Project Evaluvation Technique.(David L.olson).
   Case: Atlantic Manufacturing (Mary Sumner).

3 ERP system Installation Options- IS/IT Management results-Risk Identificatioon analysis-System Projects- Demonstation of the system-Failure method-system Architecture & ERP (David L.Olson)
   Case: DataSolutiions & Technology Knowledge (Mary Sumner).

4 ERP - sales and Marketing- Managment control process in sales and markring-ERP custoemr relatonship managment-ERP systems- Accounting & Fiance control processes. Fiancial modules in ERP systems.
   Case: atalantic manufacturing (Mary Sumner).

5 ERP – Produciton and Material Managment-Control process on produciton and manuifacturing-Produciton module in ERP- supply chain Managmeent & e-market place-e-businesss & ERP-e supply chian & ERP- Future directions for ERP.
   Case: HR in atalntic manufacturing. (Mary Sumner).

Textbook:
1. **Mary Sumner " Enterprice Resource Planning" Pearson, 2012**.

Referencs:
1. David L.Olson " Managerial Issues in ERP systems" TMH 2012.
2. Ellen Monk "Enterprice Resource Planning" Cengage, 2012.
3. Alexis Leon "Enterprice Resource Planning" 2e, TMH ,2012
4. Goyal "Enterprice Resource Planning" TMH, 2012
5. Jagan Nathan Vaman "ERP Srategies for Steering Orgnizationsal competence and competetive Advantage" TMH, 2012.

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STATISTICAL ANALYSIS LAB USING SPSS / EXCEL

Course aim: The course aims is to understand MS Excel for applying statistical tools learnt in RMSA.

Learning Outcome: The learning outcome is that the students should be able to:

- Analyse the data to draw inference for decision making.
- Understand application of statistical measures of central tendency.
- Understand application of ANOVA.
- Analyse trends.
- Test hypotheses.

Syllabus - PART A

About EXCEL

1. Introduction, Uses of Excel, New functions and features of excel 2007.
2. Getting started with excel: Opening a blank or new workbook, general organization.
3. Highlights and main functions: Home, Insert, page layout, formulas.
4. Highlights and main functions: Data, review, view, add-inns.
5. Using the Excel help function.

General EXCEL Lessons

6. Customizing the Quick Access Toolbar.
7. Creating and Using Templates.
8. Working with Data: Entering, Editing, Copy, Cut, Paste, Paste Special.
9. Formatting Data and Using the Right Mouse Click.
10. Saving, Page Setup, and Printing.
11. Using Headers and Footers.
12. Manipulating Data, using Data Names and Ranges, Filters and Sort and Validation Lists.
13. Data from External Sources.
14. Using and Formatting Tables.
15. Basic Formulas and Use of Functions.
16. Data Analysis Using Charts and Graphs.
17. Managing, Inserting, and Copying Worksheets.
18. Securing the Excel Document (Protect Cells and Workbook).

ADVANCED EXCEL LESSONS

19. Advanced Formulas and Functions.
20. Advanced Worksheet Features.
21. Advanced Data Analysis using PivotTables and Pivot Charts.

PART B – STATISTICAL TOOLS FOR EXECUTION USING EXCEL

I. Tabulation, bar diagram, Multiple Bar diagram, Pie diagram, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation.
II. Correlation, regression lines.
III. t- test, F-test, ANOVA one way classification, chi square test, independence of attributes.
IV. Time series: forecasting Method of least squares, moving average method.
V. Inference and discussion of results.

Text

1. Glyn Davis & Branko Pecar “Business Statistics Using Excel” Oxford University Press, 2012.

References:

1. David Whigham “Business Data Analysis Using Excel’’ Oxford University Press, 2012.
2. Winstion “Excel 2010 Data Analysis and Business Modelling” PHI Learning Private Limited.
3. Bajpai “Business Statistics” Pearson, 2013.
4. D P Apte : Statistical Tools for Managers USING MS EXCEL, Excel, 2012.
5. Bruce Bowerman, Business Statistics in Practice, TMH, 5/e 2012.
6. Shelly, MS Office, 2007, Cengage, 2009.
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STRATEGIC MANAGEMENT
PG CORE-V
(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
The aim of this subject is to enable the students develop a holistic perspective about Strategic management of an organization

Learning Outcome:
By reading the text and discussing the cases students should be able to understand how to scan internal and external environment of an organization, understand different types of strategies and structures, strategies of the competitors, turnaround strategies, global strategies and strategic control. With that knowledge they would be able to formulate strategies, change strategies if necessary and implement strategies. They will also be able to evaluate strategies and take corrective steps.

Unit-I:
Strategic Inputs: Introduction to Strategic Management-Strategic Management and Competitiveness-Technology and Technology change-Vision, Mission and Objectives-Strategic Leaders-Strategic Management process-The External Environment: Opportunities, Threats, Competition and Competitor Analysis. External Environmental Analysis, Segments of the External Environment, Porters 5 Force Model, The internal Environment: Resource, Capabilities, Competencies and Competitive advantages. Analyzing internal organization - Building Core Competencies - Value Chain Analysis, Outsourcing.
Case:Bharti Airtel (Hitt & Irelandpage no 4).
Case: ITC Limited (Hitt & Irelandpage no 30).

Unit-II: Formulation of Strategic Actions: Business level strategy-Effectively managing relationships with Customers-the purpose of Business strategy. Competitive Rivalry and Dynamics - A Model of Competitive Rivalry-Competitor Analysis-Drivers of Competitive actions and responses-Competitive rivalry and dynamics.
Case:Bajaj Auto limited (Hitt & IrelandPage no 80).
Case: Coca cola Vs Pepsi in India (Hitt & Irelandpage. no108)

Unit-III: Corporate level Strategy-Levels of Diversifications and reasons-Value creating diversifications. Strategic Acquisitions & Restructuring - Popularity of Mergers & Acquisitions strategies, problems in achieving Acquisition Success-Restructuring.
Case: Foster's Group Diversification into the Wine Business (Hitt & IrelandPage 150)
Case: Merger and Acquisition Activity during a Global Crisis: Global and in India (Hitt & Ireland page 154) Focus : Troubles in the Godrej –P & G Alliance(Hitt & Irelandpage. no 223)

Unit-IV: Global Strategy-Identifying International Opportunities and international Strategies-Strategic competitive Outcomes and risk in an international Environment. Corporate Implications for strategy-Strategic Alliances-corporate level cooperative strategy, Competitive risk with Cooperative strategies.
Case: Entry into India & China by Foreign Firms and Indian/Chinese Firms Reaching for Global markets (Hitt & Irelandpage. no 176).
Case: Using Cooperative Strategies at IBM (Hitt & Ireland page 206)

Unit-V: Structure and Controls with Organizations-Organizational Structure and controls, Evolutionary Patterns of strategy and organizational structure. Leadership Implications for Strategy - Entrepreneurial Implications for Strategy. Fundamental principles of Ethics, Professional Ethics, Ethics of Finance & Accounting professionals, Cyber crimes, Ethics & Human rights
Case 1 CISCO's Evolution of Strategy and Structure. (Hitt & Irelandpage. no 256)
Case 2 selecting a new CEO (Hitt & Irelandpage no 282)
Case 3 The Continuing innovation revolution at Amazon: The kindle and E-books(Hitt & Ireland page 304)

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- A Nag" Strategic Management:Analysis, Implementation & Control "Vikas Publishing house, 2012.
- Adrian & Alison" Strategic Management: Theory & Application" Oxford UniversityPress, 2010.
- C.L.Bansal, Business and Corporate Laws, 1/e, Excel Books, 2006

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RETAILING MANGEMENT
PG Elective-III (Marketing)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim: The main aim of this course is a) to enable students to gain an insight into retailing industry and shopping environment. b) to familiarize them with concepts of Retailing through cases and motivate them to go for a career in retailing industry.

Learning outcome:

a. To enable the students to link Modern Retailing Concepts to cases and understand the present Retailing Trends.
b. To facilitate the students to be able to managing retail operations efficiently and effectively.

1. **Introduction to Retail Management** - Meaning of Retail & Retailing, History, types, functions, utilities, theories of retailing, e-tailing, structure of Indian retail industry, retailing in Asia, global retailing, retailing in Europe, service retailing, FDI retailing, Rural marketing, ethics in retailing.
   Case: The Classic story.(Aditya page no 283)
   Case: The Panwallah. (Aditya Prakash page no 287)

2. **Understanding Shoppers & Shopping** - Shopping Environment, shopping in a Socio Cultural Contest, shopping process shopping behaviour, demographics of Indian shoppers, psychographic profile of Indian shoppers, lifestyle of Indian shoppers, shopping patterns in India.
   Case: Multinational Fast Food Chains in India. Retail Management (Suja Nair page no 474)
   Case: Changing Indian Consumers. (Aditya page no 258)
   Case: Tanishq. (Suja Nair page no 440)

3. **Delivering Value though Retail Functions** - Classification of formats, ownership-based, store based, non-store based, other retail formats, Value Based Model of store format choice, attribute based model of store format choice, the competitive market place, Marketing Structure, the demand side of retailing, non price decisions, types of competition, evolution of retail competition, future changes in retail competition.
   Case: Nirula's. (Suja Nair Page no 448)
   Case: Hot Breads. (Suja Nair page no 452)
   Case: McDonalds India. (Suja Nair page no 459)
   Case: Automobile and Niche Marketing (Dr. Harjit Singh page no 417)

4. **Pricing & Supply Chain Management -** Pricing Objectives & Policies, Interactive Pricing Decisions, different Pricing Strategies, Price Adjustment Strategies. SCM- introduction, derivers of SCM, SCM & competitive advantages, types of supply chain-supply chain length, width, control of supply chain, framework of Supply Chain Management-SCM network structure, Supply Chain Business Process, SCM components, Retail Inventory Management, Retail Logistics Management, EDI in SCM.
   Case: Café Coffee Day. (Suja Nair page no 434)
   Case: Shoppers stop. (Suja Nair page no 470)

5. **Retail Buying & Managing Retail Operations**-objectives of buying, organization buying, retailing buying behaviour, models of buying behaviour, buyer-responsibilities, merchandising & assortment plans-merchandise plan, merchandise plan for basic stocks retail buying groups, negotiations in retail, contract in retail, store layout & design, merchandise display-fixtures, positioning of merchandise, materials & finishes – floors, interior walls, ceilings, lightings, music, graphics-exterior signage, interior signage, layouts for e-tailers.
   Case: Godrej and Boyee's. (Suja Nair page no 466)

Textbook

- Piyush Kumar Sinha, Dwarika Prasad Uniyal, Managing Retailing, 2nd Edition, Oxford, 2012.

Journals : Vikalpa, IIMA, IIMB Review, Decision, IIMC, Vision, MDI, MICA Communications Review – A Marketing Communications Journal, Mudra Institute of Communications, Ahmedabad.

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3. **Aditya Prakash** Tripathi, Noopur Agrawal, Fundamentals of Retailing (text and cases), Himalaya Publication House, First Edition, 2009.
4. Swapna Pradhan, Retail Management-Text & Cases, TMH, 2013.
5. Dr. Harjit Singh, Retail Management a global perspective text and cases, S.Chand, 2011.
6. Michael levy, Barton Weits, Ajay Pundit, Retailing Management, McGraw-Hill, 2011.
7. Arif sheikh, Kaneez Fatima, Retail Management, Himalaya Publication House-2012.
8. Chetan Bajaj, Rajnish tuli, Nidhi Varma ,Srivastava, Retail Management, 2nd edition, oxford, 2012.
9. David Gilbert, Retail Marketing Management, 2nd edtion, Pearson, 2013

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SERVICES MARKETING
PG Elective-IV (Marketing)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
To facilitate the students about the concepts of Services Marketing through cases.

Learning Objective: The objective of the course is to provide a deeper insight into the Marketing Management of companies offering Services as product. The students will be able to understand the characteristics of services, understand consumer behaviour in services, align service design and standards, delivering service, managing services promises.

1. **Foundations of Service Marketing:** What are Services? Why Services Marketing? Role of Services in Modern Economy, Service and Technology, characteristics of services compared to goods, Services Marketing Mix, staying focusing on customer, Gaps model of Service Quality-Customer Gap, Provider Gap, Closing Gap.
   Case 1: The United Indian Bank (Govind Apte Page no 55-56)
   Case 2: Online air travel: Expedia, Orbitz and Travelocity lead the pack (John E.G.Bateson Page no 82-83)

2. **Focus on the Consumer:** Consumer behaviour in services, Consumer expectations in service, consumer perceptions of service, Understanding Consumer Requirements-listening to customers through research, building customer relationships, service recovery.
   Case1: The Crestwood Inn, (John E.G.Bateson Page no 320-321)
   Case 2: Population growth and the urban poor (Vinnie Jauhari, Kirti Dutta Page no 106-108)

3. **Aligning Service Design and Standards:** Service innovation and design-challenges, types of service innovations, stages in service innovation and development, service blueprinting, high performance service innovations, new Service Development Processes, Customer defined service standards-factors, types, and development, Physical Evidence and the Services cape.
   Case 1: Physical evidence a case of KF. (Vinnie Jauhari Page 236-238).
   Case 2: IT Trainers Limited. (Govind Apte Page no 186).

4. **Delivering and Performing Service:** Employee's roles in service delivery, customer's roles in service delivery, delivering service through intermediaries and electronic channels, managing demand and capacity.
   Case 1: Relationship between Employee satisfaction, Customer satisfaction and market share: The case of Hewlett-Packard, (Vinnie Jauhari Page 336).
   Case 2: Total Assurance Ltd. (Govind Apte Page 207-208).

5. **Managing Service Promises:** Integrated services marketing communications-need for coordination, five categories of strategies to match service promises with delivery, Pricing of Services-three key ways that service prices are different for customers, approaches to pricing services, pricing strategies that link to the four value definitions.
   Case 1: Why Differential Pricing helps the poor? (Vinnie Jauhari et al Page 336).

Textbook

1. **Valarie A.Zeithaml & Mary Jo-Bitner: Services Marketing – Integrating customer focus across the firm, TMH, Fifth edition, 2011.**

Journal : MICA Communications Review – A Marketing Communications Journal, Mudra Institute of Communications, Ahmedabad.

References

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2. Harsh V.Varma: Services Marketing text and cases, Pearson, Second edition, 2012.
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5. Govind Apte : Services Marketing, Oxford Press, 2011.
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9. Ramneek Kapoor, Justin Paul, Biplab Halder, Services Marketing Concepts and Practices, TMH, 2011.
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11. R. Srinivasan, Services Marketing the Indian context, 3rd edition, PHI,2012.
12. Dr. B. Balaji, Services Marketing and Management, S.Chand, 2012.
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INTERNATIONAL MARKETING
PG Elective-V (Marketing)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim: To enable the student understand the Global Markets, formulate of Global Marketing Strategies and Implement.
Learning Objective: The objective of the course is to provide a deeper insight into the global marketing management, environment of global markets, assessing global market opportunities, developing and implementing global marketing strategies.

1. **Introduction to International Marketing:** Definition, Scope, Features, Difference between Domestic and International Marketing, Why International? International Marketing Theories, Types of Economics & Markets.
   Case: 1 Starbucks –going Global fast. (Philip, John, Prashant Text)

2. **Environment of Global Markets:** Types: Political, Economical, Social, Legal and Technological Environments, EXIM Policy, International Trade and its barriers trade in Goods & Services.
   Case: 1 IKEA Catalogue. (Svend & Madhurima -Pearson page no 242)
   Case: 2 Mc. Donalds and obesity. (Philip John Prashant Text)

3. **Assessing Global Market Opportunities:** Global vision through Market Research: Market Selection, Role of Culture, Government Policies of Target Markets, SWOT Analysis of Target Markets, International Trade Agreements, World Market Stages.
   Case:1 Reliance Entertainment(Svend & Madhurima, Pearson page no 312)
   Case:2 Mahindra & Mahindra (Svend & Madhurima,Pearson page no 356)
   Case:3. IMAX corporation (Svend & Madhurima, Pearson page no 412)

4. **Developing Global Market strategies:** Segmentation product & services decisions for consumers and Business: Marketing channels and Distribution, Promotion Strategies, Pricing strategies.
   Case:1 Harley-Davidson:-Price level (Svend & Madhurima,pearson page no 510)
   Case:2 Mc Donalds Great Britain –the Turnaround (Text page no 793)

5. **Implementing Global marketing strategies:** Negotiation with customers and selection method, E-Marketing channels organization & controlling of the global marketing programme.
   Case: 1 NTT DOCOMO (Svend & Madhurima,Pearson page no 709)

Textbook

- **Philip R. Cateora, John L graham, Prashant Salwan, International Marketing -13th edition – TMH-2011.**

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2. *Rajagopal –International Marketing*-2nd Edition –Vikas -2011
3. *P.K.Vasudeva, International Marketing-4th edition-Excel Books-2012*
4. Dr.Gajender Sharma- International Marketing-1st edition-Excel Books-2010
5. Justin Paul, International Marketing – Text and Cases, TMH, 2013.
6. Kiefer Lee, Steve Carter-Global Marketing Management-3rd edition-Oxford-2011.
7. Warner J.Keogan, Naval K.Bghargava-Global Management-7th Edition-Person-2011
8. Francis Cherunilam- International Marketing-12th Edition-HPH-2012.
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COMPENSATION & REWARD MANAGEMENT
PG Elective – III (HR)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
It enables the student understand the concepts issues and challenges of compensation and reward management.

Learning Outcome:
The student understands how to design the compensation for various levels of jobs in the organization, designing the compensation for special groups. Government and legal issues in compensation design.

1. The Pay Model Strategy: The Totality of Decisions, Defining Internal Alignment, Job Analysis, Evaluating Work, Job Evaluation, person-based Structures.
   Case: So you want to lead an orchestra (George T Milkovich page no 72)
   Case: Job Evaluation at whole foods (George T Milkovich page no 125)

2. Defining Competitiveness, Designing pay levels, Mix and pay structures, pay for performance. The Evidence pay for performance plans.
   Case: Burger Boy(George T Milkovich page no 249)
   Case: Incentives in the club House(George T Milkovich page no 279)

3. Performance Appraisals, Benefits Determination Process, statutory Benefits including Health care, Employee welfare and Retirement Benefits.
   Case: Merit pay: Making policies and practices that work (George T Milkovich page no 319)

4. Compensation of Special Groups, Union role in wage and Salary administration. International pay systems.
   Case: Compensation of special groups (George T Milkovich page no 443)
   Case: Coke and IBM(George T Milkovich page no 491)

5. Government and legal issues in compensation Public sector pay Management: Making it work.
   Case: Communicating by copier(George T Milkovich page no 575)

Textbook:
- **George T Milkovich, Jerry M Newman, C S Venkata Ratnam" TMH,2013.**

References:
1. B D Singh "Compensation and Reward Management" Excel books,2012
2. Joseph J.Martocchio "Strategic Compensation" Pearson, 2012.
3. Kanchan Bhatia "Compensation Management" Himalaya, 2012.
4. Henderson "Compensation Management in a Knowledge Based World" 3e, Pearson, 2012.
5. Luis R.FGomez- Mejia "Compensation and Organizational Performance" Yesdee Publishing, 2012.
6. Michale Armstrong" Employee Reward" University Press, 2012.
7. Barry Gerhart, "Compensation" Sage, 20

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MANAGEMENT OF CHANGE
PG Elective – IV (HR)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
The course enables the student to understand the concept change management. This will help them to emerge as leaders in the organizations.

Learning Outcome:
The student understands the need to bring change, how to design change in the organizations, role of leadership in change management, change communication and resistance to change and the role of HR in change management.

1. Managing Change Conundrums, Organizational change classifications, History and organizational change. The role of paradigms and perspectives. External and Internal change contexts.
   Case: Changing times at Factory Bank (Mark Hughes page no 70)
2. Organizational design and change, strategic level change, Group and team level change, and Individual level change. Organizational Structure. Organizational Culture and Management of Change.
   Case: Restructuring at Flexco (Adrian page no 57)
   Case: Cultural change at Dupont Nylone (Adrian page no 65)
3. The leadership of Change, Change communication, resistance to change, Organizational learning, power, politics and Organizational change. Ethics and Managing Change, Change Agents and Agency.
   Case: Funding crisis at Musicians in the community (Mark Hughes page no 221)
4. HR and Managing Change: Recruitment & Selection & The Management of Change, Performance Management &Management of Change, Reward Managements & The Management of Change, Technological Change.
   Case: Recruitment and Selection at Unicol (Adrian page no 117)
   Case: Reward Management at Midland Main Line - Strategic Reward Management (Adrian page no 191).
5. Employee Relations, Involvement Strategies, Management of Change, Downsizing and the Management of Change, Evaluating and Promoting change.
   Case: Downsizing at Energy Co **(**Adrian page no 268)
   Case: Evaluating a possible change to training methods at telesales Incorporated (Adrian page no 300)

Textbook:
- **Mark Hughes, " Managing Change – a critical perspective", Universities Press, 2011.**

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3. Robert A Paton "Change Management" 3e , Sage Publications ,2012.
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5. Radha R Sharma "Change Management and Organizational Transformation" Mc Grawhill, 2012.
6. Dipak Kumar " Organizational Change and Development" Oxford,2012.
7. Niloanjan Sengupta " Managing Change in Organizations" PHI ,2012.
8. Nic Beech " Managing Change" Cambridge Press" 2012

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PERFORMANCE MANAGEMENT
PG Elective - V (HR)
(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
To give an understanding about performance management and reward system linked with performance.

Learning Outcome:
The students can understand the importance of performance Management, Performance Appraisals, Reward System, and other performance related concepts.

1. Performance Management and reward systems in context, Performance Management process, Performance Management strategic planning.
   Case: Performance Management at Network Solutions,Inc (Herman Aguinis page no 26)
   Case: Performance Management at the University of Ghana (Herman Aguinis page no 48)

2. Defining performance and choosing a Measurement Approach, Measuring Results and Behaviours. Gathering performance Information, Implementing a performance Management System.
   Case: Accountabilities, Objectives and Standards (Herman Aguinis page no 113)
   Case: Evaluating the appraisal form used by a Grocery Retailer ((Herman Aguinis page no 145)

3. Performance Management and employee development, Performance Management skills.
   Case: Implementation of 360 degree feed back system at Ridge intellectual (Herman Aguinis page no 204)
   Case: Was Robert Eaton A Good Coach (Herman Aguinis page no 233)

4. Reward Systems and legal issues, Managing Team performance.
   Case: Possible Illegal Discrimination at Tractors,Inc. (Herman Aguinis page no 265)
   Case: Team Performance Management at Duke University Health systems. (Herman Aguinis page no 283)

5. Relevant Performance related concepts: Bench marking, Six Sigma, Competency Mapping, Balance Score card, Coaching and Mentoring Pygmalion effect, Job Analysis.
   Case: BHEL,EVA Incentive Schemes: (B D Singh page no 589)
   Case: The TCS Approach and experience(B D Singh page no 601)
   Case: NTPC Performance Management System(B D Singh page no 632)
   Case: Performance Management system(PMS) at Bharti Telecom**(**B D Singh page no 663)

Textbook.
1. **Ram Kumar Balyan, Vikramender Singh & Suman "Performance management text and cases", Himalaya Publications, 2011**.

Reference
1. Herman Aguinis, " Performance Management" Pearson, 2012.
2. Anjali Ghanekar' Essentials of Performance Management' Everest Publishing House, 2010
3. Lance A Berger & Dorothy R Berger " The Talent Management Hand Book" 2nd edition TMH, 2013.
4. B D Singh, " Performance Management System- a holistic approach" excel Books,2010
5. Prem Chadha "Performance management" Macmillan, 2012.
6. Srinivas K Kandula "Performance Management" PHI, 2010.
7. R K Sahu : Performance Management System, Excel, 2013

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STRATEGIC INVESTMENT AND FINANCING DECISIONS
PG Elective – III (Finance)

(Students must read textbook. Faculty are free to choose any other cases)

Aim:
To develop an understanding of the role of financial strategy, in the investing, financing and resource allocation decisions with in an organization. To develop an understanding of the various strategies that are in use to trade off risk and return

Learning Outcome:
To explain the role and nature of investment and financial strategies and its relationship to maximization of wealth/shareholders value. To examine various risk models in capital budgeting. To evaluate the motives for financial implications of mergers and acquisitions and lease financing. To discuss the impact of general and specific inflation on financial and investment strategy decisions.

1. Investment decisions under conditions of Risk and uncertainty: Concepts of risk and uncertainty. Risk Analysis in Investment Decisions. Risk adjusted rate of return, certainty equivalents, probability distribution of cash flows, decision trees, sensitivity analysis and Monte Carlo Approach to Simulation. Investment Decisions under capital constraints: Capital Rationing Vs. Portfolio. Portfolio Risk and diversified projects.

2. Types of Investments and disinvestments: Project abandonment decisions, Evidence of IRR. Multiple IRR, Modified IRR, Pure, simple and mixed investments. Lorie Savage Paradox. Adjusted NPV and impact of inflation on capital budgeting decisions.

3. Critical analysis of appraisal techniques: Discounted pay back, post pay back, surplus life and surplus pay back, Bail-out pay back, Return on Investment, Equivalent Annual Cost, Terminal Value, single period constraints, multi-period capital constraint and an unresolved problem, NPV mean variance analysis, Hertz Simulation and Hillier approaches. Significance of information and data bank in project selections.

4. Strategic Analysis of selected investment decisions: Lease Financing, Leasing Vs. Operating Risk, borrowing vs. procuring. Hire purchase and Instalment decisions. Lease Risk Management, Leasing as a Financing Decision, Advantages of Leasing, and Leasing Decision in practice.

5. Financing Decisions: Mergers and Acquisitions Basic Issues, Strategy , Diversification and Mergers and Acquisitions , Theories of Mergers, Types of Mergers ,Cost of Mergers , Government guidelines for Takeover, Problems on Mergers & Acquisitions and cases

Textbooks:
- **Ravi M Kishore " Strategic Financial Management, Taxman 2012.**

References:
1. Prasanna Chandra: Financial Management, 8/e, TMH, 2012
2. Prasanna Chandra: Projects: Planning, Analysis, Financing Implementation and Review, 6/e, TMH, 2012
3. I.M. Pandey: Financial Management, Vikas 2012.
4. Brigham & Ehrhardt: Financial Management, Text and Cases, Cengage, 2012.
5. G.V.Satya Sekhar, Strategic Financial Management , Himalaya Publishing House 2012
6. MY Khan and PK Jain: Financial Management: Text, Problems & Cases, TMH, 2012.

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INTERNATIONAL FINANCIAL MANAGEMENT
PG Elective – IV (Finance)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
To give an understanding about MNC Financial Management.

Learning Outcome:
The objective of the course is to provide students with a broad view of International Monetary Systems and its understanding to enable a global manager to do business in a global setting. The prerequisite for the course is Financial Accounting and Analysis and Financial Management.

1. International Financial Management: An overview, Importance, nature and scope, International Business Methods, Recent changes and challenges in IFM

2. International Flow of Funds: Balance of Payments (BoP), Fundamentals of BoP, Accounting components of BOP, Factors affecting International Trade flows, Agencies that facilitate International flows. Indian BoP Trends. International Monetary System: Evolution, Gold Standard, Bretton Woods's system, the flexible exchange rate regime, evaluation of floating rates, the current exchange rate arrangements, the Economic and Monetary Union (EMU).

3. Foreign Exchange Market: Function and Structure of the Forex markets, major participants, types of transactions and settlements dates, Foreign exchange quotations. Process of arbitrage, speculation in the forward market - Currency Futures and Options Markets, Overview of the other markets – Euro currency market, Euro credit market, Euro bond market, International Stock market.

4. (a) Exchange Rates: Measuring exchange rate movements, Factors influencing exchange rates. Government influence on exchange rates – exchange rate systems. Managing Foreign exchange Risk. International arbitrage and interest rate parity.
   (b) Relationship between inflation, interest rates and exchange rates – Purchasing Power Parity – International Fisher Effect – Fisher Effect.

5. Asset–liability Management: Foreign Direct Investment, International Capital Budgeting, International Capital structure and cost of capital. International Portfolio Management. International Financing: Equity, Bond financing, parallel loans - International Cash management, accounts receivable management, inventory management. Payment methods of international trade, trade finance methods, Export – Import bank of India, recent amendments in EXIM policy, regulations and guidelines.

Textbooks:
1. **Jeff Madura: International Corporate Management, Cengage, 2012.**

References:
1. Alan C.Shapiro: Multinational Financial Management, John Wiley, 2012
2. Sharan.V: International Financial Management 5Th Ed.PHI2012
3. Madhu Vij: International Financial Management, Excel, 2012.
4. Ephraim Clark: International Finance, , Second Edition, Thomson.
5. P.G.Apte: International Financial Management, TMH 2012.
6. S.Eun Choel and Risnick Bruce: International Financial Management, TMH, 2012
7. Reid. W.Click& Joshua D.Coval, PHI 2012

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DERIVATIVES
PG Elective – V (Finance)
(Students must read textbook. Faculty are free to choose any other cases)

Aim:
To give an understanding about the derivatives in stock, commodity and Forex markets.

Learning Outcome:
The objective of this course is to make students efficient in the area of Derivatives, giving them the knowledge of basics in Derivatives, Future Markets, Option Strategies, etc

1. **Introduction to Derivatives** – Development and Growth of Derivative Markets, Types of Derivatives, Uses of Derivatives, Fundamental linkages between spot & Derivative Markets, The Role of Derivatives Market, Uses & Misuses of derivatives.

2. **Future and Forward Market** structure of forward and Future Markets, Mechanics of future markets, Hedging Strategies, Using futures, Determination of forward and future prices, Interest rate futures, Currency futures and Forwards.

3. **(a) Options** – Distinguish between Options and Futures, Structure of Options Market, Principles of Option Pricing, Option Pricing Models: The Binomial Model, The Black – Scholes Merton Model.
   (b) Basic Option Strategies, Advanced Option Strategies, Trading with Options, Hedging with Options, Currency Options.

4. **Commodity Market Derivatives-** Introduction, Types, Commodity Futures and Options, Swaps. Commodity Exchanges- MCX, NCDEX- Role, Functions & Trading. (Refer : M.Ranganatham & R.Madhumathi)

5. **Swaps** – Concept and Nature, Evolution of Swap Market, Features of Swaps, Major types of Swaps, Interest Rate Swaps, Currency Swaps, Commodity Swaps, Equity Index Swaps, Credit Risk in Swaps, Credit Swaps, using Swaps to Manage Risk, Pricing and Valuing Swaps.

Textbooks:
1. **John C Hull: Options, Futures and other derivatives, , Pearson , 2012.**

References:
1. M.Ranganatham & R.Madhumathi : Derivatives and Risk Management, Pearson, 2012
2. Robert A Strong: Derivatives – An Introduction, ThomsonT 2012
3. Gupta: Financial Derivatives, PHI 2012
4. Dubofsky, Miller: Derivatives Valuations and Risk Management, Oxford. 2012.
5. Don M. Chance, Robert Brooks: Derivatives and Risk Management Basic, Cengage. 2012.

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IDP (B.Tech. ECE & M.Tech. / MBA) V Year I-Sem

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E-BUSINESS
PG Elective – III (SYSTEMS)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
It enables the student understand the concepts of Electronic Business.

Learning Outcome:
The student understands E-Business, its Models, E-Business plans, E-Business Application and Securing E- Business

1. Electronic Business- Understanding new Internet Economy and Business-E-business an e-commerce-Features of E-Business- Advantages of E-Business- Busines Environment-Establishing E-Business.
   Case : Barnes & Noble nad Amazon. Com (Ref 1- Kulkarni).

2. E-Business Models- E-Business Strucutre- E-Business models- E-Business model Design-IT infrastructure requirement of E-business models.
   Case: B2C model at Aradhana Tours. (Ref 1 Kulkarni)

3. Creating E-Business plans- softwareprograms to create a business- Phases /Aspects of E-Business- e-Marketinmg and sales Strategies-website and portal managmenet.
   Case" FLOP (ref 1 :Kulkarni)

4. E-Business Appliications- Charactersttics o E-Business applications-Project palning approach for E-Business applications- Application Integration- application in various domains.
   Case Nokia (Ref 1 Kulkarni)

5. Securing your e-business- risk Managment- business continuity planning-Network and web site security-web sire Defacement-Secuiryt audit and Pentration Testing.
   Case: Asmi Agencies-e-market (Ref 1 Kulkarni)

Textbook:
- **Kulkarni et al. "E-Business" Oxford, 2012.**

Reference
1. Dave chaffey, e-business & e- commerece management- strategy, implementation and practice, 5th edition, pearson, 2013.
2. Napier et al " Creating A Winning E-Business" Cengage, 2012.
3. Parad Diwan : e-commerce A Manager's Guide to e-business, Excel, 2013.

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CYBER SECURITY
PG Elective – IV (SYSTEMS)

(Students must read textbook. Faculty are free to choose any cases)

Course Aim:
It enables the student to understand Cyber crime, Tools and methods used in cyber crime and Cyber Security.

Learning Outcome:
The student understands the cyber crimes. Computer forensic system, and Cyber Security.

1. Cyber crime: Mobile and Wireless devices-Trend mobility-authentication service security-Attacks on mobile phones-mobile phone security Implications for organizations-Organizational measurement for Handling mobile-Security policies and measures in mobile computing era.

2. Tools and methods used in cyber crime-Proxy servers and Anonymizers-Phishing-Password cracking-Key loggers and Spywares-Virus and worms-Trojan Horse and Backdoors-Steganography-SQL Injection-Buffer overflow-Attacks on wireless network.

3. Understanding computer forensic-Historical background of cyber forensic-Forensic analysis of e-mail-Digital forensic life cycle-Network forensic-Setting up a computer forensic Laboratory-Relevance of the OSI 7 Layer model to computer Forensic-Computer forensic from compliance perspectives.

4. Forensic of Hand –Held Devices-Understanding cell phone working characteristics-Hand-Held devices and digital forensic- Toolkits for Hand-Held device-Forensic of i-pod and digital music devices-Techno legal Challenges with evidence from hand-held Devices.

5. Cyber Security –Organizational implications-cost of cybercrimes and IPR issues-Web threats for organizations: the evils and Perils-Social media marketing-Security and privacy Implications-Protecting people privacy in the organizations-Forensic best practices for organizations.

Textbook:
- **Nina Godbole & Sunit Belapure "Cyber Security", Wiley india, 2012.**

Reference:
1. Harish Chander, "cyber laws & IT protection", PHI learning pvt.ltd, 2012.
2. Dhiren R Patel, "Information security theory & practice",PHI learning pvt ltd,2010.
3. MS.M.K.Geetha & Ms.Swapne Raman"Cyber Crimes and Fraud Management, "MACMILLAN, 2012.
4. Pankaj Agarwal : Information Security & Cyber Laws (Acme Learning), Excel, 2013.
5. Vivek Sood, Cyber Law Simplified, TMH, 2012.

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INFORAMTION SYSTEM CONTROL AND AUDIT
PG Elective – V (SYSTEMS)

(Students must read textbook. Faculty are free to choose any other cases)

Course Aim:
It enables the student understand the concepts of Information System and Control.

Learning Outcome:
The student understands the audit standards, Audit Process, Computer assistance Audit tools, Managing Audit tools and Strategy and Standards for Auditing.

1. Audit and review the role of Inforamntion Technology-Audit standards-Importance of audit standard independence- AICPA proannouncmenet- The need for IT audit function- role of the IT auditor-Legal implications.
   Cases.

2. Auidit proces in a inforamtion Technology Envionment-Risk Assesmant-Audit budget- Objectives and context-prelimenary review-Feildwork and implermentating audit Methodology-Docukenting results.
   Cases.

3. Computer Assistance Audit tools- Auditor productivity tools-Flowcharting Techniques-Flowcharting an nalytical tool- Defininf critical data-Flowcharting technique-Generalizing audit software-Computer forensic.
   Cases.

4. Managing IT audits- Estabish a career develpement and planning-Evaluvating IT audit quality-criteria for IT audit quality-IT auditing in new millinieum-code of ethics and professional standards-Private industry- Managmeent consultancy.
   Cases.

5. Strategy and standards for Auditing- Strategic palnning- communication- demand managmeent-Architecture and standards- Busines architecture- application and inforamtion architecture-Architecture fuanctions.
   Cases.

Textbook:
- **Sandra Senft & fredrick " Inforamtion Technology Control and Audit " CRC Press, 2012.**

Reference:
- D P Dube, V P Gulati, Information System Audit and Assurance – Includes case studies and chelists from the banking industry, TMH, 2008.