ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

ELECTRICAL & ELECTRONICS ENGINEERING

For

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

Leading to

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

(Applicable for the batches admitted from 2017-2018)

JNTUH COLLEGE OF ENGINEERING HYDERABAD

(Autonomous)

Kukatpally, Hyderabad – 500085

Telangana, India

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ACADEMIC REGULATIONS 2017
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 **2017-18** 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 2017 - 18 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 i.e. 50% credits up to first year second semester from all the relevant regular and supplementary examinations, whether the student 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 58 Credits out of 96 Credits i.e. 60% credits up to second year second semester from all the relevant regular and supplementary examinations, whether the student 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 86 Credits out of 144 Credits i.e., 60% credits up to third year second semester from all the relevant regular and supplementary examinations, whether the student 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 in a Subject / Course	Letter Grade As per UGC Guidelines	Grade Points
More than or equal to 90%	O (Outstanding)	10
80 and less than 90%	A+ (Excellent)	9
70 and less than 80%	A (Very Good)	8
60 and less than 70%	B+ (Good)	7
50 and not less than 60%	B (Average)	6
40 and not less than 50%	C (Pass)	5
Below 40%	F (Fail)	0
Absent	Ab	0

(b) For PG

% of Marks Secured in a Subject / Course	Letter Grade As per 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 ≥ 5 (for UG) / 6 (for PG)

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), is the no. of Credits allotted to the ith Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that ith Subject.

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), is the no. of Credits allotted to the jth Subject, and represents the Grade Points (GP) corresponding to the Letter Grade awarded for that jth Subject. After registration and completion of I Year I Semester however, the SGPA of that Semester itself may be taken as the CGPA, as there are no cumulative effects.

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 ≥ 5 (for UG) / 6 (for PG) 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 examination or any person not connected with the college	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including

	indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	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. / MBA)

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE
(Applicable from the batch admitted from the Academic Year 2017-18 and onwards)

I YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathematics- I	4	1	0	4
2	ES	Computer Programming & Data Structures	4	1	0	4
3	HS	English	3	0	0	3
4	ES	Engineering Graphics	2	0	3	4
5	ES	Engineering Mechanics	3	1	0	3
6	ES	Computer Programming & 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				
		Total Credits				**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 & Electronics Engineering	4	0	0	4
3	BS	Applied Physics	3	0	0	3
4	BS	Engineering Chemistry	3	0	0	3
5	ES	Environmental Science	3	0	0	3
6	BS	Computational Mathematics	2	0	0	2
7	ES	Basic Electrical & Electronics Lab	0	0	3	2
8	BS	Applied Physics Lab	0	0	3	2
9	BS	Computational Mathematics Lab	0	0	3	2
		NSS/NCC				
		Total Credits				**24**

II YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	BS	Mathamatics- III	4	1	0	4
2	PC	Electromagnetic Fields	4	0	0	4
3	PC	Electrical Circuits	3	1	0	3
4	PC	Electrical machines-I	3	1	0	3
5	ES	Electronic Devices and Circuits	4	0	0	4
6	HS	Gender Sensitization Lab	-	-	-	-
7	ES	Electronic Circuits Lab	0	0	3	2
8	PC	Electrical Machines Lab-I	0	0	3	2
9	PC	Basics Simulation Lab	0	0	3	2
		Total Credits				**24**

II YEAR **II SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Switching Theory & Logic Design	3	1	0	3
2	PC	Control Systems	3	1	0	3
3	PC	Power Systems-I	3	1	0	3
4	PC	Electrical Machines –II	3	1	0	3
5	PC	Electrical and Electronic Measurements	4	0	0	4
6	PC	Electrical Circuits Lab	0	0	3	2
7	PC	Electrical Machines Lab-II	0	0	3	2
8	PC	Simulation of Electrical Circuits Lab	0	0	3	2
9	HS	Human Values and Professional Ethics	2	0	0	2
		Total Credits				**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	Microprocessors & Micro Controllers	4	0	0	4
3	OE-I	Open Elective – I	3	0	0	3
4	HS	MEFA	4	0	0	4
5	PC	Power systems—II	3	1	0	3
6	PC	Control Systems Lab	0	0	3	2
7	PC	Electrical and Electronic Measurements lab	0	0	3	2
8	PC	Microprocessors Lab	0	0	3	2
		Total Credits				**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	Power Electronics	4	0	0	4
5	PC	Switch Gear and Protection	4	0	0	4
6	HS	Advanced English Language Communications Skills Lab	0	0	3	1
7	PC	Power Electronics Lab	0	0	3	2
8	PC	Micro Controllers Lab	0	0	3	2
		Total Credits				**24**

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

IV YEAR **I SEMESTER**

S.No.	Group	Subjects	L	T	P	Credits
1	PC (UG)	Digital Signal Processing	4	0	0	4
2	PE-III (UG)	1.HVDC Transmission 2. Reliability Engineering 3.High Voltage Engineering	4	0	0	4
3	PGC-I	Advance Power Electronics	4	0	0	4
4	PGE-I	1. Machine Modeling and Analysis 2.Reactive Power Compensation and Management 3.Gas Insulated Systems	4	0	0	4
5	PGE-II	1.Renewable Energy Sources 2.Electric Traction Technologies 3.Industrial Instrumentation	4	0	0	4
6	PGE-III	1.Modern Control Theory 2.Embedded Systems 3.Microcontrollers and Applications	4	0	0	4
7	PC (UG) Lab	Digital Signal Processing Lab	0	0	3	2
8	PGC-I Lab	Power Electronics and Converters Simulation Lab	0	0	4	2
9	EAC (UG)	Mini Project				2
		Total Credits				**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	Power Electronic Control of DC Drives	4	0	0	4
3	PGE-IV	1. Flexible AC Transmission Systems 2.Switched Mode Power Supplies 3. Energy Storage Technologies	4	0	0	4
4	PGC-II Lab	Power Electronics Drives Lab	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-III	Power Electronic Control of AC Drives	4	0	0	4
2	PGE-V	1. Dynamics of Electrical Machines 2. Integration of Energy Sources 3.Smart Grid Technologies	4	0	0	4
3	PGE-VI	1. AI Techniques and Applications to Electrical Engineering 2. Solar Photo Voltaic Systems 3. Hybrid Electric Vehicles	4	0	0	4
4	PGOE	Power Quality Programmable Logic Controllers and Applications Energy Efficient Technologies Optimization Techniques Energy Generation from Waste	4	0	0	4
5	PG	PG Project Phase -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 Phase-II				18
2	PG	Comprehensive Viva				4
		Total Credits				**22**

Professional Elective-I (PE-I):

1. Computer Methods in Power Systems
2. Computer Organization
3. Special Machines

Professional Elective-II (PE-II):

1. Digital Control Systems
2. Optimization Techniques
3. VLSI Design

OPEN ELECTIVE- I		
S.No.	**Subject**	**Offering Department**
1	Disaster Management	Civil Engineering
2	Non – Conventional Power Generation	Electrical & 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 & Communication Engineering
9	OOPS through JAVA	Computer Science & 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 & Valuation	Civil Engineering
2	Design Estimation and Costing of Electrical Systems	Electrical & 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 & Communication Engineering
9	Cyber Security	Computer Science & Engineering
10	Database Management Systems	
11	Corrosion Engineering	Metallurgical Engineering
12	Testing of Materials	
13	Solid Waste Management	Chemical Engineering

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

ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE FOR MBA

(Applicable from the batch admitted from the Academic Year 2017-18 and onwards)

IV YEAR **I SEMESTER**

S.No.	Group	Subject	L	T	P	Credits
1	PC	Digital Signal Processing	4	0	0	4
2	PE-III (UG)	1.HVDC Transmission 2. Reliability Engineering 3.High Voltage Engineering	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	Digital Signal Processing 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.***

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

L	T	P	C
4	1	0	4

MATHEMATICS – I
(Common to all Branches)

Pre Requisites: NIL

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.

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.

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COMPUTER PROGRAMMING & 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.

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

Outcomes:
At the end of the course, the student will be able to:
1. 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.
2. 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. EEE & 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:

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

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
   R - 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

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JNTUH COLLEGE OF ENGINEERING HYDERABAD

IDP (B.Tech. EEE & 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.

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

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L	T	P	C
3	1	0	3

ENGINEEERING MECHANICS

Prerequisites: Nil

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.

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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L	T	P	C
0	0	3	2

COMPUTER PROGRAMMING & 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

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.

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

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.

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 –Wiley India Pvt. Ltd. 1/e 2009.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches)- 2nd edition by Raymond A. DeCarlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N.C.Jagan & C.Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.

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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.

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.

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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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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COMPUTATIONAL MATHEMATICS
(Common to all Branches)

Pre Requisites: NIL

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

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 & ELECTRONICS ENGINEERING LAB

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

1. Identification, Specifications, Testing of R, L, C Components (Color Codes), Potentiometers, Switches (SPDT, DPDT, and DIP), Coils, Gang Condensers, Relays, Bread Boards, PCB's

2. Identification, Specifications and Testing of Active Devices, Diodes, BJT's, Low power JFET's, MOSFET's, Power Transistors, LED's, LCD's, SCR, UJT.

3. Study and operation of
   - Multimeters (Analog and Digital)
   - Function Generator
   - Regulated Power Supplies
   - CRO.

PART B: (For Laboratory examination – Minimum of 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.

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,10th 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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ELECTROMAGNETIC FIELDS

Pre-requisite: Mathematics and physics

Objectives: Objectives of this course are

- To introduce the concepts of electric field, magnetic field.
- Applications of electric and magnetic fields in the development of the theory for power transmission lines and electrical machines.

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UNIT – I Electrostatics

Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div (D)=ρv – Laplace's and Poison's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators

UNIT – II Dielectrics & Capacitance

Behavior of conductors in an electric field – Conductors and Insulators – Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions – Capacitance – Capacitance of parallel plots – spherical co-axial capacitors – with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

UNIT – III Magneto Statics

Static magnetic fields – Biot-Savart's law – Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0,

Ampere's Law & Applications

Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=Jc

UNIT – IV Force in Magnetic fields and Magnetic Potential

Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field Scalar Magnetic potential and its limitations – vector magnetic potential and its properties – vector magnetic potential due to simple configurations – vector Poisson's equations.

Self and Mutual inductance – Neumann's formulae – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field. Introduction to permanent magnets, their characteristics and applications.

UNIT – V Time Varying Fields

Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl (E)=-∂B/∂t – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current

OUTCOMES: After this course, the student gets a thorough knowledge of

- Electrostatics and magneto statics.
- Behavior of conductors, insulators, semiconductors, dielectrics and capacitors.
- Time-varying fields, interaction between electricity and magnetism, different laws, Maxwell's equations.
- Analysis and applications of the concepts to electrical and electronics problems.
- Analyzes and applies the concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. "Engineering Electromagnetics" by William H. Hayt & John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2009.
2. "Electromagnetic Fields" by Siddeku, Oxford Publications

REFERENCE BOOKS:

1. "Introduction to E-Magnetics" by CR Paul and S.A. Nasar, Mc-Graw Hill Publications
2. "Engineering Electro magnetics" by Nathan Ida, Springer(India) Pvt. Ltd. 2nd Edition
3. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition
4. "Electromagnetics" by Plonsy and Collin
5. "Static and Dynamic Electricity" Smyth.
6. "Electromagnetics" by J P Tewari.
7. "Electromagnetics" by J. D Kraus Mc Graw-Hill Inc. 4th edition 1992.

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ELECTRICAL CIRCUITS

Pre-requisite: None

Objectives: Objectives of this course are

- to introduce the basic concepts of circuit analysis, which is the foundation for all subjects of the Electrical Engineering.
- to introduce basic analysis of circuits which includes Single phase circuits, magnetic circuits, theorems, transient analysis and network topology.

UNIT – I

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

Network topology: Definitions – Graph – Tree, Basic cutset and Basic Tieset matrices for planar networks – Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources - Duality & Dual networks.

UNIT – II

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

UNIT – III

Transient Analysis: Transient response of R-L, R-C, R-L-C circuits (Series and Parallel combinations) for D.C. and sinusoidal excitations – Initial conditions – Classical method and Laplace transforms methods of solutions.

Transient response of the above circuits for different inputs such as step, ramp, pulse and impulse by using Laplace transforms method.

UNIT – IV

Network Parameters: Network functions driving point and transfer impedance *function networks-poles and zeros –necessary conditions for driving point function and for transfer function* Two port network parameters – Z, Y, ABCD and hybrid parameters and their relations– 2-port network parameters using transformed variables.

UNIT – V

Filters: Introduction to filters –low pass – high pass and band pass – RC, RL, filters- constant K and m derived filters and composite filter design

OUTCOMES: After this course, the student

- gets a thorough knowledge on basics of circuit concepts, electrical parameters, single phase and three phase circuits, magnetic circuits , resonance, locus diagrams, network topology and network theorems
- analyzes and applies the above concepts to real-world problems and applications.

TEXT BOOKS:

1. Engineering circuit analysis – by William Hayt and Jack E. Kemmerly, Mc Graw Hill Company, 6th edition.
2. Electric Circuits by A. Chakrabarthy, Dhanipat Rai & Sons.
3. Networks and systems by D.Roy Chowdary, New age international publishers

REFERENCE BOOKS

1. Network Analysis by Vanvalkenburg, PHI.
2. Network Theory: - N.C. Jagan & C.Lakshminarayana, B.S Publications.
3. Electric Circuit theory by K. Rajeswaran, Pearson Education,2004.
4. Circuits by Carlson, Thomson Publishers.
5. Network Theory by N.Sreenivasulu, HiTech Publications.
6. Network Analysis: - C.K. Mithal, Khanna Publishers.

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ELECTRICAL MACHINES – I

Pre-requisite: Electrical Circuits

Objectives: Objectives of this course are,

- To study and understand different types of DC generators, Motors and Transformers, their construction, operation and applications.
- To analyze performance aspects of various testing methods.

UNIT – I

D.C. Generators: Principle of operation – Action of commutator – constructional features – armature windings – lap and wave windings – simplex and multiplex windings – use of laminated armature – E. M.F Equation.

Armature reaction – Cross magnetizing and de-magnetizing AT/pole – compensating winding – commutation – reactance voltage – methods of improving commutation. Methods of Excitation – separately excited and self excited generators – build-up of E.M.F - critical field resistance and critical speed - causes for failure to self excite and remedial measures. Load characteristics of shunt, series and compound generators

UNIT – II

D.C Motors: Principle of operation – Back E.M.F. - Torque equation – characteristics and application of shunt, series and compound motors – Armature reaction and commutation. Speed control of D.C. Motors - Armature voltage and field flux control methods. Motor starters (3 point and 4 point starters) Testing of D.C. machines - Losses – Constant & Variable losses – calculation of efficiency – condition for maximum efficiency.

UNIT-III

Methods of Testing – direct, indirect and regenerative testing – Brake test – Swinburne's test – Hopkinson's test – Field's test - separation of stray losses in a d.c. motor test.

UNIT-IV

Single phase transformers: Types - constructional details - minimization of hysteresis and eddy current losses - EMF equation - operation on no load and on load - phasor diagrams

Equivalent circuit - losses and efficiency – regulation - All day efficiency - effect of variations of frequency & supply voltage on iron losses.

UNIT-V

OC and SC tests - Sumpner's test - predetermination of efficiency and regulation-separation of losses test-parallel operation with equal and unequal voltage ratios - auto transformers - equivalent circuit - comparison with two winding transformers.

Polyphase transformers - Polyphase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ

OUTCOMES: After this course, the student

- gets a thorough knowledge on electromechanical energy conversion
- understands construction, operation, characteristics, control techniques and testing of different types of machines
- applies the above concepts to real-world electrical and electronics problems and application.
- Know the difference of single phase and poly phase transformers.
- Know the application of various machines.

TEXT BOOKS

1. Electric Machines by I.J. Nagrath & D.P. Kothari, Tata Mc Graw – Hill Publishers, 3rd edition, 2004.
2. Electromechanics – I (D.C. Machines) S. Kamakshaiah, Hi-Tech Publishers.

REFERENCE BOOKS

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers.
2. Electric Machinary – A. E. Fritzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th edition
3. Electrical Machines – P.S. Bimbra., Khanna Publishers
4. Electromechanical Energy Conversion with Dynamics of Machines – by R. D. Begamudre, New Age International (P) Ltd., Publishers, 2nd edition, 1998.
5. Electric Machines – M. V. Deshpande, Wheeler Publishing, 1997.
6. Electrical Machines -S.K. Battacharya,

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ELECTRONIC DEVICES AND CIRCUITS

UNIT-I: SINGLE STAGE AMPLIFIERS:
Analysis of CE,CB,&CS Amplifiers Classification of Amplifiers Distortion in Amplifiers, Comparison of CE,CB,CC Amplifiers Low frequency Analysis, Low frequency response of BJT Amplifiers ,Low frequency response of FET Amplifiers Miller Effect Capacitance, High Frequency response of BJT amplifiers, Square Wave Testing.

UNIT –II FEEDBACK AMPLIFIERS:
Concept 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, Illustrative problems

OSCILLATORS
Conditions for oscillations, Frequency and Amplitude Stability of Oscillators, Generalized analysis of LC Oscillators, Quartz, Hartley, and Colpitt's Oscillators, RC –phase shift and Wein Bridge oscillators.

UNIT-III: LARGE SIGNAL AMPLIFIERS:
Class A Power Amplifier, Maximum Efficiency of Class –A Amplifier, Transformer Coupled Amplifier, Push Pull Amplifier complimentary Symmetry Class-B Power Amplifier, Phase Inverters, Transistor Power Dissipation, Thermal Runway, Heat Sinks

UNIT-IV: WAVE SHAPING:
High Pass, Low Pass RC Circuits, their response for Sinusoidal, Step, Pulse and Ramp Inputs.

CLIPPERS AND CLAMPERS
Diode Clippers, Transistor Clippers, Clipping at Two Independent Levels, Transfer Characteristics of Clippers, Comparators, Clamping Operation, Clamping Circuits using Diode with different inputs, Clamping Circuit Theorem, Practical Clamping Circuits.

UNIT V: SWITCHING CHARACTERISTICS OF DEVICES:
Diode as a Switch, Piecewise Linear Diode Characteristics, Transistor as a Switch, Breakdown Voltage Consideration of Transistor, Design of Transistor Switch, Transistor Switching Times.

MULTIVIBRATORS
Analysis and Design of Bistable, Monostable, Astable, Multivibrators and Schmitt Trigger using Transistors.

TEXT BOOKS:
1. Electronic Devices and circuit theory –Robert L Boyelstard,Louis Nashelsky 9 ed.,2007,PE
2. Electronic Devices and circuits-S.Salivahanan , N.Suresh Kumar,A.Vallava Raj 2.ed,2008,TMH .
3. Solid state Pulse Circuits –David A.Bell4 ed.,PHI

REFERENCES:
1. Introductory Electronic Devices and Circuits - Robert T.Paynter, 7 ed.,2009, PEI.
2. Electronic Devices and Circuits – Anil.K.Maini, Varsha Agarwal, 1 ed., John Wiley.
3. Pulse, Digital & Switching Waveforms – Jacob Milliman, Harbert Taub and Mothiki S Prakash Rao, 2 ed., 2008, TMH.

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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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ELECTRONIC CIRCUITS LAB

The following experiments are required to be conducted compulsory experiments:

1. CE amplifier.

2. CC amplifier (Emitter Follower).

3. FET amplifier (Common Source).

4. Weinbridge and RC Phase shift Oscillator.

5. Current series and Voltage series Feed back Amplifier.

6. Colpitt and Hartley Oscillator.

7. Double stage RC coupled amplifier.

8. Clipper and Clampers

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Transistor as a switch

10. Study of Logic gates & some applications

11. Monostable &A stable multivibrators.

12. Bistable multivibrator &Schmitt trigger**.**

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ELECTRICAL MACHINES LAB – I

The following experiments are required to be conducted compulsory experiments:

1. Magnetization characteristics of DC shunt generator. Determination of critical field resistance and critical speed.
2. Load test on DC shunt generator. Determination of characteristics.
3. Load test on DC series generator. Determination of characteristics.
4. Load test on DC compound generator. Determination of characteristics.
5. Hopkinson's test on DC shunt machines. Predetermination of efficiency.
6. Fields test on DC series machines. Determination of efficiency.
7. Swinburne's test and speed control of DC shunt motor. Predetermination of efficiencies.
8. Brake test on DC compound motor. Determination of performance curves.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted:

9. Brake test on DC shunt motor. Determination of performance curves.
10. Retardation test on DC shunt motor. Determination of losses at rated speed.
11. Separation of losses in DC shunt motor.

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BASIC SIMULATION LAB

The following experiments are required to be conducted compulsory 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, Sine.
3. Operations on Signals and Sequences such as Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power.
4. Finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
5. Convolution between Signals and sequences.
6. Auto Correlation and Cross Correlation between Signals and Sequences.
7. Verification of Linearity and Time Invariance Properties of a given Continuous/Discrete System.
8. Computation of Unit sample, Unit step and Sinusoidal responses of the given LTI system and verifying its physical realiziability and stability properties.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

9. Finding the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.
10. Waveform Synthesis using Laplace Transform.
11. Locating the Zeros and Poles and plotting the Pole-Zero maps in S-plane and Z-Plane for the given transfer function.

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SWITCHING THEORY AND LOGIC DESIGN

UNIT I NUMBER SYSTEMS & CODES:
Philosophy of number systems – complement representation of negative numbers-binary arithmetic – binary codes – error detecting and error correcting codes –hamming codes.
BOOLEAN ALGEBRA AND SWITCHING FUNCTIONS:
Fundamental postulates of Boolean Algebra-Basic theorems and properties - switching functions– Canonical and Standard forms—Algebraic simplification—digital logic gates, properties of XOR gates –universal gates-Multilevel NAND/NOR realizations.

UNIT II MINIMIZATION OF SWITCHING FUNCTIONS:
Map method, Prime implicants, Don't care combinations, Minimal SOP and POS forms, Tabular Method, Prime –Implicant chart, simplification rules
COMBINATIONAL LOGIC DESIGN:
Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters, Hazards and hazard free realizations.

UNIT III PROGRAMMABLE LOGIC DEVICES, THRESHOLD LOGIC:
Basic PLD's- ROM, PROM, PLA, PLD Realization of Switching functions using PLD's. Capabilities and limitations of Threshold gate, Synthesis of Threshold functions, Multigate Synthesis.

UNIT IV SEQUENTIAL CIRCUITS – I:
Classification of sequential circuits (Synchronous, Asynchronous, Pulse mode, Level mode with examples) Basic flip-flops-Triggering and excitation tables. Steps in synchronous sequential circuit design. Design of modulo-N Ring and Shift counters, Serial binary adder, sequence detector.
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.

UNIT V ALGOROTHIMIC STATE MACHINES:
Salient features of the ASM chart-Simple examples-System design using data path and control subsystems-control implementations-examples of Weighing machine and Binary multiplier.

TEXTBOOKS
1. Switching and Logic design – CVS Rao, Pearson, 2009.
2. Switching & Finite Automata theory – Zvi Kohavi, TMH,2nd Edition.
3. Fundamentals of Logic Design – Charles H. Roth, Thomson Publications, 5th Edition, 2004.

REFERENCES
1. Introduction to Switching Theory and Logic Design **-** F.J.Hill, G.R.Petrerson, John Wiley, 2nd edition.
2. Switching Theory and Logic Design – R.P.Jain, TMH Editon, 2003.
3. Digital Design - Morris Mano, PHI, 2nd edition.
4. An Engineering Approach To Digital Design – Fletcher, PHI.
5. Digital Logic – Application and Design – John M. Yarbrough, Thomson Publications, 1997.

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CONTROL SYSTEMS

Pre-requisite: Electric Circuits

Objectives: Objectives of course are

- to introduce the principles and applications of control systems in every day 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.

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.

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.

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 Engineering 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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POWER SYSTEMS-I

Pre-requisite: None

Objectives: Objectives of this course are

- To understand the hydro, thermal, nuclear and gas generating stations.
- To examine A.C. and D.C. distribution systems.
- To understand and compare air insulated and gas insulated substations.
- To illustrate the economic aspects of power generation and tariff methods.

UNIT- I

Thermal Power Stations: Line diagram of Thermal Power Station (TPS) showing paths of coal, steam, water, air, ash and flue gasses. - Brief description of TPS components: Economizers, Boilers, Super heaters, Turbines, Condensers, Chimney and cooling towers

Gas and Nuclear Power Stations: Nuclear Power Stations: Nuclear Fission and Chain reaction. - Nuclear fuels. - Principle of operation of Nuclear reactor.-Reactor Components: Moderators, Control rods, Reflectors and Coolants. - Radiation hazards: Shielding and Safety precautions. - Types of Nuclear reactors and brief description of PWR, BWR and FBR.

Gas Power Stations: Principle of Operation and Components (Block Diagram Approach Only)

UNIT - II

Hydroelectric Power Stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements, mass curve (explanation only) estimation of power developed from a given catchment area; heads and efficiencies.

Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design - draft tube-theory- functions and efficiency.

UNIT- III

D.C. Distribution Systems: Classification of Distribution Systems.- Comparison of DC vs. AC and Under-Ground vs. Over- Head Distribution Systems.- Requirements and Design features of Distribution Systems.-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

A.C. Distribution Systems: Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factors referred to receiving end voltage and with respect to respective load voltages.

UNIT- IV

Substations: Classification of substations

Air insulated substations - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment.

Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, main and transfer bus bar system with relevant diagrams.

Gas insulated substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

UNIT- V

Economic Aspects of Power Generation: Load curve, load duration and integrated load duration curves-load, demand, diversity, capacity, utilization and plant use factors- Numerical Problems.

Tariff Methods: Costs of Generation and their division into Fixed, Semi-fixed and Running Costs. Desirable Characteristics of a Tariff Method.-Tariff Methods: Flat Rate, Block-Rate, two-part, three – part, and power factor tariff methods and Numerical Problems

OUTCOMES:

- Able to demonstrate the operation of hydro, thermal, nuclear and gas generating stations.
- Understand A.C. and D.C. distribution systems.
- Able to distinguish between air and gas insulated substations.
- Compare different tariff methods and economic aspects of power generation.

TEXT BOOKS

1. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
2. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 1999.

REFERENCE BOOKS

1. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND & COMPANY LTD., New Delhi 2004.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Hand book of Switchgear (BHEL) Tata Mc-Graw Hill Publication 2009.
4. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.

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ELECTRICAL MACHINES – II

Pre-requisite: Electrical Machines-I

Objectives: Objectives of this course are
- to deal with the detailed analysis of polyphase induction motors & Synchronous generators and motors
- to understand operation, construction and types of single phase motors and their applications in house hold appliances and control systems.
- To introduce the concept of parallel operation of synchronous generators.
- To introduce the concept of regulation and its calculations.

UNIT- I

Polyphase Induction Motors: Construction details of cage and wound rotor machines-production of a rotating magnetic field - principle of operation - rotor EMF and rotor frequency - rotor reactance, rotor current and PF at standstill and during operation.

UNIT- II

Characteristics of Induction Motors: Rotor power input, rotor copper loss and mechanical power developed and their inter relation-torque equation-deduction from torque equation - expressions for maximum torque and starting torque - torque slip characteristic - equivalent circuit - phasor diagram - crawling and cogging -.No-load Test and Blocked rotor test – Predetermination of performance - Methods of starting and starting current and Torque calculations.

Speed Control Methods: Change of voltage, change of frequency, voltage/frequency, injection of an EMF into rotor circuit (qualitative treatment only) - induction generator-principle of operation.

UNIT- III

Construction, Principle of operation, Characteristics & Regulation of Synchronous Generator: Constructional Features of round rotor and salient pole machines – Armature windings – Integral slot and fractional slot windings; Distributed and concentrated windings – distribution, pitch and winding factors – E.M.F Equation.

Harmonics in generated e.m.f. – suppression of harmonics – armature reaction - leakage reactance – synchronous reactance and impedance – experimental determination - phasor diagram – load characteristics. Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods – salient pole alternators – two reaction analysis – experimental determination of X_d and X_q (Slip test) Phasor diagrams – Regulation of salient pole alternators.

UNIT - IV

Parallel Operation of Synchronous Generator: Synchronizing alternators with infinite bus bars – synchronizing power torque – parallel operation and load sharing - Effect of change of excitation and mechanical power input. Analysis of short circuit current wave form – determination of sub-transient, transient and steady state reactances.

Synchronous Motors – Principle of Operation: Theory of operation – phasor diagram – Variation of current and power factor with excitation – synchronous condenser – Mathematical analysis for power developed .- hunting and its suppression – Methods of starting – synchronous induction motor.

UNIT - V

Single Phase Motors & Special Motors:: Single phase induction motor – Constructional features-Double revolving field theory – split-phase motors – shaded pole motor.

OUTCOMES: After this course, the student
- gets a thorough knowledge on construction, operation, characteristics and testing of different types of Transformers.
- to understand construction, operation, characteristics, testing and speed control methods of poly-phase induction motors.

- Gets through knowledge an harmonics in generated e.m.f.
- Methods for suppression harmonics.
- applies the above concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. Electric Machines –by I.J.Nagrath & D.P.Kothari,Tata Mc Graw Hill, 7th Edition.2009
2. Performance and Design of AC Machines-M.G.Say.BPB Publishers

REFERENCE BOOKS

1. Electro mechanics-II (transformers and induction motors) S. Kamakashaiah Hitech publishers.
2. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, Mc Graw Hill Companies, 5th edition
3. Electrical machines-PS Bhimbra, Khanna Publishers.
4. Theory of Alternating Current Machinery- by Langsdorf, Tata McGraw-Hill Companies, 2nd edition.
5. Electrical Machines – M.V Deshpande, Wheeler Publishing
6. Electrical Machines – J.B. Gupta, S.K. Khataria & Son's Publications

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ELECTRICAL AND ELECTRONIC MEASUREMENTS

Pre-requisite: Basic Electrical and Electronics Engineering.

OBJECTIVES: Objectives of this course are

- to introduce the basic principles of all measuring instruments
- to deal with the measurement of voltage, current Power factor, power, energy and magnetic measurements.

UNIT- I

INTRODUCTION TO MEASURING INSTRUMENTS: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters - electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

UNIT– II

POTENTIOMETERS & INSTRUMENT TRANSFORMERS: Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

UNIT –III

MEASUREMENT OF POWER & ENERGY: Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

UNIT – IV

DC & AC BRIDGES: Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance - Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle – Desauty's Bridge - Wien's bridge – Schering Bridge.

UNIT-V

TRANSDUCERS: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

MEASUREMENT OF NON-ELECTRICAL QUANTITIES: Measurement of strain, Gauge sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

OUTCOMES: After this course, the student

- gets a thorough knowledge on, different types of measuring instruments their construction operation and characteristics
- measurements of electrical quantities through potentiometers, instrument transformers, watt meters, energy meters, DC bridges and AC bridges
- To understand the operation of different types of transducers.

- To understand the measurement of non-electrical quantities like velocity, acceleration, temperature etc.
- Applies the above concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. Electrical and Electronic Measurements and Instrumentation, R. K. Rajput, S. Chand & Company Ltd.
2. Electrical Measuring Instruments and Measurements, S. C. Bhargava, BS Publications.

REFERENCE BOOKS

1. Electrical & Electronic Measurement & Instruments, A.K.Sawhney Dhanpat Rai & Co. Publications.
2. Electrical and Electronic Measurements, G. K. Banerjee, PHI Learning Pvt. Ltd.
3. Electrical Measurements and Measuring Instruments, Golding and Widdis, Reem Publications.
4. Electrical Measurements, Buckingham and Price, Prentice – Hall
5. Electrical Measurements: Fundamentals, Concepts, Applications, Reissland, M.U, New Age International (P) Limited, Publishers.
6. Electrical Measurements and measuring Instruments, E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.

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ELECTRICAL CIRCUITS LAB

The following experiments are required to be conducted as compulsory experiments

1. Time response of first order RC / RL network for periodic non – sinusoidal inputs – Time constant and Steady state error determination.
2. Two port network parameters – Z – Y parameters, Analytical verification.
3. Two port network parameters – A, B, C, D parameters, Analytical verification
4. Current locus diagram with RL with R – varying.
5. Separation of Self and Mutual inductance in a Coupled Circuit. Determination of Co-efficient of Coupling.
6. Verification of Compensation and Millman's theorem.
7. Relation between voltage and current in star and delta networks.
8. Generation of non-linear periodic waveform for square wave using clipping and Clamping. Control of average value of the output waveform

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

9. Current locus diagram with RL with L – varying
10. Harmonic Analysis of non-sinusoidal waveform signals using Harmonic Analyzer and plotting frequency spectrum.
11. Determination of form factor for non-sinusoidal waveform

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ELECTRICAL MACHINES LAB – II

The following experiments are required to be conducted as compulsory experiments

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on a pair of single phase transformers
3. Scott connection of transformers
4. No-load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods
6. V and Inverted V curves of a three—phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Determination of Xd and Xq of a salient pole synchronous machine

In addition to the above eight experiments, at least any two of the following experiments are required to be conducted from the following list

1. Parallel operation of Single phase Transformers
2. Separation of core losses of a single phase transformer
3. Brake test on three phase Induction Motor
4. Regulation of three-phase alternator by Z.P.F. and A.S.A methods
5. Efficiency of a three-phase alternator
6. Heat run test on a bank of 3 Nos. of single phase Delta connected transformers
7. Measurement of sequence impedance of a three-phase alternator.
8. Performance characteristics of a Schrage motor

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SIMULATION OF ELECTRICAL CIRCUITS LAB

PART-A: ELECTRICAL CIRCUITS

1. Verification of Thevenin's and Norton's theorems.
2. Verification of Superposition and Maximum Power Transfer Theorems.
3. Verification of RMS value of complex wave.
4. Verification of Compensation Theorem.
5. Verification of Reciprocity, Millmann's Theorems.
6. Locus Diagrams of RL and RC Series Circuits.
7. Series and Parallel Resonance.
8. Determination of Self, Mutual Inductances and Coefficient of coupling.
9. Determination of Z and Y Parameters.
10. Determination of Transmission line and hybrid parameters.
11. Measurement of Active Power for Star and Delta connected balanced loads.
12. Measurement of Reactive Power for Star and Delta connected balanced loads.
13. Measurement of 3-phase Power by two- Wattmeter Method for unbalanced loads.

PART-B: SIMULATION EXPERIMENTS

1. Simulation of DC Circuits
2. DC Transient response
3. Mesh Analysis
4. Nodal Analysis

NOTE:

- Eight experiments are to be conducted from PART-A and any two experiments from PART-B

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HUMAN VALUES AND PROFESSIONAL ETHICS

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 sensitise the students so that they can protect themselves and the organization from the possible professional crime malpractices

Learning 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 I 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 Digitl 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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MICROPROCESSORS AND MICROCONTROLLERS

Pre-requisite: Computer programming and Data Structures

Objective: Objectives of this course are

- To familiarize with the architecture of 8086 processor, assembling language programming and interfacing with various modules.
- To understand 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.

UNIT- I

8086 ARCHITECTURE: Functional Diagram, Register Organization, Addressing modes, Instructions, Functional schematic, Minimum and Maximum mode operations of 8086, 8086 Control signal interfacing, Timing Diagrams.

ASSEMBLY LANGUAGE PROGRAMMMING OF 8086: Assembly Directives, Macro's, Simple Programs using Assembler, Implementation of FOR Loop, WHILE, REPEAT and IF-THEN-ELSE Features.

UNIT-II

I/O INTERFACE: 8255 PPI, Various modes of operations and interface of I/O devices to 8086, A/D, D/A Converter Interfacing.

INTERFACING WITH ADVANCED DEVICES: 8086 System bus structure, Memory and I/O Interfacing with 8086, Interfacing through various IC Peripheral Chips, 8257 (DMA Controller), 8259 (Interrupt Priority Control).

UNIT-III

COMMUNICATION INTERFACE: Serial Communication Standards, USART Interfacing RS-232, IEEE-488, 20mA Current Loop, Prototyping and Trouble shooting, Software Debugging tools, MDS.

UNIT-IV

INTRODUCTION TO MICRO CONTROLLERS: Overview of 8051 Micro Controller, Architecture, I/O ports and Memory Organization, Addressing modes and Instruction set of 8051, Simple Programs using Stack Pointer, Assembly language programming of 8051

INTERRUPTS COMMUNICATION: Interrupts - Timer/Counter and Serial Communication, Programming Timer Interrupts, Programming External H/W interrupts, Programming the serial communication interrupts, Interrupt Priority in the 8051, Programming 8051 Timers, Counters and **Programming.**

UNIT- V

INTERFACING AND INDUSTRIAL APPLICATIONS: Applications of Micro Controllers, Interfacing 8051 to LED's, Push button, Relay's and Latch Connections, Keyboard Interfacing, Interfacing Seven Segment Display, ADC and DAC Interfacing.

OUTCOMES: After this course, the student

- gets a thorough knowledge on, architecture, pin diagram, register and memory organizations, concept of memory segmentation, minimum and maximum mode of operations
- will be able to draw timing diagrams,
- will be able write programs, peripheral and communication interfacing of 8086 microprocessor and 8051 microcontroller
- Applies the above concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. Kenneth J Ayala, “The 8051 Micro Controller Architecture, Programming and Applications”, Thomson Publishers, 2nd Edition.
2. D.V.Hall, “Micro Processor and Interfacing “, Tata McGraw-Hill.

REFERENCE BOOKS

1. Ajay V. Deshmukh, “Microcontrollers – theory applications”, Tata McGraw Hill Companies – 2005.
2. Ray and BulChandi, “Advanced Micro Processors”, Tata McGraw Hill.
3. Kenneth J Ayala, “The 8086 Micro Processors Architecture, Programming and Applications”, Thomson Publishers, 2005.
4. Liu & Gibson, Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design, 2nd edition

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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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POWER SYSTEMS-II

Pre-requisites: Power Systems –I and Electromagnetic field theory

Objectives:

- To compute inductance and capacitance of different transmission lines.
- To understand performance of short, medium and long transmission lines.
- To examine the traveling wave performance and sag of transmission lines.
- To design insulators for over head lines and understand cables for power transmission.

UNIT- I

TRANSMISSION LINE PARAMETERS: Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, Numerical Problems.

UNIT- II

PERFORMANCE OF SHORT AND MEDIUM LENGTH TRANSMISSION LINES: Classification of Transmission Lines - Short, medium and long line and their model representations - Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical & Asymmetrical Networks, Numerical Problems.

Mathematical Solutions to estimate regulation and efficiency of all types of lines - Numerical Problems.

PERFORMANCE OF LONG TRANSMISSION LINES: Long Transmission Line - Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves - Representation of Long Lines - Equivalent-T and Equivalent Pie network models (numerical problems).

UNIT – III

POWER SYSTEM TRANSIENTS: Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems), Bewley's Lattice Diagrams (for all the cases mentioned with numerical examples).

VARIOUS FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINE: Skin and Proximity effects - Description and effect on Resistance of Solid Conductors - Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line.

Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.

UNIT- IV

OVERHEAD LINE INSULATORS: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems - voltage distribution, calculation of string efficiency, Capacitance grading and Static Shielding.

SAG AND TENSION CALCULATIONS: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor, Numerical Problems - Stringing chart and sag template and its applications.

UNIT-V

UNDERGROUND CABLES: Types of Cables, Construction, Types of Insulating materials, Calculation of Insulation resistance and stress in insulation, Numerical Problems. Capacitance of

Single and 3-Core belted cables, Numerical Problems. Grading of Cables - Capacitance grading - Numerical Problems, Description of Inter-sheath grading - HV cables.

OUTCOMES:

- Able to compute inductance and capacitance for different configurations of transmission lines.
- Able to analyze the performance of transmission lines
- Can understand transients phenomenon of transmission lines.
- Able to calculate sag and tension calculations.
- Will be able to understand overhead line insulators and underground cables.

TEXT BOOKS

1. M.L. Soni, P.V. Gupta, U.S. Bhatnagar, A. Chakrabarthy, Power System Engineering, Dhanpat Rai & Co Pvt. Ltd.
2. C.L. Wadhwa, Electrical power systems - New Age International (P) Limited, Publishers, 1998.

REFERENCE BOOKS

1. I.J. Nagarath & D.P Kothari , Power System Engineering, TMH 2/e, 2010
2. B.R. Gupta, Power System Analysis and Design, Wheeler Publishing.
3. Abhijit Chakrpabarti, Sunitha Halder, Power System Analysis, Operation and control, PHI, 3/e, 2010
4. Turan Gonen, Electrical Power Transmission system engineering Analysis and design, CRC Press (Taylor & Francis Group) Special Indian Edition,2/e.

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CONTROL SYSTEMS LAB

Any Eight of the following experiments are to be conducted

1. Time response of Second order system
2. Characteristics of Synchro's
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC motor
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Lag and lead compensation – Magnitude and phase plot
8. Transfer function of DC generator
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor

Any two simulation experiments are to be conducted using software tools

1. simulation of Op-Amp based Integrator and Differentiator circuits.
2. Linear system analysis (Time domain analysis, Error analysis).
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system.
4. State space model for classical transfer function– Verification.

REFERENCE BOOKS

1. Manuals of related software.

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ELECTRICAL AND ELECTRONIC MEASUREMENTS LAB

The following experiments are required to be conducted as compulsory experiments

1. Calibration and Testing of single phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering bridge & Anderson bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of parameters of a choke coil using 3 - voltmeter and 3 - ammeter methods.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted

9. Calibration LPF wattmeter – by Phantom testing.
10. Measurement of 3-phase power with single watt meter and two CTs.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
12. PT testing by comparison **– V.G.** as Null detector – Measurement of % ratio error and phase angle of the given PT
13. Resistance strain gauge – strain measurements and Calibration.
14. Transformer turns ratio measurement using AC bridges.
15. Measurement of % ratio error and phase angle of given CT by comparison.

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MICROPROCESSORS LAB

The following programs are to be written for assembler and execute the same with 8086 kits

1. Programs for 16 bit arithmetic operations for 8086 (using various addressing modes)
2. Program for sorting an array for 8086.
3. Program for searching for a number or character in a string for 8086.
4. Program for string manipulations for 8086.
5. Interfacing traffic light controller using 8086.
6. Interfacing ADC and DAC to 8086.
7. Parallel communication between two microprocessor kits using 8255.
8. Serial communication between two microprocessor kits using 8251.
9. Interfacing to 8086 and programming to control stepper motor.
10. Programming using logical and bit manipulation Instructions of 8086.
11. Program and verify timer/counter in 8086.

12 Program and verify interrupt handling in 8086.

13. UART operation in 8086.
14. Communication between 8086 kit and PC.
15. Interfacing LCD to 8086.
16. Interfacing Matrix/keyboard to 8086.
17. Data Transfer from peripheral to memory through DMA controller 8237/8257.

Note: Minimum of 12 experiments to be conducted.

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PE-I.1 COMPUTER METHODS IN POWER SYSTEMS

Pre-requisites: Power Systems-I, Power Systems –II, Electrical Circuits and Mathematics

Objectives: Objectives this course, are

- to understand and develop Y_{bus} and Z_{bus} matrices
- to know the importance of load flow studies and its importance
- to understand and applications of short circuit studies
- to explain rotor angle stability of power systems

UNIT-I: POWER SYSTEM NETWORK MATRICES

Graph Theory: Definitions and Relevant concepts in Graph Theory, Network Matrices. Transmission Network Representations: Bus Admittance frame and Bus Impedance frame. Formation of Y_{bus}: Direct and Singular Transformation Methods, Numerical Problems. Formation of Z_{Bus}: Modification of existing Z_{Bus} Matrix for addition of a new branch, & complete Z_{Bus} building algorithm Numerical Problems.

UNIT–II: POWER FLOW STUDIES-I

Introduction: Necessity of Power Flow Studies, Bus classification and Notations, Convergence & Bus mismatch criterias. Load Flow Methods: Gauss-Seidal Method in complex form without & with voltage control buses, line flows and loss calculations, Newton Raphson method in Polar and Rectangular form, derivation of Jacobian elements, Numerical Problems for one or two iterations.

UNIT–III: POWER FLOW STUDIES-II

Introduction to sensitivity & decoupled submatrices of J-matrix, Decoupled load flow method and its assumptions, Fast Decoupled load method and its assumptions, Comparison of Different Methods – DC load Flow method, Numerical problems for one or two iterations.

UNIT–IV: SHORT CIRCUIT ANALYSIS

Per-Unit Systems. Per-Unit equivalent reactance network of a three phase Power System, Numerical Problems. Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems. Symmetrical Components, sequence impedances and networks, Numerical Problems. Unsymmetrical Fault Analysis: Fault current calculations for LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT–V: POWER SYSTEM STABILITY ANALYSIS

Introduction to Power System Stability issues. Rotor dynamics & Swing equation, Power angle equation with & without neglecting line resistance, Steady State Stability, Determination of Transient Stability through Equal Area Criterion for single machine infinite system, Critical clearing angle & time, Numerical problems. Multi-machine transient analysis: Classical representation of system and its assumptions, Solution of Swing Equation by Point-by-Point Method, Methods to improve Stability.

OUTCOMES:

After this course, the student will be able to

- develop the Y_{bus} and Z_{bus} matrices
- develop load flow programs
- understand the importance of short circuit studies
- understand stability and instability power systems

TEXT BOOKS

1. Abhijit Chakrabarthi , Sunita Haldar, Power System Analysis Operation and Control, 3 ed , PHI,2010.
2. I.J.Nagrath & D.P.Kothari: Modern Power system Analysis – Tata McGraw-Hill Publishing company, 2nd edition.

REFERENCE BOOKS

1. M.A.Pai,Computer Techniques in Power System Analysis, TMH Publications
2. Grainger and Stevenson, Power System Analysis, Tata McGraw Hill.
3. K.Uma rao, Computer Techniques and Models in Power Systems, I.K. International.
4. Hadi Saadat, Power System Analysis, TMH Edition.

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PE-I.2- COMPUTER ORGANIZATION

Pre-requisite: None

Objectives: Objectives of this course are
- to deal with the basic principles of organization, operation and performance of modern-day computer systems.
- To cover all aspects of computer technology, from the underlying integrated circuit technology used to construct computer components, and to the use of parallel organization concepts in combining those components.

UNIT-1:
BASIC STRUCTURE OF COMPUTERS:
Computer Types, Functional unit, Basic concepts, Bus structures, Software, Performance, Multiprocessors and Multi computers. Decimal Arithmetic unit, Decimal Arithmetic operations, Data Representation, Fixed Point Representation, Floating Point Representation, Error Detection codes.

UNIT-II:
REGISTER TRANSFER LANGUAGE AND MICROOPERATIONS:
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.

UNIT–III:
MEMORY – REFERENCE INSTRUCTIONS.
Input Output and Interrupt. STACK organization. Instruction formats. Addressing modes, DATA Transfer and manipulation, Program control, Reduced Instruction set computer.
MICRO PROGRAMMED CONTROL: Control memory, Address sequencing, micro program example, design of control unit Hard wired control, Micro programmed control

UNIT-IV:
THE MEMORY SYSTEM:
Basic concepts semiconductor RAM memories, Read-only memories, Cache memories performance considerations, Virtual memories secondary storage, Introduction to RAID.
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 component, inter connect (PCI) bus introduction to Standard serial communication protocols like RS232, USB, IEEE 1394.

UNIT-V:
PIPELINE AND VECTOR PROCESSING:
Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline Vector Processing, Array Processors.
MULTI PROCESSORS: Characteristics oF Multiprocessors, Interconnection Structures, Interprocessor Arbitration. Inter Processor Communication and Synchronization Cache Coherence.Shared Memory Multiprocessors.

OUTCOMES: After this course, the student
- Evaluates necessary mathematical representations for computer operation
- Understands the arithmetic and logical operations at register level
- Evaluates memory operations, differentiate various storage devices
- Understands input and output devices of the organization
- Understands the interfacing need for multiprocessor systems and their architecture.

TEXT BOOKS:

1. M.Moris Mano, Computer Systems Architecture –IIIrd Edition, PHI/Pearson.
2. V.Rajaraman and T.Radhakrishnan, Computer Organization and Architecture, PHI Publications.

REFERENCES:

1. William Stallings, Computer Organization and Architecture –Sixth Edition, PHI/Pearson.
2. Andrew S. Tanenbaum, Structured Computer Organization –4th Edition PHI/Pearson.
3. Sivaraama Dandamudi Fundamentals or Computer Organization and Design, - Springer Int. Edition.
4. Car Hamacher, Zvonks Vranesic, SafeaZaky, Computer Organization–Vth Edition, McGraw Hill.

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PE- I.3 SPECIAL MACHINES

Pre-requisites: Electrical Machines-I and Electrical Machines-II

Objectives: Objectives of this course are

- To impart knowledge on construction, principle of operation, control and performance of stepper motors
- To impart knowledge on construction, principle of operation, control and performance of switched reluctance motors
- To impart knowledge on construction, principle of operation, control and performance of Brushless DC motors
- To impart knowledge on construction, principle of operation, control and performance of linear induction motor.

UNIT-1

SPECIAL TYPES OF D.C MACHINES-I

Series booster-Shunt booster-Non-reversible boost-Reversible booster

SPECIAL TYPES OF DC MACHINES –II

Armature excited machines—Rosenberg generator- The Amplidyne and metadyne— Rototrol and Regulex-third brush generator-three-wire generator-dynamometer.

UNIT -II

STEPPER MOTORS

Introduction-synchronous inductor (or hybrid stepper motor), Hybrid stepping motor, construction, principles of operation, Energisation with two phase at a time- essential conditions for the satisfactory operation of a 2-phase hybrid step motor- very slow- speed synchronous motor for servo control-different configurations for switching the phase windings-control circuits for stepping motors-an open-loop controller for a 2-phase stepping motor.

UNIT-III

VARIABLE RELUCTANCE STEPPING MOTORS

Variable reluctance (VR) Stepper motors, single-stack VR step motors, Multiple stack VR motors-Open-loop control of 3-phase VR step motor-closed-Loop control of step motor, discriminator (or rotor position sensor) transilator, major loop-characteristics of step motor in open-loop drive – comparison between open-loop position control with step motor and a position control servo using a conventional (dc or ac) servo motor- Suitability and areas of application of stepper motors-5- phase hybrid stepping motor-single phase-stepper motor, the construction, operating principle torque developed in the motor.

SWITCHED RELUCTANCE MOTOR

Introduction – improvements in the design of conventional reluctance motors- Some distinctive differences between SR and conventional reluctance motors-principle of operation of SRM- Some design aspects of stator and rotor pole arcs, design of stator and rotor and pole arcs in SR motor-determination of $L(\theta)$--- θ profile –power converter for SR motor-A numerical example –Rotor sensing mechanism and logic control, drive and power circuits, position sensing of rotor with Hall problems—derivation of torque expression, general linear case.

UNIT –IV

PERMANENT MAGNET MATERIALS AND MOTORS

Introduction, Hysteresis loops and recoil line- stator **frames (pole and yoke - part)** of conventional PM dc Motors, Equivalent circuit of a PM-Development of Electronically commutated dc motor from conventional dc motor.

BRUSHLESS DC MOTOR

Types of construction – principle of operation of BLDM- sensing and switching logic scheme, sensing logic controller, lockout pulses –drive and power circuits, Base drive circuits, power converter circuit-

Theoretical analysis and performance prediction, modeling and magnet circuit d-q analysis of BLDM - transient analysis formulation in terms of flux linkages as state variables-Approximate solution for current and torque under steady state –Theory of BLDM as variable speed synchronous motor (assuming sinusoidal flux distribution)- Methods or reducing Torque Pulsations, 180 degrees pole arc and 120 degree current sheet.

UNIT-V

LINEAR INDUCTION MOTOR

Development of a double sided LIM from rotary type IM- A schematic of LIM drive for electric traction development of one sided LIM with back iron-field analysis of a DSLIM fundamental assumptions.

OUTCOMES: After the course, the student

- Acquires knowledge on constructional features of Rosenberg generator, amplidyne, metadyne, etc.,
- Obtains knowledge on stepper motors and variable reluctance motors
- Will be exposed to magnetic materials and BLDC motors and linear induction motor.

TEXT BOOKS

1. K.Venkataratnam, Special electrical machines, university press.
2. R.K. Rajput - Electrical machines - 5th edition.
3. V.V. Athani - Stepper motor: Fundamentals, Applications and Design, New age International publishers.

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PE-II.1 DIGITAL CONTROL SYSTEMS

Pre-requisites: Mathematics, Control Systems

OBJECTIVES: Objectives of this course are
- to understand the fundamentals of digital control systems, z-transforms
- to understand state space representation of the control systems, concepts of controllability and observability
- to study the estimation of stability in different domains
- to understand the design of discrete time control systems, compensators, state feedback controllers, state observers through various transformations

UNIT - I
INTRODUCTION TO DIGITAL CONTROL SYSTEMS AND Z-TRANSFORMS: Introduction - Merits and Demerits of Digital Control Systems - Practical aspects of the choice of sampling rate and Multirate sampling - Basic discrete time signals - Quantization – Sampling Theorem - Data Conversions and Quantization - Sampling process - Mathematical Modeling - Data Reconstruction and Filtering of sampled signals - Zero - Order Hold (ZOH). z- Transform and Inverse z-Transform, Relationship between s - plane and z - plane - Difference equation - Solution by recursion and z-Transform - Pulse Transfer Functions of the ZOH and relationship between G(s) and G(z) - Bilinear Transformation .

UNIT- II
INPUT/OUTPUT ANALYSIS OF DIGITAL CONTROL SYSTEMS: Pulse transfer function - z transform analysis of open loop, closed loop systems - Modified z Transform - transfer function - Stability of linear digital control systems - Stability tests – Jury Stability test.
Root loci - Frequency domain analysis - Bode plots - Gain margin and phase margin.

UNIT – III
DESIGN OF CONTROLLERS FOR I/O MODEL DIGITAL CONTROL SYSTEMS: Cascade and Feedback Compensation by continuous data controllers - Digital controllers - Design using Bilinear Transformation - Realization of Digital PID controllers, Design of Digital Control Systems based on Root Locus Technique.

UNIT – IV
STATE SPACE ANALYSIS AND STATE FEEDBACK CONTROL DESIGN OF DIGITAL CONTROL SYSTEMS: State Equations of discrete data systems, solution of discrete state equations, State Transition Matrix: Computation methods for State Transition Matrix: z - transform method - Relation between State Equations and Pulse Transfer Functions.
Concepts on Controllability and Observability - Pole placement design by state feed back.

UNIT V
DIGITAL STATE OBSERVER AND STABILITY ANALYSIS
Design of the full order and reduced order state observer, Design of Dead beat Controller - some case studies - Stability analysis of discrete time systems based on Lyapunov approach.

OUTCOMES: After this course, the student
- will be able to map S-plane and Z-plane, do state-space analysis
- will be able to do stability analysis in S-domain and Z-domains
- will be able to do stability analysis through bilinear transformation and R-H criteria,
- to design of discrete-time control systems, design of lag, lead, lead-lag compensators, design of PID controllers and design of state feedback controllers and observers,
- applies the above concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. K. Ogata, Discrete Time Control Systems, PHI/Addison - Wesley Longman Pte. Ltd., India, Delhi, 1995.
2. B.C Kuo, Digital Control Systems, 2nd Edition, Oxford University Press, Inc., 1992.

REFERENCE BOOKS

1. F. Franklin, J.D. Powell, and M.L. Workman, Digital control of Dynamic Systems, Addison - Wesley Longman, Inc., Menlo Park, CA , 1998.
2. M. Gopal, Digital Control and State Variable Methods, Tata McGraw Hill, India, 1997.
3. C. H. Houpis and G.B. Lamont, Digital Control Systems, McGraw Hill, 1985.
4. John S. Baey, Fundamentals of Linear State Space Systems, McGraw Hill, 1st edition.
5. Bernard Fried Land, Control System Design, McGraw Hill, 1st edition.
6. Dorsay, Continuous and Discrete Control Systems, McGraw Hill.

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PE- II.2 OPTIMIZATION TECHNIQUES

Pre-requisites: Electrical Circuits, Electronic Devices and Circuits

OBJECTIVES: Objectives of this course are

- to introduce various optimization techniques i.e classical, linear programming, transportation problem, simplex algorithm, dynamic programming
- constrained and unconstrained optimization techniques for solving and optimizing an electrical and electronic engineering circuits design problems in real world situations.
- to explain the concept of Dynamic programming and its applications to project implementation.

UNIT – I

INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES: Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

Classical Optimization Techniques: Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.

Solution by method of Lagrange multipliers – Multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – II

LINEAR PROGRAMMING: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

Transportation Problem: Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – III

UNCONSTRAINED NONLINEAR PROGRAMMING: One dimensional minimization methods, Classification, Fibonacci method and Quadratic interpolation method

Unconstrained Optimization Techniques: Univariant method, Powell's method and steepest descent method.

UNIT – IV

CONSTRAINED NONLINEAR PROGRAMMING: Characteristics of a constrained problem - classification - Basic approach of Penalty Function method - Basic approach of Penalty Function method - Basic approaches of Interior and Exterior penalty function methods - Introduction to convex programming problem.

UNIT – V

DYNAMIC PROGRAMMING: Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

OUTCOMES: After this course, the student will be able to

- explain the need of optimization of engineering systems
- understand optimization of electrical and electronics engineering problems
- apply classical optimization techniques, linear programming, simplex algorithm, transportation problem
- apply unconstrained optimization and constrained non-linear programming and dynamic programming
- formulate optimization problems.

TEXT BOOKS

1. Singiresu S. Rao, Engineering Optimization: Theory and Practice by John Wiley and Sons, 4th edition, 2009.
2. H.S. Kasene & K.D.Kumar, Introductory Operations Research, Springer (India), Pvt. Ltd.

REFERENCE BOOKS

1. George Bernard Dantzig, Mukund Narain Thapa, "Linear programming", Springer series in operations research 3rd edition, 2003.
2. H.A. Taha, "Operations Research: An Introduction", 8th Edition, Pearson/Prentice Hall, 2007.
3 Kalyanmoy Deb, "Optimization for Engineering Design – Algorithms and Examples", PHI Learning Pvt. Ltd, New Delhi, 2005.

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PE-II.3 -VLSI DESIGN

UNIT- I: INTRODUCTION

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & Bj-CMOS technologies- Oxidation, Lithography, Diffusion, Ion implantation, Metallization, Encapsulation, Probe testing, Integrated Resistors and Capacitors.

BASIC ELECTRICAL PROPERTIES: Basic Electrical Properties of MOS and BiCMOS Circuits: Ids-Vds relationships, MOS transistor threshold Voltage, gm, gds, figure of merit w_o; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters, CMOS Nanotechnology

UNIT - II: VLSI CIRCUIT DESIGN PROCESSES

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

UNIT - III: GATE LEVEL DESIGN

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Basic circuit concepts, Sheet Resistance RS and its concept to MOS, Area Capacitance Units, Calculations - Delays, Driving large Capacitive Loads, Wiring Capacitances, Fan-in and fan-out, Choice of layers.

SUBSYSTEM DESIGN: Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters, High Density Memory Elements.

UNIT - IV: SEMICONDUCTOR INTEGRATED CIRCUIT DESIGN

PLAs, FPGAs, CPLDs, Standard Cells, Programmable Array Logic, Design Approach.

VHDL SYNTHESIS : VHDL Synthesis, Circuit Design Flow, Circuit Synthesis, Simulation, Layout, Design capture tools, Design Verification Tools, Test Principles.

UNIT - V: CMOS TESTING

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

TEXTBOOKS:

1. Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, Essentials of VLSI circuits and systems, PHI, 2005.
2. Weste and Eshraghian , Principles of CMOS VLSI Design, Pearson Education, 1999.

REFERENCES:

1. John P. Uyemura, Chip Design for Submicron VLSI: CMOS Layout & Simulation, Thomson Learning.
2. John .P. Uyemura , Introduction to VLSI Circuits and Systems JohnWiley, 2003.
3. John M. Rabaey, Digital Integrated Circuits - PHI, EEE, 1997.
4. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Edition, 1997.
5. S.M. SZE,VLSI Technology ,2nd Edition, TMH, 2003.

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POWER ELECTRONICS

Pre-requisite: Electronic Devices and Circuits

Objective: Objectives of this course are

- to introduce the basic concepts of power semiconductor devices, types, operation and characteristics
- to understand the operation of converters and choppers and their analysis
- to understand the operation of AC voltage controllers and inverters

UNIT – I

POWER SEMI CONDUCTOR DEVICES AND COMMUTATION CIRCUITS: Thyristors - Silicon Controlled Rectifiers (SCR's) - BJT - Power MOSFET - Power IGBT and their characteristics and other thyristors - Basic theory of operation of SCR - Static characteristics – Turn-on and Turn-off methods- Dynamic characteristics of SCR - Turn on and Turn off times - Salient points.
Two transistor analogy of SCR - R,RC,UJT firing circuits - Series and parallel connections of SCRs - Snubber circuit details – Specifications and Ratings of SCR, BJT, IGBT - Numerical problems – Line Commutation and Forced Commutation circuits.

UNIT – II

SINGLE PHASE HALF WAVE CONTROLLED CONVERTERS: Phase control technique - Single phase Line commutated converters - Half wave controlled converters with Resistive, RL load and RLE load - Derivation of average load voltage and current - Active and Reactive power inputs to the converters without and with Free wheeling Diode - Numerical problems
SINGLE PHASE FULLY CONTROLLED CONVERTERS: Fully controlled converters, Mid point and Bridge connections with Resistive, RL loads and RLE load - Derivation of average load voltage and current – Line commutated inverters, semi-converters, active and Reactive power inputs to the converters, Effect of source inductance – Expressions of load voltage and current - Numerical problems.
THREE PHASE LINE COMMUTATED CONVERTERS: Three phase converters - Three pulse and six pulse converters and bridge connections with R, RL load voltage and current with R and RL load and RLE loads - Semi Converters, Effect of Source inductance–Dual converters Waveforms - Numerical Problems

UNIT – III

AC VOLTAGE CONTROLLERS; AC voltage controllers – Single phase two SCR's in anti parallel with R and RL loads , modes of operation of Triac – Triac with R and RL loads – Derivation of RMS load voltage, current and power factor- wave forms , Numerical problems.

UNIT – IV

CHOPPERS: Choppers – Time ratio control and Current limit control strategies – Step down choppers - Derivation of load voltage and currents with R, RL and RLE loads- Step up Chopper – load voltage expression.
Morgan's chopper – Jones chopper - Oscillation choppers (Principle of operation only) -waveforms –– AC Chopper – Problems

UNIT – V

INVERTERS: Inverters – Single phase inverter – Basic series inverter , parallel Capacitor inverter, bridge inverter – Waveforms,. Simple bridge inverters – Modified Mc Murray and Mc Murray – Bedford inverters, Voltage control techniques for inverters- Pulse width modulation techniques – Numerical problems.

OUTCOMES: After this course, student will be able to

- understand the operation and characteristics of various types of semiconductor devices
- analyze the operation and characteristics of various single-phase converters, three-phase converters and choppers
- analyze the operation and performance of AC voltage controllers and inverters

TEXT BOOKS

1. P.S.Bhimbra, Power Electronics, Khanna publications.
2. M. D. Singh & K. B. Kanchandhani, Power Electronics, Tata Mc Graw – Hill Publishing company, 1998.
3. M. H. Rashid, Power Electronics : Circuits, Devices and Applications,– Prentice Hall of India, 2nd edition, 1998

REFERENCE BOOKS

1. Power Electronics: Circuits, Devices and Applications, M. H. Rashid, Prentice Hall of India.
2. Power Electronics, M. D. Singh & K. B. Kanchandhani, Tata Mc Graw - Hill Publishing Company.
3. Power Electronics, Vedam Subramanyam, New Age International (P) Limited, Publishers.
4. Elements of Power Electronics, Philip T. Krein, Oxford University Press.
5. Power Electronics, M. S. Jamil Asghar, PHI Private Limited.
6. Power Electronics, P.C.Sen,Tata Mc Graw-Hill Publishing.
7. Power Electronics, K. Hari Babu, Scitech Publications India Pvt. Ltd.
8. Principles of Power Electronics, John G. Kassakian, Martin, F. Schlect, Geroge C. Verghese, Pearson Education.

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SWITCH GEAR AND PROTECTION

Pre-requisites: Power Systems –I and Power Systems - II

Objectives: Objectives of this course are

- to introduce protection equipment like Circuit Breakers and Relays
- to introduce protection of Generators, Transformers and feeder bus bars from over voltages and other hazards.
- To emphasize Neutral for overall protection.

UNIT - I

INTRODUCTION TO CIRCUIT BREAKERS: Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages.- Restriking Phenomenon, Average and Maximum RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB ratings and Specifications: Types and Numerical Problems. – Auto-reclosures.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers.

UNIT – II

ELECTROMAGNETIC AND STATIC RELAYS: Principle of Operation and Construction of Attracted armature, Balanced Beam, induction Disc and Induction Cup relays.

Types of Over Current Relays: Instantaneous, DMT and IDMT types.

Application of relays: Over current/ under voltage relays, Direction relays, Differential Relays and Percentage Differential Relays.

Universal torque equation, Distance relays: Impedance, Reactance and Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison. Static Relays: Static Relays verses Electromagnetic Relays.

UNIT – III

PROTECTION OF POWER EQUIPMENT: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.

Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

UNIT – IV

NEUTRAL GROUNDING: Grounded and Ungrounded Neutral Systems.- Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

UNIT - V

PROTECTION AGAINST OVERVOLTAGES: Generation of Over Voltages in Power Systems.- Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

OUTCOMES: After this course, the student

- gets a thorough knowledge on, various types of protective devices (circuit breakers, relays etc..) and their co-ordination, protection of generators, transformers, feeders, bus-bars, through different types of protective devices, overvoltage protection, lightening, concept of earthing and grounding
- applies the above concepts to real-world electrical and electronics problems and applications.

TEXT BOOKS

1. Sunil S Rao, Switchgear and Protection – Khanna Publlishers.
2. Badri Ram , D.N Viswakarma, Power System Protection and Switchgear, TMH Publications.

REFERENCE BOOKS

1. Paithankar and S.R.Bhide, Fundamentals of Power System Protection, PHI, 2003.
2. C R Mason, Art & Science of Protective Relaying – Wiley Eastern Ltd.
3. C.L.Wadhwa, Electrical Power Systems –New Age international (P) Limited, Publishers, 3nd editon.
4. B.L.Soni, Gupta, Bhatnagar, Chakrabarthy, A Text book on Power System Engineering, Dhanpat Rai & Co.

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ADVANCED ENGLISH LANGUAGE 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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POWER ELECTRONICS LAB

Any eight experiments should be conducted

1. Study of Characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cycloconverter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase dual converter with RL loads

Any two simulation experiments should be conducted

14. Simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.
15. Simulation of resonant pulse commutation circuit and Buck chopper.
16. Simulation of single phase Inverter with PWM control.

REFERENCE BOOKS

1. M.H.Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related softwares
3. Reference guides of related softwares
4. Rashid, Spice for power electronics and electric power, CRC Press

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MICROCONTROLLERS LAB

The following programs are to be written for assembler and execute the same with 8051 kit

1. Programs for 16 bit arithmetic operations for 8051 (using various addressing modes)
2. Program for sorting an array for 8051.
3. Program for searching for a number or character in a string for 8051.
4. Program for string manipulations for 8051.
5. Interfacing traffic light controller using 8051.
6. Interfacing ADC and DAC to 8051.
7. Parallel communication between two microcontroller kits using 8255.
8. Serial communication between two microcontroller kits using 8251.
9. Interfacing to 8051 and programming to control stepper motor.
10. Programming using logical and bit manipulation Instructions of 8051.
11. Program and verify timer/counter in 8051.

12 Program and verify interrupt handling in 8051.

13. UART operation in 8051.
14. Communication between 8051 kit and PC.
15. Interfacing LCD to 8051.
16. Interfacing Matrix/keyboard to 8051.
17. Data Transfer from peripheral to memory through DMA controller 8237/8257.

Note: Minimum of 12 experiments to be conducted

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DC(UG) - DIGITAL SIGNAL PROCESSING

Prerequisite : Mathematics

OBJECTIVES: Objectives of this course are
- to deal with the fundamentals of signal analysis
- to introduce the concepts of Fourier series, Fourier transforms, Laplace transforms, Z-transforms, linear time invariant systems
- to introduce discrete Fourier series, discrete Fourier transform, fast Fourier transform
- to introduce filters and their design aspects

UNIT – I
INTRODUCTION: Introduction to Digital Signal Processing: Sampling process, Discrete time signals & sequences, linear shift invariant systems, stability and causality, Linear constant coefficient difference equations, Frequency domain representation of discrete time signals and systems.

UNIT – II
DISCRETE FOURIER SERIES: Properties and theorems of discrete Fourier series, DFS representation of periodic sequences.
DISCRETE FOURIER TRANSFORMS: Properties of DFT, linear convolution of sequences using DFT, Computation of DFT. Relation between Z-transform and DFS.
FAST FOURIER TRANSFORMS: Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT, and FFT for composite number.

UNIT – III
REALIZATION OF DIGITAL FILTERS; Review of Z-transforms, Applications of Z – transforms, Solution of difference equations of digital filters, Block diagram representation of linear constant-coefficient difference equations, Basic structures of IIR systems, Transposed forms, Basic structures of FIR systems, System function, stability criterion.

UNIT – IV
IIR DIGITAL FILTERS: Analog filter approximations – Butter worth and Chebyshev, Design of IIR Digital filters from analog filters, bilinear transformation method and impulse invariance techniques.
FIR DIGITAL FILTERS: Characteristics of FIR Digital Filters, frequency response. Design of FIR Digital Filters using Window Techniques - Frequency Sampling technique, Comparison of IIR & FIR filters.

UNIT – V
INTRODUCTION TO DSP PROCESSORS: Introduction to programmable DSPs: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSPs Multiple access memory, multiport memory, On-Chip Peripherals - All the above with an example of TMS320CXX processors.

OUTCOMES: After this course, the student
- gets a thorough knowledge on signal analysis by various mathematical tools viz., Fourier transforms, Laplace transforms, Z-transforms, Discrete Fourier Transform, Fast-Fourier transforms
- understands importance of filters, their design methodology and necessary mathematical analysis
- gets knowledge of DSP processors, architecture and programming skills

TEXT BOOKS
1. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles, Algorithms, and Applications, Pearson Education / PHI, 2007.
2. A.V.Oppenheim and R.W. Schaffer, Discrete Time Signal Processing, PHI.
3. B.Venkataramani, M. Bhaskar, Digital Signal Processors – Architecture, Programming and Applications, TATA McGraw Hill, 2002.

REFERENCE BOOKS

1. Andreas Antoniou , Digital Signal Processing:, TATA McGraw Hill , 2006.
2. MH Hayes, Schaum's Outlines, Digital Signal Processing, TATA McGraw Hill, 2007.
3. C. Britton Rorabaugh DSP Primer - Tata McGraw Hill, 2005.
4. Robert J. Schilling, Sandra L. Harris, Fundamentals of Digital Signal Processing using Matlab Thomson, 2007.
5. Alan V. Oppenheim, Ronald W. Schafer, Digital Signal Processing –, PHI Ed., 2006
6. S. Salivahanan, Digital Signal Processing-.TMH, 2000.

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DE(UG) - III.1: HVDC TRANSMISSION

Prerequisite: Power Electronics and Power Systems

Course Objectives:

- To Comprehend the conversion principles of HVDC Transmission
- Analysis of 3, 6, 12 pulse converters, rectifier and inverter operations of HVDC converters
- To identify the different types of Harmonics and reduction by using Filters
- To comprehend interaction between HVAC and DC systems in various aspects
- To appreciate the reliable MTDC systems and protection of HVDC system

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

- To find the applications of HVDC transmission in the power system with the acquired knowledge.
- To analyze different converter topologies viz. 3, 6 and 12 Pulse converters and understand it's control aspects.
- To understand the filter configuration for Harmonics in HVDC systems.
- To appreciate the reliable Multi terminal HVDC system.
- To have knowledge on the Protection of HVDC systems against Transient over voltages and over currents.

UNIT-I: INTRODUCTION

General consideration, Power Handling Capabilities of HVDC Lines Basic Conversion principles, static converter configuration.

UNIT-II: STATIC POWER CONVERTERS

3-pulse, 6-pulse, and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter – special features of converter transformers. Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters. VSC based HVDC and Hybrid HVDC systems. Back to back thyristor converter system.

UNIT-III: CONTROL OF HVDC CONVERTERS AND SYSTEMS

Constant current, constant extinction angle and constant ignition angle control Individual phase control and equidistant firing angle control DC power flow control. Interaction between HV AC and DC systems – Voltage interaction Harmonic instability problems and DC power modulation.

UNIT-IV: MTDC SYSTEMS & OVER VOLTAGES

Series parallel and series parallel systems their operation and control.
Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults.

UNIT-V: CONVERTER FAULTS & PROTECTION

Converter faults, over current protection – valve group, and DC line protection over voltage protection of converters, surge arresters.

TEXT BOOKS:

1. E.W. Kimbark: Direct current Transmission, Wiely Inter Science – New York.
2. J. Arillaga HVDC Transmission Peter Peregrinus ltd. London UK 1983

REFERENCES:

1. K. R. Padiyar, "High Voltage Direct current Transmission", Wiely Esatern Ltd New Delhi – 1992.
2. E. Uhlman, "Power Transmission by Direct Current", Springer Verlag, Berlin Helberg. 1985.

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DE(UG) - III.2: RELIABILITY ENGINEERING

Prerequisite: None

Course Objectives:

- To comprehend the concept of Reliability and Unreliability
- Derive the expressions for probability of failure, Expected value and standard deviation of Binominal distribution, Poisson distribution, normal distribution and weibull distributions.
- Formulating expressions for Reliability analysis of series-parallel and Non-series parallel systems
- Deriving expressions for Time dependent and Limiting State Probabilities using Markov models.

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

- Apply fundamental knowledge of Reliability to modeling and analysis of series-parallel and Non-series parallel systems.
- Solve some practical problems related with Generation, Transmission and Utilization of Electrical Energy.
- Understand or become aware of various failures, causes of failures and remedies for failures in practical systems.

Unit I:

Rules for combining probabilities of events, Definition of Reliability. Significance of the terms appearing in the definition. Probability distributions: Random variables, probability density and distribution functions. Mathematical expectation, Binominal distribution, Poisson distribution, normal distribution, Wei-bull distribution.

Unit II:

Hazard rate, derivation of the reliability function in terms of the hazard rate. Failures: Causes of failures, types of failures (early failures, chance failures and wear-out failures). Bath tub curve. Preventive and corrective maintenance. Modes of failure. Measures of reliability: mean time to failure and mean time between failures.

Unit III:

Classification of engineering systems: series, parallel and series-parallel systems- Expressions for the reliability of the basic configurations.

Reliability evaluation of Non-series-parallel configurations: Decomposition, Path based and cutest based methods, Deduction of the Paths and cutsets from Event tree.

Unit IV:

Discrete Markov Chains: General modeling concepts, stochastic transitional probability matrix, time dependent probability evaluation and limiting state probability evaluation of one component repairable model. Absorbing states.

Continuous Markov Processes: Modeling concepts, State space diagrams, Stochastic Transitional Probability Matrix, Evaluating time dependent and limiting state Probabilities of one component repairable model. Evaluation of Limiting state probabilities of two component repairable model.

UNIT-V:

Approximate system Reliability analysis of Series systems, parallel systems with two and more than two components, Network reduction techniques. Minimal cutest/failure mode approach.

TEXT BOOKS:

1. "Reliability evaluation of Engineering systems", Roy Billinton and Ronald N Allan, BS Publications.
2. "Reliability Engineering", Elsayed A. Elsayed, Prentice Hall Publications.

REFERENCES:

1. "Reliability Engineering: Theory and Practice", By Alessandro Birolini, Springer Publications.
2. "An Introduction to Reliability and Maintainability Engineering", Charles Ebeling, TMH Publications.
3. "Reliability Engineering", E. Balaguruswamy, TMH Publications.

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DE(UG) - III.1: HIGH VOLTAGE ENGINEERING

Prerequisite: Power Systems and Electrical & Electronics Instrumentation

Course Objectives:

- To distinguish the Gaseous, liquid and solid dielectric behavior under High Voltages.
- To understand the generation methods of High A.C, DC & Impulse Voltages required for various application.
- To apply the measuring techniques of High AC, DC & Impulse voltages and currents.
- To identify the testing techniques for High Voltage Equipment.

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

- Know conduction and breakdown in gases, liquids and solids dielectrics and different applications of the insulating materials in electrical power apparatus.
- Know the insulation testing of various components in power systems for different voltages, viz. power frequency, high frequency, switching or lightning impulses.
- Interpret the necessity to measure the voltages and currents accurately, ensuring perfect safety to the personnel and equipment.
- Obtain the necessary condition for all the electrical equipment capable of withstanding the over voltages.

UNIT- I: INTRODUCTION TO HIGH VOLATGE ENGINEERING

Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, rotating machines, circuit breakers, cable power capacitors and bushings.

UNIT- II: BREAK DOWN IN DIELECTRIC MATERIALS

Gases as insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law. Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. Intrinsic breakdown, electromechanical breakdown, thermal breakdown, breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, solid dielectrics used in practice.

UNIT-III: GENERATION & MEASUREMENT OFHIGH VOLTAGES & CURRENTS

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators. Measurement of High Direct Current voltages, Measurement of High Voltages alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

UNIT-IV: OVER VOLTAGES & INSULATION CO-ORDINATION

Natural causes for over voltages – Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

UNIT- V: TESTING OF MATERIALS & ELECTRICAL APPARATUS

Measurement of D.C Resistivity, Measurement of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of Isolators and circuit breakers, testing of cables, Testing of Transformers, Testing of Surge Arresters, and Radio Interference measurements.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

REFERENCES:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited, 1995.
3. High Voltage Engineering, Theory and Practice by Mazen Abdel Salam, Hussein Anis, Ahdan El-Morshedy, Roshdy Radwan , Marcel

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(PGC-I): ADVANCED POWER ELECTRONICS

Prerequisite: Power Electronics

Course Objectives:

- To understand various advanced power electronics devices.
- To describe the operation of multi level inverters with switching strategies for high power applications.
- To comprehend the design of resonant converters and switched mode power supplies.

Course Outcomes:

After taking this course, student will be able to:

- Develop and analyze various converter topologies.
- Design AC or DC switched mode power supplies.

UNIT I: MODERN POWER SEMICONDUCTOR DEVICES

Modern power semiconductor devices – Insulated Gate Bipolar Transistor (IGBT) –MOSFET-MOS Turn off Thyristor (MTO) – Emitter Turn Off Thyristor (ETO) – Integrated Gate-Commutated Thyristor (IGCTs) – MOS-controlled thyristors(MCTs)– Power integrated circuits (PICs) – symbol, structure and equivalent circuit – comparison of their features.

UNIT II: RESONANT PULSE INVERTERS

Resonant pulse inverters – series resonant inverters – series resonant inverters with unidirectional switches – series resonant inverters with bidirectional switches – analysis of half bridge resonant inverter – evaluation of currents and voltages of a simple resonant inverter – analysis of half bridge and full bridge resonant inverter with bidirectional switches – Frequency response of series resonant inverters – for series loaded inverter – for parallel loaded inverter – For series and parallel loaded inverters – parallel resonant inverters – Voltage control of resonant inverters – class E resonant inverter – class E resonant rectifier – evaluation of values of *C*'s and *L's* for class E inverter and Class E rectifier – numerical problems.

UNIT III: RESONANT CONVERTERS

Resonant converters – zero current switching resonant converters – L type ZCS resonant converter – M type ZCS resonant converter – zero voltage switching resonant converters – comparison between ZCS and ZVS resonant converters – Two quadrant ZVS resonant converters – resonant dc-link inverters – evaluation of L and C for a zero current switching inverter – Numerical problems.

UNIT IV: MULTILEVEL INVERTERS

Multilevel concept – Classification of multilevel inverters – Diode clamped Multilevel inverter – principle of operation – main features – improved diode Clamped inverter – principle of operation – Flying capacitors multilevel inverter-principle of operation – main features – cascaded multilevel inverter – principle of operation – main features – Multilevel inverter applications – reactive power compensation – back to back intertie system – adjustable drives - Switching device currents – dc link capacitor voltage balancing – features of Multilevel inverters – comparisons of multilevel converters.

UNIT V: D.C & A.C POWER SUPPLIES

DC power supplies – classification - switched mode dc power supplies – fly back Converter – forward converter – push-pull converter – half bridge converter – Full bridge converter – Resonant d c power supplies – bidirectional power supplies – Applications.

AC power supplies – classification – switched mode ac power supplies – Resonant AC power supplies – bidirectional ac power supplies – multistage conversions – control circuits – applications. Introduction – power line disturbances – power conditioners – Uninterruptible Power supplies – applications.

TEXT BOOKS:

1. Mohammed H. Rashid –"Power Electronics"– Pearson Education-Third Edition – first Indian reprint -2004.
2. Ned Mohan, Tore M. Undeland and William P. Robbins- "Power Electronics"– John Wiley & Sons – Second Edition.

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PGE – I.1: MACHINE MODELLING AND ANALYSIS

Prerequisite: Electrical Machines

Course Objectives:
- Identifying the methods and assumptions in modeling of machines.
- Recognize the different frames for modeling of AC machines.
- To write voltage and torque equations in state space form for different machines.

Learning Outcomes: At the end of the course, the student is able to:
- Develop the mathematical models of various machines like, induction motor and Synchronous machines using modeling equations.
- Analyze the developed models in various reference frames.

UNIT-I:
Basic Two-pole DC machine - primitive 2-axis machine – Voltage and Current relationship – Torque equation.

UNIT-II:
Mathematical model of separately excited DC motor and DC Series motor in state variable form – Transfer function of the motor - Numerical problems.
Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor - Numerical Problems

UNIT-III:
Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o to d, q). Circuit model of a 3 phase Induction motor – Linear transformation - Phase Transformation – Transformation to a Reference frame – Two axis models for induction motor - dq model based DOL starting of Induction Motors

UNIT-IV:
Voltage and current Equations in stator reference frame – equation in Rotor reference frame – equations in a synchronously rotating frame – Torque equation - Equations I state – space form.

UNIT-V:
Circuits model of a 3ph Synchronous motor – Two axis representation of Synchronous Motor.
Voltage and current Equations in state – space variable form – Torque equation - dq model based short circuit fault analysis- emphasis on voltage, frequency and recovery time.

TEXT BOOKS:
1. Generalized Machine theory - P.S. Bimbhra, Khanna Publishers
2. Analysis of electric machinery and Drives systems - Paul C. Krause, Oleg wasynezuk, Scott D. Sudhoff.
3. Thyristor control of Electric Drives - Vedam Subranmanyam.
4. Power System Stability and Control – Prabha Kundur, EPRI.

REFERECES:
1. Performance optimization of induction motors during Voltage-controlled soft starting, Article In IEEE Transactions On Energy Conversion, July 2004.
2. A Novel Method for Starting of Induction Motor with Improved Transient Torque Pulsations, Nithin K.S, Dr. Bos Mathew Jos, Muhammed Rafeek, Dr. Babu Paul. International Journal of Engineering and Innovative Technology (IJEIT) Volume 2, Issue 8, February 2013.

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PGE – I.2: REACTIVE POWER COMPENSATION AND MANAGEMENT

Prerequisite:

Course Objectives:

- To identify the necessity of reactive power compensation
- To describe load compensation
- To select various types of reactive power compensation in transmission systems
- To illustrate reactive power coordination system
- To characterize distribution side and utility side reactive power management.

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

- Distinguish the importance of load compensation in symmetrical as well as un symmetrical loads
- Observe various compensation methods in transmission lines
- Construct model for reactive power coordination
- Distinguish demand side reactive power management & user side reactive power management

UNIT-I: LOAD COMPENSATION

Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

UNIT-II: STEADY–STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM

Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation – examples

Transient state reactive power compensation in transmission systems:

Characteristic time periods – passive shunt compensation – static compensations - series capacitor compensation – compensation using synchronous condensers – examples

UNIT-III: REACTIVE POWER COORDINATION

Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady –state variations – effects of under voltages – frequency –Harmonics, radio frequency and electromagnetic interferences

UNIT-IV: DEMAND SIDE MANAGEMENT

Load patterns – basic methods load shaping – power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels

Distribution side Reactive power Management:

System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks

UNIT-V: USER SIDE REACTIVE POWER MANAGEMENT

KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations

Reactive power management in electric traction systems and are furnaces:

Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures –power factor of an arc furnace

TEXT BOOKS:

1. Reactive power control in Electric power systems by T.J.E.Miller, John Wiley and sons, 1982.
2. Reactive power Management by D.M.Tagare, Tata McGraw Hill, 2004.

REFERENCES:

1. Wolfgang Hofmann, Jurgen Schlabbach, Wolfgang Just “Reactive Power Compensation: A Practical Guide, April, 2012, Wiely publication.

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PGE – I.3: GAS INSULATED SYSTEMS

Prerequisite: Switch Gear and Protection

Course objectives:
- To know the GIS concepts and principles
- To choose Air Insulated Substation and GIS
- To demonstrate the design and constructional aspects of GIS
- To analyze transient phenomenon, problems and diagnostic methods in GIS

Course Outcomes: Upon the completion of this course, the student will be able to
- Know the advantages of GIS systems over air insulated systems
- Observe constructional design features of GIS design
- Discriminate the problems and design diagnostic methods of GIS

UNIT–I: INTRODUCTION TO GIS AND PROPERTIES OF SF_6

Characteristics of GIS- Introduction to SF_6 - Physical properties-Chemical properties - Electrical properties-Specification of SF_6 gas for GIS application - Handling of SF_6 gas before use - Safe handling of Sf_6 gas in electrical equipment - Equipment for handling the SF_6 Gas - SF_6 and environment.

UNIT–II: LAYOUT OF GIS STATIONS

Advancement of GIS station - Comparison with Air Insulated Substation - Economics of GIS - User Requirements for GIS - Main Features for GIS - Planning and Installation components of a GIS station.

UNIT–III: DESIGN AND CONSTRUCTION OF GIS STATION

Introduction - Rating of GIS components - Design Features - Estimation of different types of Electrical Stresses -Design Aspects of GIS components - Insulation Design for Components - Insulation Design for GIS - Thermal Considerations in the Design of GIS - Effect of very Fast Transient Over-voltages (VFTO) on the GIS design - Insulation Coordination systems - Gas handling and Monitoring System Design.

UNIT-IV: FAST TRANSIENT PHENOMENA IN GIS

Introduction - Disconnector Switching in Relation to Very fast Transients-Origin of VFTO-Propagation and Mechanism of VFTO-VFTO Characteristics- Effects of VFTO-Testing of GIS for VFTO.

UNIT–V: SPECIAL PROBLEMS IN GIS AND GIS DIAGNOSTICS

Introduction - particles their effects and their control- Insulating Spacers and their Reliability - SF_6 Gas Decomposition - Characteristics of imperfections in insulation - Insulation Diagnostic methods - PD Measurement and UHF Method.

TEXT BOOKS:

1. M. S. Naidu," Gas Insulated Substations"- IK International Publishing House.
2. Hermann J. Koch, "Gas Insulated Substations", June 2014, Wiley - IEEE Press.

REFERENCES:

1. Olivier Gallot-Lavellee, "Dielectric materials and Electrostatics" , Wiley - IEEE Press
2. Jaun Martinez, "Dielectric Materials for Electrical Engineering", Wiley - SIEEE Press

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PGE – II.1: RENEWABLE ENERGY SOURCES

Prerequisite: None

Course Objectives:
- To recognize the awareness of energy conservation in students
- To identify the use of renewable energy sources for electrical power generation
- To collect different energy storage methods
- To detect about environmental effects of energy conversion

Course Outcomes: Upon the completion of this course, the student will be able to
- find different renewable energy sources to produce electrical power
- estimate the use of conventional energy sources to produce electrical energy
- role-play the fact that the conventional energy resources are depleted
- arrange Store energy and to avoid the environmental pollution

UNIT-I:
Photo voltaic power generation ,spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, commercial photo voltaic systems, test specifications for PV systems, applications of super conducting materials in electrical equipment systems.

UNIT-II:
Principles of MHD power generation, ideal MHD generator performance, practical MHD generator, MHD technology.
Wind Energy conversion: Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

UNIT-III:
Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation.
Wave energy conversion: properties of waves and power content, vertex motion of Waves, device applications. Types of ocean thermal energy conversion systems Application of OTEC systems examples,

UNIT-IV:
Miscellaneous energy conversion systems: coal gasification and liquefaction, biomass conversion, geothermal energy, thermo electric energy conversion, principles of EMF generation, description of fuel cells, Co-generation and energy storage, combined cycle co-generation, energy storage.
Global energy position and environmental effects: energy units, global energy position.

UNIT-V:
Types of fuel cells, H_2-O_2 Fuel cells, Application of fuel cells – Batteries, Description of batteries, Battery application for large power. Environmental effects of energy conversion systems, pollution from coal and preventive measures steam stations and pollution, pollution free energy systems.

TEXT BOOKS:
1. "Energy conversion systems" by Rakosh das Begamudre, New age International publishers, New Delhi - 2000.
2. "Renewable Energy Resources" by John Twidell and Tony Weir, 2nd Edition, Fspon & Co.

REFERENCES:
1. "Understanding Renewable Energy Systems" , by Volker Quaschning, 2005, UK.
2. "Renewable Energy Systems-Advanced Conversion, Technologies & Applications" by Faner Lin Luo Honer Ye, CRC press, Taylor & Francis group.

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PGE-II.2: ELECTRIC TRACTION TECHNOLOGIES

Prerequisite: None

Course Objectives:

- To be able to understand various systems of track electrification, power supply system and mechanics of electric train.
- To understand various motors used in the electric traction and their converters.

Course Outcomes:

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

- Distinguish the importance of single and three phase traction system.
- Observe various Traction mechanics
- Construct model HV arrangements, Semi conductor converter controlled drives.

UNIT – I

TRACTION SYSTEMS: Electric drives - Advantages & disadvantages - System of track electrification - DC, 1-Phase low frequency, 3-Phase low frequency and composite systems, Problems of 1-phase traction system - Current unbalance, Voltage unbalance, Production of harmonics, Induction effects, Booster transformer - Rail connected booster transformer. Comparison between ac and dc systems.

UNIT – II

TRACTION MECHANICS: Types of services, Speed - time curves - Construction of quadrilateral and trapezoidal speed time curves, Average & schedule speeds. Tractive effort - Speed characteristic, Power of traction motor, specific energy consumption - Factors affecting specific energy consumption, Coefficient of adhesion, slip - Factors affecting slip, magnetically suspended trains.

UNIT – III

POWER SUPPLY ARRANGEMENTS: High voltage supply, Constituents of supply system - Substations, Feeding post, Feeding & sectioning arrangements, Remote control center, Design considerations of substations, Over head equipment - principle of design of OHE, Polygonal OHE - Different types of constructions, Basic sag & tension calculations, Dropper design, Current collection gear for OHE.

UN IT – IV

TRACTION MOTORS: Desirable characteristics, D.C. series motors, A.C. series motors, 3-Phase induction motors, linear induction motors, D.C. motor series & parallel control - Shunt bridge transition – Drum controller, Contact type bridge transition control, Energy saving, Types of braking in a.c. and d.c. drives, Conditions for regenerative braking, Stability of motors under regenerative braking.

UNIT – V

SEMI CONDUCTOR CONVERTER CONTROLLED DRIVES: Advantages of 25KV of AC Traction - Control of d.c. motors - single and two stage converters, Control of ac. motors - CSI fed squirrel cage induction motor, PWM VSI induction motor drive, D.C. traction — Chopper controlled d.c. motors, composite braking, Diesel electric traction — D.C. generator fed d.c. series motor, Alternator fed d.c. series motor, Alternator fed squirrel cage induction motor, Locomotive and axle codes..Introduction to new technologies in super speed electric locomotives.

TEXT BOOKS:

1. Partab.H - Modern Electric Traction, Dhanpat Rai& Sons – 1998.
2. Dubey. G.K. - Fundamentals of Electrical Drives, Narosa Publishing House - 2001.
3. C.LWadhwa — Generation, Distribution and Utilization of Electrical Energy, New Age International - 2006.
4. J.B. Gupta - Utilization of Electrical Power and Electric Traction, S.K. Kataria & Sons publications, 9th edition2004.

REFERENCE:

1. www.siemens.com/mobility/locomotives
2. www.abb.com/railway

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PGE-II.3: INDUSTRIAL INSTRUMENTATION

Prerequisite: None

Course Objectives:

- To study the characteristics of instruments
- Analyze the various type s of transducers
- Principle of operation and selection of transducers depend s on their applications.
- Basic knowledge of displacement, strain, pressure, temperature, flow, level, density, and viscosity measurements.

Course Outcomes:

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

- Select the transducers and their types, usage and operation and different characteristics of transducers.
- Calibrate the various instruments and application of various instruments to different fields.
- Implement process techniques, instrumental setups as well as controlling and monitoring of various processes in the industries.

UNIT – I: INTRODUCTION:

Introduction to Instrumentation system - Static and Dynamic characteristics of Instruments - Principles of transducers.

UNIT- II: MEASUREMENT OF DISPLACEMENT & STRAIN:

Displacement and proximity gauges - Linear Variable Differential Transformer (LVDT) - Measurement of strain: Strain Gauge - unbalanced Wheatstone bridge.

UNIT – III: MEASUREMENT OF TEMPERATURE:

Thermocouples - Resistance Temperature Detector (RTD) - Thermisters and radiation pyrometer.

UNIT- IV : MEASUREMENT OF FLOW:

Measurement of level: Capacitance based and Float based method. Differential pressure flow meters - variable area flow meters- variable reluctance flow meters - Turbine flow meter - Ultrasonic flow meter (Both transit time and Doppler Shift) - Electromagnetic flow meter and mass flow meter.

UNIT – V: MEASUREMENT OF PRESSURE & OTHER QUANTITIES:

Elastic transducers- Low pressure measurement-McLeod and ionization gauge-Load cell - Torque Cell - pH probe and viscosity measurement - Basics of Data transmission - Synchro and Servo motor - Pneumatic and Hydraulic Instrumentation system.

TEXT BOOK:

1. E. Doeblin," Industrial Instrumentation"- CRC Press
2. A.K.Sawhney, Course in Electrical and Electronics Measurements and Instrumentation, Dhanpat Rai& Company

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PGE – III.1: MODERN CONTROL THEORY

Prerequisite: Control Systems

Course Objectives:
- To explain the concepts of basics and modern control system for the real time analysis and design of control systems.
- To explain the concepts of state variables analysis.
- To study and analyze non linear systems.
- To analyze the concept of stability for nonlinear systems and their categorization.
- To apply the comprehensive knowledge of optimal theory for Control Systems.

Course Outcomes:
Upon completion of this course, students should be able to:
- Various terms of basic and modern control system for the real time analysis and design of control systems.
- To perform state variables analysis for any real time system.
- Apply the concept of optimal control to any system.
- Able to examine a system for its stability, controllability and observability.
- Implement basic principles and techniques in designing linear control systems.
- Formulate and solve deterministic optimal control problems in terms of performance indices.
- Apply knowledge of control theory for practical implementations in engineering and network analysis.

UNIT I: Mathematical Preliminaries and State Variable Analysis:
Fields, Vectors and Vector Spaces – Linear combinations and Bases – Linear Transformations and Matrices – Scalar Product and Norms – Eigen values, Eigen Vectors and a Canonical form representation of Linear systems – The concept of state – State space model of Dynamic systems – Time invariance and Linearity – Non uniqueness of state model – State diagrams for Continuous-Time State models - Existence and Uniqueness of Solutions to Continuous-Time State Equations – Solutions of Linear Time Invariant Continuous-Time State Equations – State transition matrix and it's properties. Complete solution of state space model due to zero input and due to zero state.

UNIT II: Controllability and Observability:
General concept of controllability – Controllability tests, different state transformations such as diagonalization, Jordon canonical forms and Controllability canonical forms for Continuous-Time Invariant Systems – General concept of Observability – Observability tests for Continuous-Time Invariant Systems – Observability of different State transformation forms.

UNIT III: State Feedback Controllers and Observers:
State feedback controller design through Pole Assignment, using Ackkermans formula– State observers: Full order and Reduced order observers.

UNIT IV: Non-Linear Systems:
Introduction – Non Linear Systems - Types of Non-Linearities – Saturation – Dead-Zone - Backlash – Jump Phenomenon etc; Linearization of nonlinear systems, Singular Points and its types– Describing function–describing function of different types of nonlinear elements, – Stability analysis of Non-Linear systems through describing functions. Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, Stability analysis of nonlinear systems based on phase-plane method.

UNIT V: Stability Analysis:
Stability in the sense of Lyapunov, Lyapunov's stability and Lypanov's instability theorems - Stability Analysis of the Linear continuous time invariant systems by Lyapunov second method – Generation of Lyapunov functions – Variable gradient method – Krasooviski's method.

TEXT BOOKS:
1. M.Gopal, Modern Control System Theory, New Age International - 1984
2. Ogata. K, Modern Control Engineering, Prentice Hall - 1997
3. N K Sinha, Control Systems, New Age International – 3rd edition.

REFERENCES:
1. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice - Hall Network series - First edition.

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PGE – III.2: EMBEDDED SYSTEMS

Prerequisite: Microprocessors and Interfacing Devices

Course Objectives:
- To emphasize the general embedded system concepts, design of embedded hardware and software development tools
- To explain the basics of real time operating and embedded systems
- To describe key issues such as CPU scheduling, memory management, task synchronization, and file system in the context of real-time embedded systems.

Course Outcomes: Upon the completion of this course, the student will be able to
- To analyze and design embedded systems and real-time systems
- Define the unique design problems and challenges of real-time systems
- Identify the unique characteristics of real-time operating systems and evaluate the need for real-time operating system
- Explain the general structure of a real-time system and Understand and use RTOS to build an embedded real-time system
- Gain knowledge and skills necessary to design and develop embedded applications based on real-time operating systems.

UNIT- I: OVERVIEW OF EMBEDDED SYSTEM
Embedded System, types of Embedded System, Requirements of Embedded System, and Issues in Embedded software development, Applications.

UNIT-II: PROCESSOR & MEMORY ORGANIZATION
Structural units in a processor, Processor selection, Memory devices, Memory selection, Memory Allocation & Map, Interfacing.

UNIT-III: DEVICES, DEVICE DRIVERS & BUSES FOR DEVICE NETWORKS
I/O devices, Timer & Counter devices, Serial Communication, Communication between devices using different buses. Device drives, Parallel and serial port device drives in a system, Interrupt servicing mechanism, context and periods for context switching, Deadline and Interrupt Latency.

UNIT-IV: PROGRAMMING & MODELING CONCEPTS
Program elements, Modeling Processes for Software Analysis, Programming Models, Modeling of Multiprocessor Systems, Software algorithm Concepts, design, implementation, testing, validating, debugging, Management and maintenance, Necessity of RTOS.

UNIT-V: HARDWARE AND SOFTWARE CO-DESIGN
Embedded system design and co-design issues in software development, design cycle in development phase for Embedded System, Use of ICE & Software tools for development of ES, Issues in embedded system design.

TEXTBOOKS:
1. Embedded systems: Architecture, programming and design by Rajkamal, TMH
2. Embedded system design by Arnold S Burger, CMP

REFERENCES:
1. An embedded software primer by David Simon, PEA
2. Embedded systems design:Real world design be Steve Heath; Butterworth Heinenann, Newton mass USA 2002
3. Data communication by Hayt.

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PGE – III.3: MICROCONTROLLERS AND APPLICATIONS

Prerequisite: Microprocessors and Interfacing Devices

Course Objectives:
- To relate the basic architecture and addressing modes of a microcontroller.
- To explain the principles of top down design to microcontroller software development
- To demonstrate assembly language programs for the advanced Microcontroller , assembly language code for high-level language structures such as IF-THEN-ELSE and DO-WHILE
- To analyze a typical I/O interface and to discuss timing issues
- To identify different types of memory used in microcontrollers

Course Outcomes: Upon the completion of this course, the student will be able to
- Distinguish types of computers & microcontrollers,
- know 8-Bit, 16- Bit & 32 Bit advanced Microcontrollers.
- Develop Real time Applications of Microcontrollers & Demonstrate RTOS for Microcontrollers.
- Translate Hardware applications using Microcontrollers.

UNIT-I: OVERVIEW OF ARCHITECTURE & MICROCONTROLLER RESOURCES
Architecture of a microcontroller – Microcontroller resources – Resources in advanced and next generation microcontrollers – 8051 microcontroller – Internal and External memories – Counters and Timers – Synchronous serial-cum asynchronous serial communication - Interrupts.

UNIT-II: 8051- MICROCONTROLLERS INSTRUCTION SET
Basic assembly language programming – Data transfer instructions – Data and Bit-manipulation instructions – Arithmetic instructions – Instructions for Logical operations on the test among the Registers, Internal RAM, and SFRs – Program flow control instructions – Interrupt control flow.

UNIT-III: REAL TIME CONTROL
INTERRUPTS: Interrupt handling structure of an MCU – Interrupt Latency and Interrupt deadline – Multiple sources of the interrupts – Non-maskable interrupt sources – Enabling or disabling of the sources – Polling to determine the interrupt source and assignment of the priorities among them – Interrupt structure in Intel 8051.
TIMERS: Programmable Timers in the MCU's – Free running counter and real time control – Interrupt interval and density constraints.

UNIT-IV: SYSTEMS DESIGN
DIGITAL AND ANALOG INTERFACING METHODS: Switch, Keypad and Keyboard interfacings – LED and Array of LEDs – Keyboard-cum-Display controller (8279) – Alphanumeric Devices – Display Systems and its interfaces – Printer interfaces – Programmable instruments interface using IEEE 488 Bus – Interfacing with the Flash Memory – Interfaces – Interfacing to High Power Devices – Analog input interfacing – Analog output interfacing – Optical motor shaft encoders – Industrial control – Industrial process control system – Prototype MCU based Measuring instruments – Robotics and Embedded control – Digital Signal Processing and digital filters.

UNIT-V: REAL TIME OPERATING SYSTEM FOR MICROCONTROLLERS:
Real Time operating system – RTOS of Keil (RTX51) – Use of RTOS in Design – Software development tools for Microcontrollers.
16-BIT MICROCONTROLLERS: Hardware – Memory map in Intel 80196 family MCU system – IO ports – Programmable Timers and High-speed outputs and input captures – Interrupts – instructions. ARM 32 Bit MCUs: Introduction to 16/32 Bit processors – ARM architecture and organization – ARM / Thumb programming model – ARM / Thumb instruction set – Development tools.

TEXT BOOKS:

1. Raj Kamal, "Microcontrollers Architecture, Programming, Interfacing and System Design" – Pearson Education, 2005.
2. Mazidi and Mazidi, "The 8051 Microcontroller and Embedded Systems" – PHI, 2000.

REFERENCES:

1. A.V. Deshmuk, "Microcontrollers (Theory & Applications)" – WTMH, 2005.
2. John B. Peatman, "Design with PIC Microcontrollers" – Pearson Education, 2005.
3. Microcontroller Programming, Julio Sanchez, Maria P. Canton, CRC Press.
4. The 8051 Microcontroller, Ayala, Cengage Learning.
5. Microprocessors and Microcontrollers, Architecture, Programming and System Design, Krishna Kant, PHI Learning PVT. Ltd.
6. Microprocessors, Nilesh B. Bahadure, PHI Learning PVT. Ltd.

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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. To find DFT / IDFT of given DT Signal
3. To find Frequency Response of a given System given in Transfer Function/ Differential equation form.
4. Implementation of FFT of given Sequence
5. Determination of Power Spectrum of a given Signal(s).
6. Implementation of LP FIR Filter for a given Sequence/Signal.
7. Implementation of HP FIR Filter for a given Sequence/Signal
8. Implementation of LP IIR Filter for a given Sequence/Signal
9. Implementation of HP IIR Filter for a given Sequence/Signal
10. Generation of Sinusoidal 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. Audio application such as to plot a Time and Frequency display of Microphone plus a Cosine using DSP. Read a .wav file and match with their respective spectrograms.
16. Noise Removal: Add noise above 3 KHz and then remove, interference suppression using 400 Hz tone.
17. Impulse Response of First order and Second Order Systems.

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

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PGC-I Lab: POWER ELECTRONICS AND CONVERTERS SIMULATION LAB

Course Objectives:

Upon successful completion of the lab students will be familiar with:

- Simulation of various AC-AC, AC-DC, DC-DC, DC-AC converter topologies
- Modeling and simulation of industrial drives

Course Outcomes:

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

- Simulate AC-AC Converters
- Simulate AC-DC Converters
- Simulate DC-DC Converters
- Simulate DC-AC Converters
- Model and Simulate DC drives fed by power electronics converters
- Model and Simulate AC drives fed by power electronics converters

1. Single phase full converter using RL and E loads.
2. Single phase semi converter using RL and E loads.
3. Three-phase full converter using RL and E loads.
4. Three-phase semi converter using RL and E loads.
5. Single phase AC Voltage controller using RL load.
6. Single phase Cyclo-converter Voltage controller using RL load.
7. Three-phase inverter with PWM controller.
8. DC-DC Converters.
9. Modeling of Separately Excited DC Motor.
10. Modeling of Three Phase Induction Motor.

Note: Use any two suitable software's for each simulation.

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HSS (UG): 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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PGC - II: POWER ELECTRONIC CONTROL OF DC DRIVES

Prerequisite: Power Electronics

Course Objectives:

- To introduce drive system, characteristics of drive, and operating modes of drive
- To comprehend the principle operation of phase control & Chopper controlled of dc drives.
- To design a current and speed controllers to achieve closed loop operation of dc drives.

Learning Outcomes: After taking this course, student will be able to:

- Perform simulations of phase or chopper controlled dc drive both for open loop and closed loop operations.
- Choose proper gain values for speed and current controllers.
- Distinguish the difference between PWM controller and hysteresis controller.

UNIT–I: SINGLE-PHASE RECTIFIERS CONTROLLED DC MOTOR

Separately excited DC motors with rectified single –phase supply – single-phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor.

UNIT–II: THREE-PHASE RECTIFIERS CONTROLLED DC MOTOR

Three-phase semi-converter and Three phase full converter for continuous and discontinuous modes of operations – power and power factor - Addition of Freewheeling diode – Three phase double converter.

Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase controlled bridge rectifier inverter.

UNIT–III: PHASE, CURRENT & SPEED CONTROLLED DC DRIVE

Three-phase controlled converter, control circuit, control modeling of three phase converter – Steady state analysis of three phase converter control DC motor drive – Two quadrant, Three phase converter controlled DC motor drive – DC motor and load, converter.

Current and speed controllers - Current and speed feedback – Design of controllers – Current and speed controllers – Motor equations – filter in the speed feedback loop speed controller – current reference generator – current controller and flow chart for simulation – Harmonics and associated problems – sixth harmonics torque.

UNIT–IV: CHOPPER CONTROLLED DC MOTOR DRIVES

Principle of operation of the chopper – Chopper with other power devices – model of the chopper – input to the chopper – steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque.

Closed loop operation: Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current controller.

UNIT–V: FOUR QUADRANT OPERATION OF DC DRIVES

Introduction to Four quadrant operation – Motoring operations, Electric Braking – Plugging, Dynamic and Regenerative Braking operations. Four quadrant operation of D.C motors by single phase, three phase dual converters and Choppers – Closed loop operation of DC motor.

TEXT BOOKS:

1. Power Electronics and motor control – Shepherd, Hulley, Liang – II Edition Cambridge University Press.
2. Electronic motor drives modeling Analysis and control – R. Krishnan – I Edition Prentice Hall India.
3. Power Electronics circuits, Devices and Applications – MH Rashid – PHI – 1 Edition 1995.

REFERENCES:

1. Fundamentals of Electric Drives – GK Dubey, Narosa Publishers 1995
2. Power Semiconductor drives – SB Dewan and A Straughen -1975.

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PGE – IV.1: FLEXIBLE AC TRANSMISSION SYSTEMS

Prerequisite: Power Electronics and Power Systems

Course Objectives:
- To develop the understanding of uncompensated lines and their behavior under heavy loading conditions.
- To understand the concept and importance controllable parameters of FACTS controllers.
- To emphasize the objectives of Shunt compensation, and basic operation of SVC and STATCOM.
- To analyze the functioning of series controllers like GCSC, TSSC and TCSC

Course Outcomes: Upon the completion of this course, the student will be able to
- Choose proper controller for the specific application based on system requirements
- Understand various systems thoroughly and their requirements
- Interpret the control circuits of Shunt Controllers SVC & STATCOM for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping
- Detect the Power and control circuits of Series Controllers GCSC, TSSC and TCSC

UNIT-I: FACTS CONCEPTS
Transmission interconnections power flow in an AC system, loading capability limits, Dynamic stability considerations, importance of controllable parameters basic types of FACTS controllers, benefits from FACTS controllers.

UNIT-II: VOLTAGE SOURCE CONVERTERS
Single phase three phase full wave bridge converters transformer connections for 12 pulse 24 and 48 pulse operation. Three level voltage source converter, pulse width modulation converter, basic concept of current source Converters, and comparison of current source converters with voltage source converters.

UNIT-III: STATIC SHUNT COMPENSATION
Objectives of shunt compensation, mid-point voltage regulation voltage instability prevention, improvement of transient stability, Power oscillation damping, Methods of controllable VAR generation, variable impedance type static VAR generators switching converter type VAR generators hybrid VAR generators.

UNIT-IV: SVC AND STATCOM
The regulation and slope transfer function and dynamic performance, transient stability enhancement and power oscillation damping operating point control and summary of compensator control.

UNIT-V: STATIC SERIES COMPENSATORS
Concept of series capacitive compensation, improvement of transient stability, power oscillation damping, and functional requirements of GTO thyristor controlled series capacitor (GSC), thyristor switched series capacitor (TSSC), and thyristor controlled series capacitor (TCSC)
Control schemes for GSC TSSC and TCSC.

TEXT BOOKS:
1. Hingorani H G and Gyugyi. L " Understanding FACTS-Concepts and Technology of Flexible AC Transmission Systems" New York, IEEE Press, 2000.
2. Padiyar.K.R, " FACTS Controllers in Power Transmission and Distribution" New Age Int. Publishers, 2007

REFERENCES:
1. Zhang, Xiao-Ping, Rehtanz, Christian, Pal, Bikash "Flexible AC Transmission Systems: Modeling and Control", Springer, 2012
2. Yong-Hua Song, Allan Johns, "Flexible AC Transmission Systems", IET, 1999.

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PGE – IV.2: SWITCHED MODE POWER SUPPLIES

Prerequisite: Power Electronic Devices and circuits

Course Objectives:
- To apply the basic concepts of power electronics for designing converters.
- Design and implement practical circuits for UPS, SMPS etc.

Learning Outcomes: After taking this course, student will be able to:
- Design converter system for electrical applications
- Understand and design SMPS.

UNIT – I
BASIC CONVERTER CIRCUITS:
Buck Regulator, Buck- Boost Regulator, Boost Regulator, Cuk Converters and Resonant Converters. Choice of switching frequency.

UNIT – II
ISOLATED SMPS:
Fly back Converter, Forward Converter, Half-Bridge and Full Bridge Converters, Push-Pull Converter and SMPS with multiple outputs. Choice of switching frequency.

UNIT – III
CONTROL ASPECTS
PWM Controllers, Isolation in feedback loop, Power Supplies with multiple output.
Stability analysis using Bode Diagrams.

UNIT – IV
DESIGN CONSIDERATIONS
Selection of output filter capacitor, Selection of energy storage inductor, Design of High Frequency Inductor and High frequency Transformer, Selection of switches. Snubber circuit design, Design of driver circuits.

UNIT – V
ELECTRO MAGNETIC INTERFERENCE (EMI)
EMI Filter Components, Conducted EMI suppression, Radiated EMI suppression, Measurement.
PROTECTION
Over current protection, Over voltage protection, Inrush current protection.
THERMAL MODEL
Thermal Resistance, Cooling Considerations, Selection of Heat sinks, Simple Heat sink calculations.

TEXT BOOKS:
1. Switched Mode Power Supplies, Design and Construction, H. W. Whittington, B. W. Flynn and D. E. MacPherson, Universities Press, 2009 Edition.
2. Mohan N. Undeland . T & Robbins W, Power Electronics Converters, Application and Design. John Wiley, 3rd edition, 2002
3. Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. , Wiley Eastern Ltd.,1992
4. Robert. W. Erickson, D. Maksimovic .Fundamentals of Power Electronics., Springer International Edition, 2005 Course Material on Switched Mode Power Conversion, V. Ramanarayanan.

References:
1. Krein P.T .Elements of Power Electronics., Oxford University Press
2. M.H.Rashid, Power Electronics. Prentice-Hall of India

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PGE-IV.3: ENERGY STORAGE TECHNOLOGIES

Prerequisite: Power Systems

Course Objectives:
- To know about the Demand for Energy Storage.
- To study the roles of electrical energy storage technologies in electricity.
- To analyze the features of energy storage systems.

Course Outcomes:
At the end of the course the student will be able to:
- Evaluate various techniques for storing electrical energy.
- Understand the features of storage systems and apply them for conventional power generation, grid operation & service.

UNIT-I:
THE ROLE OF ELECTRICAL ENERGY STORAGE TECHNOLOGIES IN ELECTRICITY USE: Characteristics of electricity, Electricity and the role 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, Emerging needs for EES, More renewable energy, less fossil fuel, Smart Grid uses, The role of electrical energy storage technologies, The role from the viewpoint of a utility, The role from the viewpoint of consumers, The role from the viewpoint of generators of renewable energy.

UNIT-II:
TYPES AND 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, Lead-Acid Batteries, Lithium-Ion Batteries, Flow batteries, Other Batteries in Development, Chemical energy storage, Hydrogen (H2), Synthetic natural gas (SNG), Electrical storage systems, Double-layer capacitors (DLC), Superconducting magnetic energy storage (SMES),Thermal storage systems, Standards for EES, Technical comparison of EES technologies.

UNIT-III:
APPLICATIONS OF EES: Present status of applications, Utility use (conventional power generation, grid operation & service), Consumer use (uninterruptable power supply for large consumers), EES installed capacity worldwide, New trends in applications, Renewable energy generation, Smart Grid, Smart Microgrid, Smart House, Electric vehicles,

UNIT-IV:
MANAGEMENT AND CONTROL HIERARCHY OF EES: 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.
DEMAND FOR ENERGY STORAGE: Growth in Variable Energy Resources, Relationship between balancing services and variable energy resources, Energy Storage Alternatives, Variable Generator Control, Demand Management, Market Mechanisms, Longer Term Outlook.
VALUATION TECHNIQUES: Overview, Energy Storage Operational Optimization, Market Price Method, Power System Dispatch Model Method, Ancillary Service Representation, Energy Storage Representation, Survey of Valuation Results.

UNIT-V:
FORECAST OF EES MARKET POTENTIAL BY 2030: EES market potential for overall applications, EES market estimation by Sandia National Laboratory (SNL), EES market estimation by the Boston Consulting Group (BCG), EES market estimation for Li-ion batteries by the Panasonic Group, EES

market potential estimation for broad introduction of renewable energies, EES market potential estimation for Germany by Fraunhofer, Storage of large amounts of energy in gas grids, EES market potential estimation for Europe by Siemens, EES market potential estimation by the IEA, Vehicle to grid concept, EES market potential in the future

TEXT BOOKS:

1. Techno-Economic Analysis of Different Energy Storage Technologies, Hussein Ibrahim and Adrian Ilinca
2. Energy Storage 2010th Edition, by Robert A. Huggins (Author), Springer
3. Energy Storage, Yves Brunet (Editor), May 2013, Wiley-ISTE
4. Energy Storage in Electric Power Grids ,by Benoît Robyns, Bruno François, Wiley

REFERENCES:

1. andreasoberhofer@gmx.de
2. www.ecofys.com/com/publications
3. www.iec.ch

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PGC-II: POWER ELECTRONICS AND DRIVES LAB

Course Objectives:

Upon successful completion of the lab students will be familiar with:

- Speed control techniques of DC and AC drives
- Gate drive circuit configurations for converter circuits
- Advanced converter topologies
- Open loop and closed loop speed control analysis of AC and DC drives

Course Outcomes:

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

- Know the speed control strategies of AC and DC drives
- Design speed, current controllers for AC and DC drives
- Get the knowledge on multi-level inverter/converter topologies
- Perform the open loop and closed loop speed control analysis of AC and DC drives
- Design the gate driver circuits for converter topologies
- Know the complete study of advanced converter technologies.

1. Speed control of separately excited DC Motor Drive with 1 quadrant chopper
2. Speed control of separately excited DC Motor Drive with 4 quadrant chopper.
3. Speed control of BLDC Motor Drive.
4. Multi-level inverter based AC Induction Motor Drive control equipment.
5. Speed control of 3-phase wound rotor Induction Motor Drive.
6. Speed control of 3-phase doubly fed Induction Motor Drive.
7. Speed control of 5-phase Induction Motor Drive.
8. Speed control of 3-phase Induction Motor Drive using V/F control.
9. Speed control of 3-phase Induction Motor Drive using Vector Control technique.
10. Speed Measurement and closed loop control using PMDC Motor Drive.
11. Speed measurement and closed loop control of PMDC Motor Drive with thyristor circuit.
12. Matrix Converter
13. Speed measurement and closed loop control of IGBT used single 4 quadrant chopper for PMDC Motor Drive.
14. Isolated Gate Drive circuits for MOSFET / IGBT based circuits.

Note: Any ten experiments can be conducted.

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PGC – III: POWER ELECTRONIC CONTROL OF AC DRIVES

Prerequisite: Power Electronics

Course Objectives:
- To understand principle operation of scalar control of ac motor and corresponding speed-torque characteristics
- To comprehend the vector control for ac motor drive (IM and SM)
- To explain the static resistance control and Slip power recovery drive
- To explain synchronous motor drive characteristics and its control strategies
- To comprehend the brushless dc motor principle of operation.

Learning Outcomes: After taking this course, student will be able to:
- Develop induction motor for variable speed operations using scalar and vector control techniques.
- Identify the difference between the rotor resistance control and static rotor resistance control method and significance of slip power recovery drives.
- Develop controllers for synchronous motor and variable reluctance motor.

UNIT-I: INTRODUCTION
Introduction to motor drives – Torque production – Equivalent circuit analysis – Speed – Torque Characteristics with variable voltage operation Variable frequency operation constant v/t operation – Variable stator current operation – Induction motor characteristics in constant torque and field weakening regions.

UNIT-II: STATOR SIDE CONTROL OF INDUCTION DRIVES
Scalar control – Voltage fed inverter control – Open loop volts/Hz control – speed control slip regulation – speed control with torque and flux control – current controlled voltage fed inverter drive – current – fed inverter control – Independent current and frequency control – Speed and flux control in Current –Fed inverter drive – Volts/Hz control of Current –fed inverter drive – Efficiency optimization control by flux program.

UNIT–III: ROTOR SIDE CONTROL OF INDUCTION DRIVES
Slip power recovery drives – Static Kramer Drive – Phasor diagram – Torque expression – speed control of Kramer Drive – Static Scheribus Drive – modes of operation.
Vector control of Induction Motor Drives: Principles of Vector control – Vector control methods – Direct methods of vector control – Indirect methods of vector control – Adaptive control principles – Self tuning regulator Model referencing control.

UNIT–IV: CONTROL OF SYNCHRONOUS MOTOR DRIVES
Synchronous motor and its characteristics – Control strategies – Constant torque angle control – Unity power factor control – Constant mutual flux linkage control.
Controllers: Flux weakening operation – Maximum speed – Direct flux weakening algorithm – Constant Torque mode controller – Flux Weakening controller – indirect flux weakening – Maximum permissible torque – speed control scheme – Implementation strategy speed controller design.

UNIT–V: VARIABLE RELUCTANCE MOTOR DRIVE
Variable Reluctance motor drive – Torque production in the variable reluctance motor Drive characteristics and control principles – Current control variable reluctance motor service drive.
BRUSHLESS DC MOTOR DRIVES: Three phase full wave Brushless dc motor – Sinusoidal type of Brushless dc motor- current controlled Brushless dc motor Servo drive.

TEXT BOOKS:

1. Electric Motor Drives Pearson Modeling, Analysis and control – R. Krishnan – Publications – 1st edition – 2002.
2. Modern Power Electronics and AC Drives B K Bose – Pearson Publications 1st edition
3. Power Electronics and Control of AC Motors – MD Murthy and FG Turn Bull Pergman Press 1st edition

REFERENCES:

1. Power Electronics and AC Drives – BK Bose – Prentice Hall Eagle wood diffs New Jersey - 1st edition
2. Power Electronic circuits Deices and Applications – M H Rashid – PHI – 1995.
3. Fundamentals of Electrical Drives – G. K. Dubey – Narora publications – 1995.

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PGE - V.1: DYNAMICS OF ELECTRICAL MACHINES

Prerequisite: Machine Modeling and Analysis

Course Objectives:
- To introduce generalized modeling electrical machines
- To analyze different electrical machines with dynamic modeling

Learning Outcomes: After taking this course, the student will be able to:
- Understand the basic mathematical analysis of electrical machines and its characteristics.
- Understand behavior of electrical machines under steady state and transient state.
- Understand dynamic modeling of electrical machines.

UNIT-I: BASIC MACHINE THEORY
Electromechanical Analogy – Magnetic Saturation – Rotating field theory – Operation of Inductor motor – equivalent circuit – Steady state equations of DC machines – operations of synchronous motor – Power angle characteristics

UNIT-II: ELECTRODYNAMICAL EQUATION & THEIR SOLUTIONS
Spring and Plunger system - Rotational motion – mutually coupled coils – Lagrange's equation – Application of Lagrange's equation solution of Electro dynamical equations.

UNIT-III: DYNAMICS OF DC MACHINES
Separately excited d.c. generations – stead state analysis – transient analysis – Separately excited d. c. motors – stead state analysis – transient analysis – interconnection of machines – Ward Leonard system of speed control.

UNIT-IV: INDUCTION MACHINE DYNAMICS
Induction machine dynamics during starting and braking – accelerating time – induction machine dynamic during normal operation – Equation for dynamical response of the induction motor.

UNIT-V: SYNCHRONOUS MACHINE DYNAMICS
Electromechanical equation – motor operation – generator operation – small oscillations – general equations for small oscillations – representation of the oscillation equations in state variable form.

TEXT BOOKS:
1. Sen Gupta D.P. and J.W " Electrical Machine Dynamics "Macmillan Press Ltd 1980.
2. Bimbhra P.S. "Generalized Theory of Electrical Machines " Khanna Publishers 2002.

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PGE - V.2: INTEGRATION OF ENERGY SOURCES

Prerequisite: Power Systems

Course Objectives:
Upon successful completion of the course the students will be familiar with:
- To introduce the characteristics of various types of renewable energy sources and converters.
- To explain the importance of storage and sizing of hybrid systems.
- To introduce the control issues of isolated systems.
- To explain the harmonics, power quality, voltage imperfections, power injection issues on the grid by integrating renewable energy sources.

Course Outcomes:
At the end of the course, the student should be able to:
- Identify the characteristics of renewable energy sources and converters.
- Analyze the importance of storage and sizing of hybrid systems.
- Realize the problems related to isolated systems.
- Analyze the challenges faced by the grid by integrating renewable energy sources.

UNIT- I:
REVIEW OF CHARACTERISTICS OF POWER SOURCES: Basic review of power generation from wind - Solar PV - Thermal - Small hydro - Biomass power strategies in each of these energy conversion systems - Review of maximum power point tracking techniques in solar PV and wind (perturb & observe, hill climbs, incremental conductance).

UNIT-II:
CONVERTER TOPOLOGIES: DC/DC converter (buck, boost, buck boost) - DC/AC inverters (sine, triangular, PWM techniques) - Phase locked loop for inverters.

UNIT-III:
HYBRID SYSTEMS: Advantages of hybrid power systems - Importance of storage in hybrid power systems - Design of hybrid power system based on load curve - Sizing of hybrid power systems.

UNIT-IV:
ISOLATED SYSTEMS: Control issues in isolated systems for voltage and frequency - Small signal stability in isolated power systems - Importance of storage and dump load in isolated systems.

UNIT-V:
ISSUES IN INTEGRATION OF RENEWABLE ENERGY SOURCES: Overview of challenges in integrating renewable sources to the grid - Impact of harmonics on power quality - Need to maintain voltage within a band and fluctuations in voltage because of renewable integration - Power inverter and converter technologies - Mechanism to synchronize power from renewable sources to the grid - Overview of challenges faced in designing power injection from offshore generation sources - Challenges in modeling intermittent nature of renewable power in a power system.

TEXT BOOKS:
1. Power Electronics, Converters, Applications and Design" by N. Mohan; T.M. Undeland; W.P. Robbins. 1995, John Wiley and Sons.
2. Renewable Energy Integration Challenges and Solutions Series: Green Energy and Technology Hossain, Jahangir,Mahmud, Apel (Eds.)
3. Integration of Alternative Sources of Energy Felix A. Farret, M. Godoy Simões, December 2005, Wiley-IEEE Press.

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PGE - V.3: SMART GRID TECHNOLOGIES

Prerequisite: None

Course Objectives:
- To group various aspects of the smart grid,
- To defend smart grid design to meet the needs of a utility
- To select issues and challenges that remain to be solved
- To analyze basics of electricity, electricity generation, economics of supply and demand, and the various aspects of electricity market operations in both regulated and deregulated environment.

Course Outcomes: Upon the completion of this course, the student will be able to
- Analyze the structure of an electricity market in either regulated or deregulated market conditions.
- know the advantages of DC distribution and developing technologies in distribution
- Discriminate the trade-off between economics and reliability of an electric power system.
- Differentiate various investment options (e.g. generation capacities, transmission, renewable, demand-side resources, etc) in electricity markets.
- Analyze the development of smart and intelligent domestic systems.

UNIT–I: INTRODUCTION
Introduction to smart grid - Electricity network - Local energy networks- Electric transportation - Low carbon central generation - Attributes of the smart grid - Alternate views of a smart grid.
SMART GRID TO EVOLVE A PERFECT POWER SYSTEM: Introduction- Overview of the perfect power system configurations- Device level power system- Building integrated power systems- Distributed power systems- Fully integrated power system-Nodes of innovation.

UNIT–II: DC DISTRIBUTION AND SMART GRID
AC Vs DC sources-Benefits of and drives of DC power delivery systems - Powering equipment and appliances with DC-Data centers and information technology loads - Future neighborhood-Potential future work and research.
INTELLIGRID ARCHITECTURE FOR THE SMARTGRID: Introduction- Launching intelli-grid –Intelli-grid today - Smart grid vision based on the intell-igrid architecture-Barriers and enabling technologies.

UNIT–III: DYNAMIC ENERGY SYSTEMS CONCEPT
Smart energy efficient end use devices-Smart distributed energy resources - Advanced whole building control systems- Integrated communications architecture - Energy management-Role of technology in demand response- Current limitations to dynamic energy management-Distributed energy resources-Overview of a dynamic energy management-Key characteristics of smart devices- Key characteristics of advanced whole building control systems-Key characteristics of dynamic energy management system.

UNIT–IV: ENERGY PORT AS PART OF THE SMART GRID:
Concept of energy - Port, generic features of the energy port.
POLICIES AND PROGRAMS TO ENCOURAGE END – USE ENERGY EFFICIENCY: Policies and programs in action - multinational - national-state-city and corporate levels.
MARKET IMPLEMENTATION: Framework-factors influencing customer acceptance and response - program planning - monitoring and evaluation.

UNIT–V: EFFICIENT ELECTRIC END–USE TECHNOLOGY ALTERNATIVES
Existing technologies – lighting - Space conditioning - Indoor air quality - Domestic water heating - hyper efficient appliances - Ductless residential heat pumps and air conditioners - Variable refrigerant flow air conditioning-Heat pump water heating - Hyper efficient residential appliances - Data center energy efficiency- LED street and area lighting - Industrial motors and drives - Equipment retrofit and replacement - Process heating - Cogeneration, Thermal energy storage - Industrial energy

management programs - Manufacturing process-Electro-technologies, Residential, Commercial and industrial sectors.

TEXT BOOKS:

1. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response”- CRC Press, 2009.
2. Jean Claude Sabonnadière, NouredineHadjsaïd, “Smart Grids”, Wiley-ISTE, IEEE Press, May 2012

REFERENCES:

1. Janaka Ekanayake, KithsiriLiyanage, Jianzhong.Wu, Akihiko Yokoyama, Nick Jenkins, “Smart Grid: Technology and Applications”- Wiley, 2012.
2. James Momoh, “Smart Grid: Fundamentals of Design and Analysis” - Wiley, IEEE Press, 2012.

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PGE - VI.1: AI TECHNIQUES AND APPLICATIONS TO ELECTRICAL ENGINEERING

Prerequisite: None

Course Objectives:
- To locate soft commanding methodologies, such as artificial neural networks, Fuzzy logic and genetic Algorithms.
- To observe the concepts of feed forward neural networks and about feedback neural networks.
- To practice the concept of fuzziness involved in various systems and comprehensive knowledge of fuzzy logic control and to design the fuzzy control
- To analyze genetic algorithm, genetic operations and genetic mutations.

Course Outcomes: Upon the completion of this course, the student will be able to
- Understand feed forward neural networks, feedback neural networks and learning techniques.
- Understand fuzziness involved in various systems and fuzzy set theory.
- Develop fuzzy logic control for applications in electrical engineering
- Develop genetic algorithm for applications in electrical engineering.

UNIT – I: ARTIFICIAL NEURAL NETWORKS
Introduction-Models of Neural Network - Architectures – Knowledge representation – Artificial Intelligence and Neural networks – Learning process – Error correction learning – Hebbian learning – Competitive learning – Boltzmann learning – Supervised learning – Unsupervised learning – Reinforcement learning - learning tasks.

UNIT- II: ANN PARADIGMS
Multi – layer perceptron using Back propagation Algorithm-Self – organizing Map – Radial Basis Function Network – Functional link, network – Hopfield Network.

UNIT – III: FUZZY LOGIC
Introduction – Fuzzy versus crisp – Fuzzy sets - Membership function – Basic Fuzzy set operations – Properties of Fuzzy sets – Fuzzy Cartesian Product – Operations on Fuzzy relations – Fuzzy logic – Fuzzy Quantifiers - Fuzzy Inference - Fuzzy Rule based system – De-fuzzification methods.

UNIT – IV: GENETIC ALGORITHMS
Introduction-Encoding – Fitness Function-Reproduction operators - Genetic Modeling – Genetic operators - Crossover - Single–site crossover – Two-point crossover – Multi point crossover-Uniform crossover – Matrix crossover - Crossover Rate - Inversion & Deletion – Mutation operator –Mutation – Mutation Rate-Bit-wise operators-Generational cycle-convergence of Genetic Algorithm.

UNIT–V: APPLICATIONS OF AI TECHNIQUES
Load forecasting – Load flow studies – Economic load dispatch – Load frequency control – Single area system and two area system – Small Signal Stability (Dynamic stability) Reactive power control – speed control of DC and AC Motors.

TEXT BOOKS:
1. S.Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic & Genetic Algorithms”- PHI, New Delhi, 2003.

REFERENCES:
1. P.D.Wasserman,Van Nostrand Reinhold,’”Neural Computing Theory & Practice”, New York,1989.
2. Bart Kosko, “Neural Network & Fuzzy System”, Prentice Hall, 1992.
3. G.J.Klir and T.A.Folger, “Fuzzy sets, Uncertainty and Information”, PHI, Pvt.Ltd,1994.
4. D.E.Goldberg, “Genetic Algorithms”, Addison Wesley 1999.

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PGE - VI.2: SOLAR PHOTO VOLTAIC SYSTEMS

Pre-requisite: None

OBJECTIVES: Objectives of this course are
- To introduce photovoltaic systems
- To deal with various technologies of solar PV cells
- To understand details about manufacture, sizing and operating techniques
- To have knowledge of design considerations.

OUTCOMES:
After this course, the student will be able to
- Identify photovoltaic system components and system types
- Calculate electrical energy and power
- Correctly size system components, design considerations of solar equipment
- Design a basic grid-tie PV system.

UNIT – I
SOLAR ENERGY: Sun and Earth, Solar Spectrum, Solar Geometry, Solar radiation on horizontal and inclined planes, Instruments for measurement of solar radiation ,Solar cell, Equivalent circuit, V-I characteristics, Performance improvement.

UNIT – II
SOLAR CELLS: Manufacture of Solar Cells-Technologies, Design of Solar cells, Photovoltaic modules, Design requirements, encapsulation systems, manufacture, power rating, hotspot effect, Design qualifications.

UNIT – III
PROTECTION AND MEASUREMENTS: Flat plate arrays, support structures, module interconnection and cabling, lightning protection, Performance measurement – using natural sun light and simulator, determination of temperature coefficients, internal series resistance, curve correction factor.

UNIT - IV
PHOTOVOLTAIC SYSTEMS: Photovoltaic systems- types- general design considerations- system sizing-battery sizing- inverter sizing-design examples – Balance of PV systems.

UNIT – V
MAXIMUM POWER POINT TRACKERS: Maximum power point trackers-algorithms- perturb and observe-incremental conductance method, hill climbing method, , hybrid and complex methods, data based and other approximate methods, instrument design, other MPP techniques-Grid interactive PV system.

TEXT BOOKS:
1. Generating electricity from Sun, F.C.Treble, Pergamon Press
2. Photvolatic systems: Analysis and design, A.K.Mukherjee, Nivedita Thakur, PHI 2011
3. Solar Photovoltaics: Fundamentals, Technologies and applications, C.S.Solanki, PHI, 2009

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PGE - VI.3: HYBRID ELECTRIC VEHICLES

Pre-requisites:
1. Control Systems Engineering – I.
2. Electrical Machines-I.
3. Electrical Machines-II.
4. Power Electronics

Course Objectives:
Objectives of this course are to:
- Introduce the fundamental concepts, principles, analysis and design of hybrid and electric vehicles
- Introduce the various aspects of hybrid and electric drive train such as their configuration, types of electric machines that can be used, energy storage devices, etc.

Course Outcomes:
After this course, the student will be able to
- Get knowledge on hybrid electric vehicles
- Compare the advantages and disadvantages of hybrid electric vehicles over conventional vehicles
- Compare the merits and demerits of hybrid electric trains over electrical trains
- Know the different energy storage techniques
- Discuss the electric population, motor drive technologies
- Analyze the different types of energy management strategies

UNIT-I:
Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies.
Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, and mathematical models to describe vehicle performance.

UNIT-II:
Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.
Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis.

UNIT-III:
Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT-IV:
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.
Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT-V:

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

TEXT BOOKS:

1. Iqbal Hussein, Electric and Hybrid Vehicles: Design fundamentals, CRC Press, 2003.
2. MehrdadEhsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press, 2004.

REFERENCES:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, 2003.
2. Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

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PG-OE.1: POWER QUALITY

Prerequisite: Power Systems

Course Objectives:
- To Study the basics of power quality , power quality problems and power quality standards,
- To Study about the characteristics of non-linear loads
- To Study Voltage, Current, Power and Energy measurements and analysis methods of Laplace's, Fourier and Hartley and Wavelet Transforms
- To Study the analysis and conventional mitigation methods
- To Study about various devices used to enhance power quality.

Course Outcomes: After taking this course, the student will be able to:
- Know the different characteristics of electric power quality in power systems,
- Learn about the applications of non-linear loads ,
- Know the applications of Hartley and Wavelet Transforms ,
- Learn how to mitigate the power quality problems
- Learn about the application of FACTS device on DG side.

UNIT-I: INTRODUCTION
Introduction of the Power Quality (PQ) problem, Terms used in PQ: Voltage, Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring.

UNIT-II: LONG & SHORT INTERRUPTIONS
Interruptions – Definition – Difference between failures, outage, Interruptions – causes of Long Interruptions – Origin of Interruptions – Limits for the Interruption frequency – Limits for the interruption duration – costs of Interruption – Overview of Reliability evaluation to power quality, comparison of observations and reliability evaluation.
Short interruptions: definition, origin of short interruptions, basic principle, fuse saving, voltage magnitude events due to re-closing, voltage during the interruption, monitoring of short interruptions, difference between medium and low voltage systems. Multiple events, single phase tripping – voltage and current during fault period, voltage and current at post fault period, stochastic prediction of short interruptions.

UNIT III: SINGLE AND THREE-PHASE VOLTAGE Sag CHARACTERIZATION
Voltage sag – definition, causes of voltage sag, voltage sag magnitude, and monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, and voltage sag duration.
Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT-IV: POWER QUALITY CONSIDERATIONS IN INDUSTRIAL POWER SYSTEMS
Voltage sag – equipment behavior of Power electronic loads, induction motors, synchronous motors, computers, consumer electronics, adjustable speed AC drives and its operation. Mitigation of AC Drives, adjustable speed DC drives and its operation, mitigation methods of DC drives.

UNIT-V: MITIGATION OF INTERRUPTIONS & VOLTAGE SAGS
Overview of mitigation methods – from fault to trip, reducing the number of faults, reducing the fault clearing time changing the power system, installing mitigation equipment, improving equipment immunity, different events and mitigation methods. System equipment interface – voltage source converter, series voltage controller, shunt controller, combined shunt and series controller.
Power Quality and EMC Standards:
Introduction to standardization, IEC Electromagnetic compatibility standards, European voltage characteristics standards, PQ surveys.

TEXT BOOKS:

1. “Understanding Power Quality Problems” by Math H J Bollen. IEEE Press.
2. “Power Quality VAR Compensation in Power Systems”, R. SastryVedam Mulukutla S. Sarma,CRC Press.

REFERENCES:

1. Power Quality, C. Sankaran, CRC Presss.
2. Electrical Power Systems Quality, Roger C. Dugan , Mark F. Mc Granaghan, Surya Santoso, H. Wayne Beaty, Tata McGraw Hill Education Private Ltd.

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PG-OE.2: PROGRAMMABLE LOGIC CONTROLLERS AND APPLICATIONS

Prerequisite: None

Course Objectives:

- To provide and ensure a comprehensive understanding of using advanced controllers in measurement and control instrumentation.
- To illustrate about data acquisition - process of collecting information from field instruments.
- To analyze Programmable Logic Controller (PLC), IO Modules and internal features.
- To Comprehend Programming in Ladder Logic, addressing of I/O.
- To apply PID and its Tuning.

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

- Describe the main functional units in a PLC and be able to explain how they interact.
- They should know different bus types used in automation industries.
- Development of ladder logic programming for simple process.

UNIT-I:

PLC Basics PLC system, I/O modules and interfacing CPU processor programming equipment programming formats, construction of PLC ladder diagrams, devices connected to I/O modules.

UNIT-II:

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation.

Digital logic gates programming in the Boolean algebra system, conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT-III:

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters counter function industrial applications, Architecture functions, Number comparison functions, number conversion functions.

UNIT-IV:

Data handling functions: SKIP, Master control Relay Jump Move FIFO, FAL, ONS, CLR and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT-V:

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing , analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning, PID functions

TEXT BOOKS:

1. Programmable Logic Controllers – Principle and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI
2. Digital Design by Morris Mano, PHI, 3rd Edition 2006.

REFERENCES:

1. Programmable logic Controllers, Frank D. Petruzella, 4th Edition, McGraw Hill Publishers.
2. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth & F.D Hackworth Jr. – Pearson, 2004.
3. Programmable logic controllers and their Engineering Applications, 2nd Edition, Alan J. Crispin.

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PG-OE.3: ENERGY EFFICIENT TECHNOLOGIES

Prerequisite: Power Systems

Course Objectives:
- To have basic concepts of Electrical systems, motors, generating systems.
- To illustrate the application of Electrical systems in PF improvement scheme
- To illustrate the application of pumps and pumping system.

Course Outcomes:
Upon the completion of this course, the student will be able to
- Understand the advantages of Electrical system and its basic components.
- Understand the implementation of Energy Efficient Technologies in Electrical Systems

UNIT-I:
ELECTRICAL SYSTEM: Electricity billing, Electrical Load Management and maximum demand control, Power factor improvement and its benefit, Selection and location of capacitors, Performance assessment of PF capacitors, Distribution and Transformer losses.

UNIT-II:
ELECTRIC MOTORS: Types, Losses in Electric Motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.
LIGHTING SYSTEM: Light source, choice of lighting, luminance requirements, and energy conservation avenues. Energy efficient lightning controls, comparison of sodium vapor, halogen, CFL and LED lamps.

UNIT-III:
COMPRESSED AIR SYSTEM: Types of air compressors, compressor efficiency, efficient compressor operation, compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities.
HVAC AND REFRIGERATION SYSTEM: Vapor compression refrigeration cycle, refrigerants, coefficient of performance, capacity, factors affecting refrigeration and air-conditioning system performance and saving opportunities, vapor absorption refrigeration system - working principle, types and comparison with vapor compression system, saving potential Fans and Blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.

UNIT-IV:
PUMPS AND PUMPING SYSTEM: TYPES, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.
COOLING TOWER: Types and performance evaluation, efficient system operation, flow control strategies, energy saving opportunities, Assessment of cooling tower.

UNIT-V:
DIESEL GENERATING SYSTEM: Factors affecting selection, energy performance assessment of diesel conservation avenues.
ENERGY EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS: Maximum Demand Controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers, electronic ballast, occupancy sensors, energy saving potential of each technology. Calculation of energy frequency ratio in the performance of star ratings.

TEXT BOOKS:

1. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists,Logman Scientific & Technical, ISBN-0-582-03184, 1990.
2. Reay D.A, Industrial Energy Conservation, 1stedition, Pergamon Press, 1977.

REFERENCE:

1. Larry C Whitetal, Industrial Energy Management & Utilization.
2. Power System Engineering 2nd Ed. D P Kothari, I J Nagrath, Tata McGraw-Hill Co 2008
3. Bureau of Energy Efficiency (BEE) : www.bee-india.nic.in
4. The Energy and Resource Institute (TERI): http://www.teriin.org/
5. Energy Efficiency for Engineers and Technologists, First Edition, 1990, by TD Eastop and DR Croft, Longman Group UK Ltd.
6. Industrial Energy Management and Utilization, 1988, by LC Wittie, P S Schmidt and D R Brown, Hemisphere Publishing Company. 3. Energy Management Hand Book, Third Edition, 1997, by W C Turner, the Fairmont Press Inc.
7. www.bee-india.nic.in (Guide on Energy Efficient room Air conditioners)

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PG-OE.4: OPTIMIZATION TECHNIQUES

Prerequisite: None

Course Objectives:
- To understand the theory of optimization methods and algorithms developed for solving various types of optimization problems.
- To develop an interest in applying optimization techniques in problems of Engineering and Technology
- To apply the mathematical results and numerical techniques of optimization theory to concrete Engineering problems.

Course Outcomes:
Upon the completion of this course, the student will be able to
- Know basic theoretical principles in optimization
- formulate optimization models and obtain solutions for optimization;
- apply methods of sensitivity analysis and analyze post processing of results

UNIT – I
INTRODUCTION AND CLASSICAL OPTIMIZATION TECHNIQUES:
Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.
CLASSICAL OPTIMIZATION TECHNIQUES
Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints.
Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints – Kuhn – Tucker conditions.

UNIT – II
LINEAR PROGRAMMING
Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT – III
TRANSPORTATION PROBLEM
Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.
UNCONSTRAINED NONLINEAR PROGRAMMING:
One – dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method

UNIT – IV
UNCONSTRAINED OPTIMIZATION TECHNIQUES
Univariate method, Powell's method and steepest descent method.

CONSTRAINED NONLINEAR PROGRAMMING:
Characteristics of a constrained problem, Classification, Basic approach of Penalty Function method; Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

UNIT – V

DYNAMIC PROGRAMMING:

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

TEXT BOOKS:

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research" by H.S. Kasene & K.D. Kumar, Springer (India), Pvt .LTd.

REFERENCES:

1. "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mital and C. Mohan, New Age International (P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research – by Dr. S.D.Sharma.
3. "Operations Research: An Introduction" by H.A. Taha, PHI Pvt. Ltd., 6th edition
4. Linear Programming by G. Hadley

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PG-OE.5: ENERGY GENERATION FROM WASTE

Prerequisite: None

Course Objectives:
- To understand the theory of Nonconventional energy sources.
- To develop an interest in applying energy generation from waste and solve problems of Engineering and Technology.

Course Outcomes:
Upon the completion of this course, the student will be able to
- Apply fundamental knowledge of NCPG to Generate Energy from Waste.
- Solve some related practical problems**.**
- Understand or become aware of various failures, causes of failures and remedies for failures in practical systems

UNIT-I:
Solid Waste Sources Solid Waste Sources, types, composition, Properties, Global warming, Municipal Solid Waste: Physical, chemical and biological properties , Waste Collection and, Transfer stations, Waste minimization and recycling of municipal waste, Segregation of waste, Size Reduction , Managing Waste. Status of technologies for generation of Energy from Waste Treatment and Disposal Aerobic composting, incineration, Furnace type and design, Medical waste /Pharmaceutical waste treatment Technologies, incineration, Environmental impacts, Measures to mitigate environmental effects due to incineration .

UNIT-II:
Land Fill method of Solid waste disposal Land fill classification, Types, methods and Sitting consideration, Layout and preliminary design of landfills: Composition, characteristics, generation, Movement and control of landfill leach ate and gases, Environmental monitoring system for land fill gases.

UNIT-III:
Energy Generation from Waste Bio-chemical Conversion: Sources of energy generation, anaerobic digestion of sewage and municipal wastes, direct combustion of MSW-refuse derived solid fuel, Industrial waste, agro residues, Anaerobic Digestion.

UNIT-IV:
Biogas production, Land fill gas generation and utilization, Thermo-chemical conversion: Sources of energy generation, Gasification of waste using Gasifiers, Briquetting, Utilization and advantages of briquetting, Environmental benefits of Bio-chemical and Thermo- chemical conversion.

UNIT–V:
E-waste: e-waste in the global context – Growth of Electrical and Electronics Industry in India – Environmental concerns and health hazards – Recycling e-waste: a thriving economy of the unorganized sector – Global trade in hazardous waste – impact of hazardous e-waste in India. Management of e-waste: e-waste legislation, Government regulations on e-waste management – International experience – need for stringent health safeguards and environmental protection laws of India.

TEXT BOOKS:
1. Nicholas P. Cheremisinoff. Handbook of Solid Waste Management and Waste Minimization Technologies. An Imprint of Elsevier, New Delhi (2003).
2. P. Aarne Vesilind, William A. Worrell and Debra R. Reinhart. Solid Waste Engineering. Thomson Asia Pte Ltd. Singapore (2002)

3. M. Dutta , B. P. Parida, B. K. Guha and T. R. Surkrishnan. Industrial Solid Waste Management and Landfilling practice. Narosa Publishing House, New Delhi (1999).
4. "E-waste in India: Research unit, Rajya Sabha Secretariat, New Delhi, June 2011"
5. Amalendu Bagchi. Design, construction and Monitoring of Landfills. John Wiley and Sons. New York. (1994)
6. M. L. Davis and D. A. Cornwell. Introduction to environmental engineering. Mc Graw Hill International Edition, Singapore (2008)
7. C. S. Rao. Environmental Pollution Control Engineering. Wiley Eastern Ltd. New Delhi (1995)
8. S. K. Agarwal. Industrial Environment Assessment and Strategy. APH Publishing Corporation. New Delhi (1996)
9. Sofer, Samir S. (ed.), Zaborsky, R. (ed.), "Biomass Conversion Processes for Energy and Fuels", New York, Plenum Press, 1981
10. Hagerty, D.Joseph; Pavoni, Joseph L; Heer, John E., "Solid Waste Management", New York, Van Nostrand, 1973
11. George Tchobanoglous, Hilary Theisen and Samuel Vigil Prsl: Tchobanoglous, George Theisen, Hillary Vigil, Samuel, "Integrated Solid Waste management: Engineering Principles and Management issues", New York, McGraw Hill, 1993.

REFERENCES:

1. C Parker and T Roberts (Ed), Energy from Waste - An Evaluation of Conversion Technologies, Elsevier Applied Science, London, 1985
2. KL Shah, Basics of Solid and Hazardous Waste Management Technology, Prentice Hall, 2000 3. M Datta, Waste Disposal in Engineered Landfills, Narosa Publishing House, 1997
3. G Rich et.al, Hazardous Waste Management Technology, Podvan Publishers, 1987
4. AD Bhide, BB Sundaresan, Solid Waste Management in Developing Countries, INSDOC, New Delhi,1983 FUEL CELL AND
5. **Google books:**
   (i) e-waste Management: From waste to Resource Klaus Hieronymi, Ramzy Kahnat, Eric williams Tech. & Engg.-2013(Publisher: Earthscan 2013).
   (ii) What is the impact of E-waste: Tamara Thompson
   (iii) E-waste poses a Health Hazard: Sairudeen Pattazhy
6. **Web links :**
   www.unep.org
   www.routledge.com
   www.amazon.com
   www.bookdepository.com
   www.ecoactiv.com

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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

- Understand various types of dielectric materials, their properties in various conditions.
- Evaluate magnetic materials and their behavior.
- Evaluate semiconductor materials and technologies.
- 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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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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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.
7. Robert H Carver, Doing Data Analysis with SPSS, Cengage, 2013

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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)

REFERENCES:

- Hitt & Ireland and Manikutty," Strategic Management: A South Asian Perspective": Cengage Learning, 9e, 2012
- Mital; Cases in Strategic Management; 3rdEdition, TMH, 2015.
- Mason A Carpenter et al."Strategic Management: A dynamic Perspective"Pearson,2e, 2012.
- 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.

References:

1. Lusch, Dunne, Carver, Introduction to Retailing, 7th Edition, Cengage Learning, 2013.
2. **Suja Nair**, Retail Management, Himalaya Publication House, 2012.
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

1. John E.G.Bateson, K.Douglas Hoffman : Services Marketing, Cengage Learning, Fourth Edition, 2012.
2. Harsh V.Varma: Services Marketing text and cases, Pearson, Second edition, 2012.
3. Ravi Shanker : Services Marketing - The Indian Prespective, Excel Books, 2011.
4. Vinnie Jauhari, Kirti Dutta: Services- Marketing, Operations and Management, Oxford University Press,2012.
5. Govind Apte : Services Marketing, Oxford Press, 2011.
6. Christoper lovelock,Jochen wirtz, Jayanta Chatterjee, Services Marketing, 7th edition Pearson 2013.
7. K.Rama Mohan Rao, Services Marketing, 2nd edition Pearson, 2011.
8. Dr. S. Shajahan, Services Marketing, 2nd edition, HPH, 2012.
9. Ramneek Kapoor, Justin Paul, Biplab Halder, Services Marketing Concepts and Practices, TMH, 2011.
10. Rajendra Nargundkar, Services Marketing, , 3rd edition, TMH,2012.
11. R. Srinivasan, Services Marketing the Indian context, 3rd edition, PHI,2012.
12. Dr. B. Balaji, Services Marketing and Management, S.Chand, 2012.
13. Steve Baron, Kim Harris and Toni Hilton, Services Marketing text and cases, Macmillan, 2009.
14. Nimit Chowdhary, Monika Chowdhary, textbook of Marketing of Service the Indian Experience, Macmillian, 2013.

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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.**

References

1. Svend Hollensen, Madhumita Benerjee-Global Marketing-4th Edition- Pearson-2010.
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.
9. Rathor, Jani,Rathor- International Marketing-4th edition- HPH-2011

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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.**

References:
1. Adrian Thornhill,Phil Lewis,Mike Millmore. Mark N K Saunders "Managing change", Pearson,2011.
2. John Hayes " The Theory and Practice of Change Management", Palgrave,2012.
3. Robert A Paton "Change Management" 3e , Sage Publications ,2012.
4. Palmer Dunford 'Managing Organizational Change" TMH,2012.
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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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.