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AR-18

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ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2018-2019)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT
(AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC,
Recognised under 2(f)12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada
K.Kotturu, Tekkali, Srikakulam-532 201, Andhra Pradesh.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT (AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC, Recognized under 2(f) and 12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada.
K.Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh

Academic Regulations 2018 (AR18) for B. Tech.
(Effective for the students admitted into I year from the **Academic Year 2018-2019** and onwards)

1.   Award of B.Tech. Degree:

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

(i)   Pursued a course of study for not less than four academic years and not more than eight academic years.
(ii)   Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 160 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2.   Courses of study:

The following courses of study are offered at present with specialization in the B.Tech. Course.

Sl. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology

And any other course as approved by the authorities of the University from time to time.

3.   Credits (Semester system from I year onwards):

Sl. No	Course	Credits
1	Theory Course	2/3/4
2	Interdisciplinary Electives	02
3	Laboratory Course	1.5
4	Internship	1.5
5	Employability skills	1.5
6	Minor Project	2/3
7	Project	07

4.   Interdisciplinary Electives:

There is one interdisciplinary elective in each semester from 2-2 Semester to 4-1 semester. The student can choose one interdisciplinary elective of respective semester. The pattern of Midterm examinations and end examinations of these courses is similar to regular theory courses and the valuation is purely internal.

6.   MOOCs:

Explore all possibilities to run at least one subject in every semester from 2-1 semester onwards as a MOOCs.

7.   Evaluation Methodology:

The performance of a student in each semester shall be evaluated subject wise with a maximum of **100** marks for theory course, laboratory and other courses. The project work shall be evaluated for **200** marks.

6.1   Theory course:

For theory courses the distribution shall be **40** marks for internal midterm evaluation and**60** marks for the External End Examinations. Out of **40** internal midterm marks: **25** marks are allotted for descriptive exam, **10**marks for two assignments or one case study (group wise), and **5** marks for objective test.

Pattern for Internal Midterm Examinations (30 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive   exam is to be held for **30** marks with the duration of **90** minutes.

For final calculation of internal marks, weightage of **70%** will be given to the student who performed well either in first Midterm or second Midterm and **30%** weightage will be given to other Midterm examinations.

Midterm paper contains three descriptive type questions with internal choice. Each question carries **10** marks (3×10=30M) and scale down to **25** marks. The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for **60** marks. There shall be one question from each unit with internal choice. Each question carries **12** marks. Each course shall consist of five units of syllabus. The student should answer total **5** questions. (5x12M=60M)

6.2   Laboratory Course:

(i)   For practical subjects there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal: **25** marks for day to day work, **5** marks for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

(ii)   For the course Engineering Graphics and Design, the distribution shall be **40** marks for internal evaluation (**20** marks for day–to–day work, and **20** marks for internal tests) and 60 marks for end examination.

For award of marks for internal tests weightage of **70%** will be given to the student who performed well either in first test or second test and **30%** weightage will be given to other test.

7.3   Minor Project:

Out of a total of **100** marks for the minor project work **40** marks shall be for internal evaluation and **60** marks for end semester examination. The end semester examination (Viva-Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the department and supervisor of the minor project. The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her project, which was evaluated by internal committee. Out of **40** internal marks **10** marks allotted for literature survey, **15** marks for results and analysis and **15** marks for seminar.

7.4   Project:

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and **120** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of **80** internal marks - **20** marks allotted for literature survey, **30** marks for results and analysis, **15** marks for first seminar (usually after 8 weeks) and **15** marks for second seminar (at the end of semester).

7.5   Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry anyCredits. The list of mandatory courses is shown below:

> ➢   Induction Program
> ➢   Constitution of India
> ➢   Environmental sciences

7.6   Employability Skills:

Employability skills shall be evaluated for **100** marks. **40** marks for day-to-day evaluation and **60** marks on the basis of end (internal) examination.   There is no external examination for employability skills. It will be evaluated in IV-I semester.

7.7 Internship:

All the students shall undergo the internship period minimum of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **100** marks consists of **40** marks for internal assessment and **60** marks for end examination.

Internal assessment for **40** marks shall be done by the internship supervisor. Semester end examination (Viva – Voce) for **60** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

For a few merit students, internship for six months will be allowed based on their performance in academics. Those who want to go for internship for six months are requiredto intimate the same to the college through proper channel at the end of III-II semester and they require completing all the subjects of IV B.Tech.either in IV-I Semester or IV-II Semester. However, project will be evaluated only in IV-II Semester.

7. Attendance Requirements:

(i)   A student shall be eligible to appear for End Semester examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.
(ii)   Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons and shall be approved by a committee duly appointed by the college. The condonation approved otherwise it can be reviewed by the College academic committee.
(iii)   A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.
(iv)   Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.
(v)   Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
(vi)   A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

8. Minimum Academic Requirements:

8.1 Conditions for pass and award of credits for a course:

(i)   A candidate shall be declared to have passed in individual course if he/she secures a minimum of **40%** aggregate marks i.e**40** out of **100** (Internal & Semester end examination marks put together), subject to a minimum of **35%** marks i.e**21** marks out of **60** in semester end examination.
(ii)   On passing a course of a programme, the student shall earn assigned credits in that Course.

8.2 Method of Awarding Letter Grades and Grade Points for a Course:

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.TechProgramme

Percentage	Grade Points	Letter Grade
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

8.3   Calculation of Semester Grade Points Average (SGPA)* for semester:

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \text{ (for all courses passed in semester)}$$

Where CR = Credits of a Course
        GP = Grade points awarded for a course
 *SGPA is calculated for the candidates who passed all the courses in that semester.

8.4   Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for entire programme:

The CGPA is calculated as below:
$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \text{ (For entire programme)}$$
Where CR = Credits of a course
        GP = Grade points awarded for a course

Table: Award of Divisions:

CGPA	DIVISION
≥ 7.5 (with single attempt)	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and <6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

Equivalence percentage = (CGPA -0.5) $\times$ 10 %

8.5   Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

8.6 Conditions for Promotion:

(i)   A student will be promoted to second year, if he/she put up the minimum attendance requirement.

(ii)   A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if number credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii)   A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

9.   Course pattern:

(i)   The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii)   A student is eligible to appear for the end examination in a subject, but absent for it or failed in the end examinations may appear for that subject's **supplementary** examinations, when offered.

(iii)   When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

10.   Minimum Instruction Days:

The minimum instruction days for each semester shall be **95** clear instruction days.

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

12.   **General:**

(i)   Where the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".

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

(iii)   In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

(iv)   The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT: TEKKALI
SRIKAKULAM-532201, Andhra Pradesh (India)
Academic Regulations 2018 (AR18) for B. Tech. (Lateral Entry Scheme)
(Effective for the students admitted into II year from the **Academic Year 2019-2020** and onwards)

1. Award of B. Tech. Degree:

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

(i) Pursued a course of study for not less than three academic years and not more than six academic years.

(ii) Registered for **all** the credits of 2nd, 3rd and 4th year of respective branches and he/she must secure total credits of 2nd, 3rd and 4th year of respective branches.

Sl.No	Branch	Credits Required
01	Civil Engineering	118
02	Electrical and Electronics Engineering	120
03	Mechanical Engineering	120
04	Electronics and Communication Engineering	120
05	Computer Science and Engineering	119.5
06	Information Technology	119.5

Students, who fail to complete their three year Course of study within six years or fail to acquire the total credits for the award of the degree within **6** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

(i) A lateral entry student will be promoted to II year to III year if he puts up the minimum required attendance in II year.

(ii) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations , whether the candidate takes the examinations or not.

3. **All other regulations as applicable for B. Tech. Four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)**

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DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student 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 student 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.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or students 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 students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student 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 student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student 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.
3	If the student impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, 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 student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student 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	If the student 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 student 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 student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5	If the student 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	If the student 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 students 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	If the student leaves the exam hall taking away answer script or intentionally tears off 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 student 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 student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the student possesses 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 student 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 student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges inany malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the student 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 student 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 student has appeared including practical examinations and project work of that semester/year examinations.

Aditya Institute of Technology and Management, Tekkali
AR 18 – COURSE STRUCTURE

I-I B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
	18MCT101	Induction Program	3 weeks			0
1	18BST101	Linear Algebra & Calculus	3	1	0	4
2	18BST108	Chemistry	3	1	0	4
3	18EST101	Basic Electrical Engineering	3	1	0	4
4	18EET101	Professional Core – 1 (Switching Theory and Logic Design)	2	0	0	2
5	18ESL103	Workshop and Manufacturing practice	0	0	3	1.5
6	18BSL102	Chemistry Lab	0	0	3	1.5
7	18ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
		Total	**11**	**3**	**9**	**18.5**

I-II B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
	18MCT102	Environmental Science	3	0	0	0
1	18HST101	English	2	0	0	2
2	18BST102	Differential Equations & Transform Theory	3	1	0	4
3	18BST106	Applied Physics	3	1	0	4
4	18EST102	Programming for problem solving	3	0	0	3
5	18EET102	Professional Core – 2 (Electric Circuit Theory)	2	0	0	2
6	18ESL104	Engineering Graphics & Design	0	0	4	2
7	18HSL101	Language proficiency lab	0	0	3	1.5
8	18BSL101	Physics Lab	0	0	3	1.5
9	18ESL102	Programming for Problem Solving Lab	0	0	3	1.5
		Total	**16**	**2**	**13**	**21.5**

II-I B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
	18MCT203	Constitution of India	3	0	0	0
1	18BST204	Complex Variables & Statistical Methods	3	0	0	3
2	18EET203	Professional core – 3 (Electro Magnetic Field Theory)	3	0	0	3
3	18EET204	Professional core – 4 (Network Analysis and Synthesis)	3	1	0	4
4	18EET205	Professional core – 5 (Electronic Devices And Circuits)	3	0	0	3
5	18EET206	Professional core – 6 (Electrical Machines - I)	3	0	0	3
6	18EEL201	Professional Lab – 1 (Electronic Devices and Circuits Lab)	0	0	3	1.5
7	18EEL202	Professional Lab – 2 (Electrical Machines – I Lab)	0	0	3	1.5
		Total	**18**	**1**	**6**	**19**

II-II B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
1	18BST209	Biology	3	0	0	3
2	18EST103	Engineering Mechanics	3	1	0	4
3	18EET207	Professional core – 7 (Electrical Machines - II)	3	0	0	3
4	18EET208	Professional core – 8 (Power Systems-I)	3	0	0	3
5	18EET209	Professional core – 9 (Control Systems)	3	0	0	3
6	xxxxxx	Interdisciplinary Elective – I	2	0	0	2
7	18EEL203	Professional Lab – 3 (Electrical Machines –II Lab)	0	0	3	1.5
8	18EEL204	Professional Lab – 4 (Electrical Circuits Lab)	0	0	3	1.5
9	18EEL205	Professional Lab – 5 (Control Systems Lab)	0	0	3	1.5
		Total	**17**	**1**	**9**	**22.5**

III-I B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
1	18EET310	Professional core – 10 (Power Electronics)	3	0	0	3
2	18EET311	Professional core – 11 (Micro Processor and Micro Controllers)	3	0	0	3
3	18EET312	Professional core – 12 (Electrical Measurements)	3	0	0	3
4	18EET313	Professional core – 13 (Power Systems –II)	3	0	0	3
5	xxxxxx	Professional elective – I	3	0	0	3
6	xxxxxx	Interdisciplinary Elective – II	2	0	0	2
7	18EEL306	Professional Lab – 6 (Micro Processor and Micro Controllers Lab)	0	0	3	1.5
8	18EEL307	Professional Lab – 7 (Electrical Measurements Lab)	0	0	3	1.5
9	18EEP301	Minor Project-1	0	0	4	2
		Total	**17**	**0**	**10**	**22**

III-II B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
1	18EET314	Professional core – 14 (Switchgear and Protection)	3	0	0	3
2	18EET315	Professional core – 15 (Power System Analysis)	3	0	0	3
3	18EET316	Professional core – 16 (Industrial Automation)	3	0	0	3
4	xxxxxx	Professional elective – II	3	0	0	3
5	xxxxxx	Interdisciplinary Elective – III	2	0	0	2
6	18EEL308	Professional Lab – 8 (Power Electronics Lab)	0	0	3	1.5
7	18EEL309	Professional Lab – 9 (Industrial Automation Lab)	0	0	3	1.5
8	18HSL302	Professional Communication Skills Lab	0	0	3	1.5
9	18EEP302	Minor Project – 2	0	0	6	3
		Total	**14**	**0**	**15**	**21.5**

IV-I B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
1	18HST402	Human Values	2	0	0	2
2	18HST404	Managerial Economics & Management Science	3	0	0	3
3	xxxxxx	Professional elective – III	3	0	0	3
4	xxxxxx	Professional elective – IV	3	0	0	3
5	18EET417	Electrical Distribution Systems	3	0	0	3
6	xxxxxx	Interdisciplinary Elective – IV	2	0	0	2
7	18HSL406	Employability Skills	0	0	3	1.5
8	18EEL410	Professional Lab – 10 (Electrical Simulation Lab)	0	0	3	1.5
9	18EEL411	Professional Lab – 11 (Power Systems Lab)	0	0	3	1.5
		Total	**16**	**0**	**9**	**20.5**

IV-II B. Tech.

S.No	Subject Code	Theory/Lab	L	T	P	C
1	xxxxxx	Professional elective –V	3	0	0	3
2	xxxxxx	Professional elective –VI	3	0	0	3
3	18EEP403	Internship				1.5
4	18EEP404	Project				7
		Total	**6**	**0**	**0**	**14.5**

Total credits: 160

NOTE: L: Lecture   T: Tutorial   P: Practical

Professional Elective - I

Code	Subject
18EEE311	Integrated Circuits Applications
18EEE312	Principles of Pulse and Digital Circuits
18EEE313	Communication Theory

Professional Elective - II

Code	Subject
18EEE321	Principles of Signals &Systems
18EEE322	Special electrical machines
18EEE323	Instrumentation

Professional Elective - III

Code	Subject
18EEE431	Electric Drives
18EEE432	High Voltage DC Transmission
18EEE433	Flexible AC Transmission Systems

Professional Elective - IV

Code	Subject
18EEE441	Power System Operation and Control
18EEE442	High Voltage Engineering
18EEE443	Power Quality Management Systems

Professional Elective - V

Code	Subject
18EEE451	Utilization of Electrical Energy
18EEE452	Advanced Control Systems
18EEE453	Electrical Machine Design

Professional Elective - VI

Code	Subject
18EEE461	Digital Control Systems
18EEE462	Optimization Techniques
18EEE463	Non Conventional Energy Sources

Subject Code	Offered by Dept.	Interdisciplinary Elective I	Offered for Dept.
18IET211	BS&H	Transform Theory	MECH/CIVIL
18IET212	BS&H	Numerical Methods	ECE/EE
18IET213	BS&H	Computational Number Theory	CSE/IT
18IET214	CIVIL	Water Shed Management	MECH
18IET215	CIVIL	Computer aided engineering drawing	ECE/EEE/CSE/IT
18IET216	EEE	Introduction to mathematical simulation and modeling	ECE/MECH/CIVIL/CSE/IT
18IET217	MECH	Fundamentals of Material Science	ECE/EEE/CIVIL
18IET218	MECH	Engineering Optimization Techniques	CSE/IT
18IET219	ECE	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
18IET21A	CSE	UNIX Utilities	ECE/EEE/MECH/CIVIL/IT
18IET21B	IT	IT systems Management	ECE/EEE/MECH/CIVIL/CSE

Subject Code	Offered by Dept.	Interdisciplinary Elective II	Offered for Dept.
18IET321	BS&H	Fundamentals of Fuzzy Logic	All
18IET322	CIVIL	Fundamentals of building planning	MECH
18IET323	CIVIL	Remote Sensing	ECE/EEE/CSE/IT
18IET324	EEE	Renewable energy sources	ECE/MECH/CIVIL/CSE/IT
18IET325	MECH	Principles of Mechanical Measurements	ECE/EEE/CIVIL
18IET326	MECH	Linear programming and its applications	CSE/IT
18IET327	ECE	Principles of communications	EEE/MECH/CIVIL/CSE/IT
18IET328	CSE	JAVA Programming	ECE/EEE/MECH/CIVIL
18IET329	IT	PYTHON Programming	ECE/EEE/MECH/CIVIL/CSE

Subject Code	Offered by Dept.	Interdisciplinary Elective III	Offered for Dept.
18IET331	MBA	HRD & Organizational Behavior	All
18IET332	CIVIL	Environmental impact Assessment	ECE/EEE/MECH
18IET333	CIVIL	GPS & Survey Methods	CSE/IT
18IET334	EEE	Energy audit management and conservation	ECE/MECH/CIVIL/CSE/IT
18IET335	MECH	Elements of workshop Technology	ECE/EEE/CIVIL/CSE/IT
18IET336	ECE	Introduction to Signal Processing	EEE/MECH/CIVIL
18IET337	ECE	Fundamentals of Signals & Systems	CSE/IT
18IET338	CSE	Simulation and Modeling	ECE/EEE/MECH/CIVIL/IT
18IET339	IT	Fundamentals of Image Processing	ECE/EEE/MECH/CIVIL/CSE

Subject Code	Offered by Dept.	Interdisciplinary Elective IV	Offered for Dept.
18IET441	MBA	Project Management	ECE/EEE/CIVIL/CSE/IT
18IET442	MBA	Industrial Engineering and Management	MECH
18IET443	MBA	Entrepreneurial Development	ECE/EEE/MECH/ CIVIL/CSE/IT
18IET444	CIVIL	Geographical Information Systems	ECE/EEE/MECH/ CSE/IT
18IET445	EEE	Power quality monitoring	ECE/MECH/ CIVIL/CSE/IT
18IET446	MECH	Fundamentals of ROBOTICS	ECE/EEE/ CIVIL/CSE/IT
18IET447	ECE	Basics of Mobile Cellular Communications	EEE/MECH/ CIVIL
18IET448	ECE	Introduction to Wireless Networks	CSE/IT
18IET449	CSE	Introduction to Cloud Computing	ECE/EEE/MECH/ CIVIL/IT
18IET44A	IT	Introduction to DBMS	ECE/EEE/MECH/ CIVIL
18IET44B	IT	Embedded Systems	CSE

LINEAR ALGEBRA AND CALCULUS

Subject Code: 18BST101   **Internal Marks: 40**
Credits: 4.0   **External Marks: 60**

Course Objectives:
- The application of the essential tool of matrices and linear algebra including linear transformation, eigen values, diagonalization and orthogonalization.
- The application of Taylor's and Maclaurin's series to calculate maxima and minima of two variable functions.
- The application of integration to length, surface area and volume.
- The mathematical tools needed in evaluating multiple integrals and their usage.
- The essential tool of vector differentiation to calculate gradient, divergence, curl and apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

Course Outcomes:
The student will be able to:

CO1: To calculate rank, eigen values, eigen vectors of matrices, solve linear system of equations including diagonalization and orthogonalization.

CO2: To estimate maxima and minima of functions of two variables

CO3: To apply single integrals to estimate length, surface area and volume.

CO4: To evaluate multiple integral in both Cartesian and polar coordinates and estimate area and volume.

CO5: To calculate gradient, divergence, curl of a scalar and vector point functions; line, surface and volume integrals and apply Green's, Stokes and Gauss Divergence theorems to convert from single to double or double to triple integrals.

UNIT-I: Matrices

Matrices – Rank - Systems of linear equations - linear dependence and independence –Eigen values, eigenvectors, symmetric, skew-symmetric, orthogonal matrices -Diagonalization.
Vector Space – Basis - Dimension, rank and nullity - Inner product spaces- Gram-Schmidt orthogonalization.

UNIT-II: Differential Calculus

Functions of single Variables: Rolle's, Lagrange's, Cauchy's mean value theorems (without proof) - Taylor's and Maclaurin's Series.
Functions of several Variables: Limits and continuity for two variables - Partial derivative - Total derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).

UNIT-III: Single Integrals:

Definite Integrals, Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.

UNIT-IV: Multiple Integrals :

Double integral (Cartesian and polar form) -Change of order of integration -Change of variables (Cartesian to polar)- area by double integration. Triple integrals – Change of variables (Cartesian to spherical/cylindrical) - Volume by triple integration.

UNIT-V: Vector Calculus:

Scalar and vector point functions- Vector differentiation - Directional derivatives - Gradient, Curl and Divergence –Vector Integration -Line, Surface, Volume Integrals - Green, Stokes and Gauss divergence theorems (without proofs) .

TEXT BOOKS

1.B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2.Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

REFERENCE BOOKS
 1.ErwinKreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
 2.G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
 3.Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
 4.D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
 5.N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

CHEMISTRY
(Common to All Branches)

Subject Code: 18BST108   **Internal Marks: 40**
Credits: 4.0   **External Marks: 60**

Course Objectives:
 The students will become familiar and understand about:
- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise reference electrodes and science of corrosion.
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:
The course will enable the student to:

CO1: Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.

CO2: Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

CO3: Rationalise reference electrodes and science of corrosion.

CO4: Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.

CO5: Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

UNIT-I:Atomic Structure and Chemical Bonding:
Types of Hybridisation-valency shell electron pair repulsion theory (VSEPR) -Molecular orbital theory(MOT) –Energy Level diagrams of diatomic molecules (O_2, CO) - Atomic and ionic sizes - ionization energies - electron affinity and electro negativity – variable oxidation states - coordination numbers and geometries.

UNIT-II: Spectroscopy:
Spectroscopy - Electronic spectroscopy-types of Electronic transitions and selection rules – Definition of Chromophore – Definition of Auxochrome – Absorption and intensity shifts. Principle of Fluorescence and Phosphorescence. Introduction to I.R. Spectroscopy –Fingerprint region–I.R.Values for Functional groups (-Carbonyl, -alcohol, -nitryle, -amino)- Introduction to NMR – Principle - equivalent and non-equivalent protons - Chemical shift& Splitting – Coupling Constant

UNIT-III: Electrochemistry & Corrosion:
Introduction to Electrochemistry - EMF of the cell or Cell potential-Electrochemical series and its importance–Reference electrodes (SHE and Calomel electrode).
Corrosion (chemical and electrochemical theory of corrosion) –Galvanic series. Factors effecting the rate of corrosion – Controlling of corrosion (Proper designing, Modifying the environment, Cathodic protections – Sacrificial Anodic and Impressed Current Cathodic Protection).

UNIT-IV:Organic Reactions& Introduction to Polymers:
Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical - Substitution - electrophilic, nucleophilic (SN^1 and SN^2) and free radical – Elimination(E_1 and E_2) (E_{CB}- Examples) – Rearrangement Reactions (Claisen, Pinacolpinacolone rearrangement) – Diels-Alder reaction - Isomerism (Cis- Trans)
Definition of Polymer - Polymerisation(Addition and Condensation) – Functionality – Degree of Polymerisation–Classification of Polymers – Zeiglar Natta Catalysis.

UNIT-V: Green Chemistry & Energy:
Introduction to green chemistry – Definition and 12 principles of green chemistry.
Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants.
Introduction of Energy storage devices: Principle& mechanism of Batteries&Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors.

 TEXT BOOKS:
 1.   University chemistry, by B. H. Mahan
 2.   Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
 3.   Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
 4.   "Engineering Chemistry", P. C. Jain and Monica Jain, DhanpatRai Publications, Co., New Delhi, 2004, 16th Edition

 REFERENCE BOOKS:
1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
5. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

BASIC ELECTRICAL ENGINEERING

Subject Code: 18EST101   **Internal Marks: 40**
Credits: 4.0   **External Marks: 60**

Course objectives:
- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with AC circuits.
- To become familiar with DC Machines.
- To understand the concept of transformers.
- To provide knowledge on three phase induction motors.

Course outcomes:
CO1: Able to summarize different electrical circuits.
CO2: Able to outline the basics of AC circuits.
CO3: Able to examine DC Machines.
CO4: Able to demonstrate working of transformers.
CO5: Able to generalize three phase induction motors.

UNIT –I Introduction to Electric Circuits
Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, voltage and current sources, Series & Parallel circuits, Kirchhoff's Laws, Star-delta and delta-star transformations, simple problems with dc excitation.

UNIT-II AC Circuits
Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, sample problems.

UNIT-III DC Machines
Generator-Principle of Operation, construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator.Motor-principle of operation, Torque equation, Speed Control Methods, Operation of 3 point starter.

UNIT-IV Transformers
Operation of a Single Phase Transformer, EMF equation, losses, Regulation and Efficiency of a single phase transformer, O.C and S.C Tests.sample problems.

UNIT-V Three Phase induction Motor
Principle of Operation of 3-Φ induction motor, power and torque equations, Speed-Torque Characteristics of 3- Φ induction Motor.

TEXT BOOKS
1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

REFERENCE BOOKS .
1. Basic Electrical Engineering Dr.K.B.MadhuSahuscitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

SWITCHING THEORY AND LOGIC DESIGN

Subject Code: 18EET101   **Internal Marks: 40**
Credits: 2.0   **External Marks: 60**

Course Objectives:
- To classify different number systems and apply to generate various codes.
- To use the concept of Boolean algebra in minimization of switching functions
- To design different types of Adders and Subtractors
- To design different types of decoders, encoders, code converters, multiplexers and comparators
- To apply knowledge of flip-flops in designing of Registers and Counters

Course Outcomes:
    At the end of the course the student will be able to:
CO1: Solve typical number base conversions and analyze new coding techniques
CO2: Optimize logic gates for digital circuits design
CO3: Understand concepts of Adders and Subtractors.
CO4: Analyze combinational circuits for various digital design applications.
CO5: Develop sequential circuits

UNIT – I
Number systems: Review of Number systems, complements of numbers- r's, r – 1's compliment, BCD, excess-3, self complement codes, 2421, gray code.

UNIT – II
Logic operations: Logic gates, Boolean theorems, complements and dual of logic expressions, standard SOP and standard POS. Minimization of switching functions using theorems, K – map (up to 5-variables).

UNIT – III
Combinational logic circuits-I: Design of half adder, full adder, half subtractor, full subtractor, 4-bit binary adder, 4-bit binary subtractor, BCD adder, carry look ahead adder.

UNIT – IV
Combinational logic circuits-II: Design of decoder, encoder, multiplexer, de-multiplexer, 2-bit comparator and LED seven segment display.

UNIT – V
Sequential logic circuits: Introduction, flip-flops with truth tables and excitation tables. Design of ripple counters, synchronous counters, Johnson and ring counters, Design of shift registers, universal shift register.

TEXT BOOKS:
1. Switching and Finite automata theory – ZviKohavi, Tata Mcgraw – Hill, 1978, 2/e.
2. Digital Systems: Hardware Organization and Design, 3rd Edition -Frederick J. Hill, Gerald R. Peterson

REFERENCE BOOKS:
1. Digital design – Moris Mano, PHI, 2/e.
2. Fundamentals of Logic Design – Charles H.RothJr, Jaico Publishers.

WORKSHOP AND MANUFACTURING PRACTICE

Subject Code: 18ESL103   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

COURSE OBJECTIVES:
• The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. The modules include training on different trades like Fitting, Carpentry, Black smithy etc… which makes the students to learn how various joints are made using wood and other metal pieces.

COURSE OUTCOMES:
CO1: Make half-lap, mortise &tenon, corner dovetail or bridle wooden joints.
CO2: Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
CO3: Forge MS rod from round to square cross-section, or into L- or S- bend.
CO4: Fabricate MS pieces into either a straight, square, dovetail or V-fit.
CO5: Connect a staircase or a tube light house-wiring electrical circuit.

I. Wood Working Technology - Familiarity with different types of wood and tools used in wood Working technology.
Tasks to be performed:
1) Half – Lap joint   2) Mortise and Tenon joint
3) Corner Dovetail joint   4) Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.
Tasks to be performed:
1) Square Tray   2) Taper side Tray
3) Conical Funnel   4) Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...
Tasks to be performed:
1) round M.S rod to square bar   2) L bend in given M.S. Rod.

3) S bend in given M.S. Rod.   4) heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.
Tasks to be performed:
1) "V" – fitting   2) square fitting
3) Dovetail fitting   4) Straight fitting

V.HOUSE WIRING
1) Tube light connection
2) Staircase connection

Note: Any two jobs from each trade must be performed by the student.

CHEMISTRY LAB
(Common to All Branches)

Subject Code: 18BSL102   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives:
The students will become familiar and understand about:

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

Course Outcomes:
The students will learn to:

CO1: Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
CO2: Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
CO3: Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
CO4: Synthesize a small polymer molecule and analyze a salt sample.
CO5: Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

LIST OF EXPERIMENTS: Choice of 10-12 experiments from the following:
1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt
9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colurimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg
14. Thin layer chromatography.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

TEXT BOOKS:
1. "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. "Lab Manual on Engineering Chemistry" by Sudharani, DhanpatRai Publications, Co., New Delhi., (2009).

REFERENCE BOOKS:
1. "Engineering Chemistry Lab Manual" by ShuchiTiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand& Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

BASIC ELECTRICAL ENGINEERING LAB

Subject Code: 18ESL101   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objective:
To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

Course Outcomes:

Students will be able to
CO1: Label various types of electrical components.
CO2: Demonstrate various basic electrical laws.
CO3: Demonstrate speed control DC motor &testing of transformer.
CO4: Experiment with lamps.
 CO5: Examine electrical wiring system

 List of Experiments:
1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
 6. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
7.   OC and SC tests on single phase transformer.
8.   Fluorescent tube connection.
9. (a) One way control of lamp
    (b) Two way control of lamp
10. Fan wiring.

Additional Experiments:
 11. Soldering and bread board precautions.
 12. To find voltage current relationship for series RL circuit and determine power factor.

ENVIRONMENTAL SCIENCE
(Common to all Branches)

Subject Code: 18MCT102   **Internal Marks: 40**
Credits: 0   **External Marks: 60**

Course Objectives:
- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity.
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes:
CO1: Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
CO2: Explain and demonstrate the ecosystems setup, assess the magnitude of diversity to upkeep.
CO3: Examine a range of pollution problems along with control and their eco-friendly disposal methods.
CO4: Translate the sustainable development practice through clean development mechanisms.
CO5: Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

UNIT – I
Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness
Forest Resources - Use and over exploitation - deforestation – consequences – case study
Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment
Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study
Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources

UNIT – II
Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession
Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

UNIT – III
Environmental Pollution: Definition – causes - effects - control measures of Air pollution -Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.
Solid waste Management: Causes - effects - disposal methods of urban waste – biomedical wastes - case studies
Disaster management: floods – earthquakes – cyclones

UNIT – IV
Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting- Watershed management - Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

UNIT – V
Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

TEXT BOOKS:
1. ShashiChawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

REFERENCE BOOKS:
1. Odum, E.P, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.
3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi.
4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, McGraw – Hill Internationaledition.
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, PearsonPublications.

ENGLISH

Subject Code: 18HST101   **Internal Marks: 40**
Credits: 2.0   **External Marks: 60**

Course Objectives

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students acquire appropriate and adequate letter writing skills
- To get students produce written texts using appropriate vocabulary and expression, coherence devices and logical arguments

Course Outcomes

CO1: Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
CO2: Students will be able to write short texts masterly.
CO3: Students will be able to construct grammatically correct sentences.
CO4: Students will be able to communicate through letters and emails effectively.
CO5: Students will be able to comprehend unfamiliar passages, and will be able to write précis and essays.

Course Syllabus
UNIT–I: *Father's Help* by R K Narayan
Vocabulary Building:Word Formation—Root Words—Prefixes and Suffixes—
        Synonyms and Antonyms—Idioms —Phrasal Verbs—One-word Substitutes—
        Standard Abbreviations
UNIT–II: *My Early Days* by A P J Abdul Kalam
        Basic Writing Skills: Tense— Voice— Reported Speech—Degrees of Comparison
        —*If* Clauses— Simple, Compound, Complex Sentences—Punctuation—Correction
of Sentences
UNIT–III: *Politics and the English Language* by George Orwell
Identifying Common Errors in Writing:Subject-Verb Agreement—Noun-Pronoun
        Agreement—Misplaced modifiers—Articles—Prepositions—Redundancies—Clichés
UNIT–IV: *Sacrifice* by Rabindranath Tagore
Writing Practice:Letter Writing—Email Writing
UNIT–V: *Stopping by Woods on a Snowy Evening* by Robert Frost
Writing Practice:Comprehension—*Précis Writing*— Essay Writing

Suggested Readings:
*On Writing Well.*William Zinsser. Harper Resource Book. 2001
Practical English Usage. Michael Swan. Oxford University Press. 1995.
*Remedial English Grammar.*F.T. Wood. Macmillan. 2007.
Step by Step.K. Nirupa Rani and others. Pearson. Delhi. 2013.
*Study Writing.*Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.

DIFFERENTIAL EQUATIONS AND TRANSFORM THEORY

Subject Code: 18BST102   **Internal Marks: 40**
Credits: 4.0   **External Marks: 60**

Course Objectives:
- The application of the effective mathematical tools for the solutions of differential equations that model physical processes.
- To develop the tool of Fourier series for learning advanced Engineering mathematics.
- The mathematical tool of Fourier transforms their properties and applications.
- The mathematical tool of Laplace transform, their properties and application to solve an ordinary differential equations (I.V.P or B.V.P).
- The mathematical tool of Z- transform, their properties and implementation.

Course Outcomes:
The student will be able to:

CO1: To evaluate higher order homogenous and non-homogeneous linear differential equations using different methods.

CO2: To estimate a Fourier series/ Fourier sine series/ Fourier cosine series expansion of different functions.

CO3: To evaluate Fourier transform/ Fourier sine(cosine) Transform/ inverse Fourier transform/ inverse Fourier sine(cosine) transform of different functions.

CO4: To evaluate Laplace transform and inverse Laplace transform of different functions utilizing different properties.

CO5: To evaluate Z-transform and inverse Z- transform of different functions utilizing different properties.

UNIT-I : Ordinary Differential equations:

Linear - Bernoulli – Exact - Equations   reducible to exact.- Higher order homogenous and non-homogenous linear differential equations with constant coefficients - Particular integrals for the functions of type $\sin(ax+b)/\cos(ax+b)$, x^m, e^{ax} , $e^{ax} V(x)$ - Method of variation of parameters

UNIT-II: Fourier Series:

Fourier Series -Even and odd functions– Fourier series of functions defined in the interval $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2c)$,$(-c,c)$ - Half range Fourier sine and cosine series.

UNIT-III: Fourier Transforms

Fourier Integral Theorem (without proof)- Fourier sine and cosine integrals –complex form of Fourier Integral - Fourier transform – Fourier sine and cosine transforms – properties - Inverse Fourier, sine and cosine transforms - properties – Convolution Theorem.

UNIT-IV: Laplace Transforms

Laplace Transform - Properties - Laplace transform of derivative, integrals, multiplication by t^n and division by t – Unit step and unit impulse function - Inverse Laplace transform – Evaluation by partial fractions, convolution theorem - Applications of Laplace transform's to ordinary differential equations.

UNIT-V: Z- Transforms:

Z-transform – Linear property – Damping rule – Shifting rule – Initial and final value theorems- Z transforms of functions multiplied and divided by n - Inverse Z-Transforms by basic formulae, Partial fractions, Convolution theorem.

TEXT BOOKS
1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

REFERENCE BOOKS
1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

APPLIED PHYSICS

Subject Code: 18BST106   **Internal Marks: 40**
Credits: 4.0   **External Marks: 60**

COURSE DESCRIPTION:
This course encompass Fundamental Concepts of Physics that include
- Wave Optics
- Fiber Optics
- Modern Physics
- Electro Magnetic Theory
- Semiconductor Physics
    that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

COURSE OBJECTIVES
- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Fiber Optics
- To define the shortcoming of classical physics and describe the need for modifications to classical theory
- To analyze the interaction of electromagnetic fields
- To understand the properties and importance of materials based on band diagrams

COURSE OUTCOME
Will be able to
CO1   Apply the principles of optics in designing optical devices
CO2   outline the Principles of Fiber Optics
CO3   resolve the discrepancies in classical estimates through quantum principles
CO4   Analyze the interaction of electromagnetic fields.
CO5   Summarize the characteristics of semiconductor materials.

UNIT- I: WAVE OPTICS
- **Interference -** Introduction, Huygen's Principle, Principle of Superposition of Waves, Interference of Light by Division of Wavefront – Young's Double Slit Experiment, Interference of Light by Division of Amplitude - Newton's Rings under Reflected Light
- **Diffraction -** Introduction, Fraunhofer Diffraction due to Single Slit – Fraunhofer Diffraction due to Double Slit, Diffraction Grating

UNIT-II: Fiber Optics
- **Principles of Optical Fiber** - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle
- **Types of Fibers** - Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Fiber Optic Communication System and Applications

UNIT-III: Modern Physics
- **Quantum Mechanics** - Wave Particle Duality, De-Broglie Hypothesis of Matter Waves, Heisenberg's Uncertainty Principle, Physical Significance of Wave Function
- **Review of Quantum Theory:** Planck's Hypothesis**,** Schrödinger Time independent wave equation and Particle in One Dimensional Potential Box

UNIT-IV: Electromagnetic Theory
- **Electromagnetism –** Concept of Electric Field, Point Charge in Electric Field, Gauss Law and it's Applications, Magnetic Field - Magnetic Force on Current Carrying Coil
- **Magnetostatics –** Ampere's Law, Biot-Savart Law, Faraday's Law of Induction, Lenz's Law, Maxwell's Equations and Applications

UNIT-V : Semiconductors Physics
- **Introduction** - Intrinsic and Extrinsic Semiconductors, Dependence of Fermi Level on Carrier Concentration and Temperature, Diffusion and Drift Currents, Direct and indirect Band Gap Semiconductors
- **Applications –** Hall Effect –Mobility, Sign of Charge Carriers, Conductivity, Resistivity and Continuity Equation

TEXT BOOKS
1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker
3. Modern Physics by Arthur Beiser

REFERENCES BOOKS
1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Pubishers
3. Engineering Physics, Volume-I&II, P.K.PalaniSwamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

PROGRAMMING FOR PROBLEM SOLVING

Subject Code: 18EST102   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course Objective

The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

Course Outcomes

CO1: Understand the fundamentals of C programming
CO2: Choose the loops and decision making statements to solve the problem
CO3: Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.
CO4: Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.
CO5: Create user defined data types including structures and unions to solve problems and implement file operations in C programming for a given application.

UNIT - I

Introduction to Programming : Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Structure of C program, Basic I/O statements, Operators, Operator precedence.

UNIT - II

Control Structures: Decision statements: if, if-else, nested if and switch, **Iterative statements:** for, while, do while and nested loops **Branching:** Break, continue, goto.

UNIT - III

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.
Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions and Storage classes,

UNIT - IV

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, functions and pointers, arrays and pointers, Dynamic memory allocation

UNIT - V

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.
Files: Definition, types of files, Opening modes, file IO Functions, Random access functions, Preprocessor directives.

TEXT BOOKS

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language.2nd Edition, PHI.
   2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg3rd Edition

REFERENCES
1. YashwantKantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata McGraw Hills, New Delhi, India.
3. https://www.tutorialspoint.com › Cprogramming › C – Home
4. https://www.programiz.com/c-programming

ELECTRIC CIRCUIT THEORY

Subject Code: 18EET102   **Internal Marks: 40**
Credits: 2.0   **External Marks: 60**

Course objectives:
- To introduce electric circuits and its analysis
- To become familiar about resonance.
- To impart knowledge on solving circuits using network theorems for D.C circuits.
- To impart knowledge on solving circuits using network theorems for A.C circuits.
- To provide knowledge on three phase circuits.

Course outcomes:
CO1: Able to estimate different electrical circuits.
CO2: Able to summarize resonance.
CO3: Knows how to apply theorems to DC circuits.
CO4: Knows how to apply theorems to AC circuits.
CO5: Able to generalize three phase circuits.

UNIT I:
Circuit Analysis: Basic definitions, voltage and current sources, Independent and dependent sources; **:** Capacitor, Integral Voltage-current relationship, energy stored in a capacitor; The inductor, integral voltage-current relationship, energy stored in an inductor; Inductance and Capacitance combinations-inductors in series and parallel; Capacitors in series and parallel; Source transformations , Nodal Analysis, Super node; Mesh analysis, super mesh-Problems.
.
UNIT II:
Resonance: Resonance-series, parallel circuits, concept of band width and Q factor - Locus diagrams - series R-L, R-C, R-L-C and parallel combination with variation of various parameters.

UNIT III:
Network theorems – I: Superposition, Thevenin's, Norton's and Reciprocity Theorems for D.C and sinusoidal excitations (for independent and dependent sources).

UNIT IV:
Network theorems –II: Maximum Power Transfer, Millman's, Tellegen's, and compensation Theorems for D.C and sinusoidal excitations (for independent sources).

UNIT-V:
Three Phase Circuits: Three phase circuits: Phase sequence- Star and delta connection-Relation between line and phase voltages and currents in balanced systems-Analysis of balanced three phase circuits Measurement of Active and Reactive power in balanced three phase systems. Analysis of Three Phase unbalanced circuits-Loop Method- Application of Millman's Theorem.

TEXT BOOKS:
1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
3. Fundamentals of Electrical circuits by Charles K.Alexander , Matthew N.O Sadiku.

REFERENCE BOOKS:
1. Circuit theory Analysis & Synthesis by Chakrabarti, DhanpatRai Publishing Company (P) Ltd.
2. Network Analysis by N.C.Jagan, C.LakshmiNarayana BS publications 2nd edition.
3. Electric circuits in SI units by Joseph A Edminister, MSE, 1st Edition
4. Electrical Circuits by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill

ENGINEERING GRAPHICS AND DESIGN

Subject Code: 18ESL104   **Internal Marks: 40**
Credits: 02   **External Marks: 60**

COURSE OBJECTIVES:
- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice verse
- To understand the fundamentals of computer aided design and drafting

COURSE OUTCOMES:
    CO1: Draw projection of points and straight lines in first angle projection.
    CO2: Project plane surfaces and simple solids inclined to one reference plane.
    CO3: Convert orthographic views into isometric projections and vice-versa.
    CO4: Draw basic lines and profiles with commonly used operations in drafting software.
    CO5: Generate 2D drawings along with dimensioning in drafting software.

LIST OF EXERCISES:

PART-A: Conventional Engineering drawing
1. Projections of points
2. Projections of straight lines inclined to one reference plane only.
3. Projections of planes inclined to one reference plane only.
4. Projections of simple solids inclined to one reference plane only.
5. Conversion of isometric views into orthographic views
6. Conversion of orthographic views into isometric views.

PART-B: Basic Computer aided engineering drawing (2-D drawings)
1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines,   Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

TEXT BOOKS:
    1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
    2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

REFERENCE BOOKS:
    1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
    2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

LANGUAGE PROFICIENCY LAB

Subject Code: 18HSL101   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

Course Outcomes

CO1: Students will be able to recognize differences among various accents and speak with neutralized accent.

CO2: Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.

CO3: Students will be able to generate dialogues for various situations.

CO4: Students will be able to communicate perceptively and concisely.

CO5: Students will be able to comprehend and interpret data provided in graphs and tables.

Course Syllabus
Unit I: Listening Comprehension of Audio and Video clips of different accents
Unit II: Pronunciation—Intonation—Stress—Rhythm
Unit III: Situational Dialogues
Unit IV: Poster Presentation
Unit V: Interpretation of Data in Graphs and Tables

Suggested Readings:

Communication Skills.Sanjay Kumar and PushpaLata.OUP. 2011.
*Practical English Usage.*Michael Swan. OUP. 1995.
Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
Technical Communication.Meenakshi and Sangeetha.OUP. New Delhi. 2013.

PHYSICS LAB
(Common for all Branches)

Subject Code: 18BSL101   **External Marks: 60**
Credits: 1.5   **Internal Marks: 40**

Course Description:

> This Laboratory course is intended to apply the scientific method to expedite experiments the include
- Error analysis
- Waves Fundamentals
- Wave Optics
- Lasers and Fiber Optics
- Semiconductor devices

> So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

Course Objectives:

- To operate optical systems and design Instrumentation with precision measurements to estimate error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To understand the phenomenon of Interference and Diffraction using Travelling Microscope and Spectrometer.
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize semiconducting material devices.

Course Outcomes:

> Will be able to

CO1   demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy

CO2   infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum

CO3   Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens

CO4   illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics

CO5   evaluate characteristics of semiconducting material devices.

LIST OF EXPERIMENTS

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
4. Determination of Acceleration due to Gravity (g) using Compound Pendulum
5. Newton's Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Determination of Wavelength of Monochromatic Source using LASER Diffraction
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

Manual / Record Book

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.

2. Lab Manual of Engineering Physics by Dr.Y. Aparnaand Dr. K. VenkateswaraRao
   (VGS books links, Vijayawada)

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common to all branches)

Subject Code: 18ESL102   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives:
- To gain experience about structured programming
- To help students to understand the implementation of C language
- To understand various features in C

Course Outcomes:
At the end of the course students will be able to

CO1: Solve the given problem using the syntactical structures of C language.
CO2: Design programs involving decision structures and loops.
CO3: Apply programming to solve different operations on arrays and strings.
CO4: Develop modularity concept using functions and write programs for allocating memory dynamically.
CO5: Construct C program that uses structures and unions and implement file operations on given application.

List of Experiments

1. Write the C programs to calculate the following
    a) Area of triangle when sides are given.
    b) Program for Type Casting.
    c) Interchanging values of two variables.

2. Write the C programs to perform the following
    a) Read lower case character and convert into uppercase.
    b) Find maximum of 3 values using conditional operator.
    c) Calculate area and perimeter of circle.

3. Write C programs for the following using decision making statements
    a) Program to find roots of quadratic equation.
    b) Find the Largest among 3values.
    c) Calculate the grades of a student.

4.
    a) Arithmetical operations using switch-case.
    b) Read a number and display in reverse.
    c) Check for Armstrong number property

5.
    a) Check for strong number property
    b) Generate Fibonacci series.
    c) Generate Prime numbers between two numbers.

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6. Implement the following using arrays
    a)   Largest and smallest from a list of elements.
    b)   Program for Linear Search.
    c)   Program for Bubble Sort.

7. Implement the following using arrays
    a) Matrix addition.
    b) Matrix Multiplication.
    c) Program using string handling functions.

8. Implement C Program using any Numerical methods

9. a) Factorial using recursion and no recursion.
    b) GCD using recursion and no recursion.

10. a) Find the sum and average of list of elements using DMA Functions
    b) Implementation of call by reference and call by valve.

11. a) Implementation of array of structure.
    b) Demonstration of Union.

12. a) Copy the contents of one file into another.
    b) Count the number of characters, words and lines in a file.

TEXT BOOKS

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language.2nd Edition, PHI.
   2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg3rd Edition

REFERENCES

1.   YashwantKantikar. 2012. Let Us C, 8th Ed.. PBP Publications.
2.   E. Balagurusamy. 2011. C Programming. Tata McGraw Hills, New Delhi, India.
3.   https://www.tutorialspoint.com › Cprogramming › C – Home
4.   https://www.programiz.com/c-programming

CONSTITUTION OF INDIA

Subject Code: 18MCT203   **Internal Marks: 0**
Credits: 0   **External Marks: 0**

Course Objectives:
1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.

Course Outcomes: By the end of this course the student will be able to:

CO 1: Realize the rigidness of our Indian Politics and Administrative aspects.
CO 2: A Student can understand our nation federalism.
CO 3: Can assess different types of risks involved in misadministration.
CO 4: Can create competitive advantage.
CO 5: Summarizes the legal, Administrative, Political and Financial aspects for betterment of
the National building.

Unit – I
INTRODUCTION:
Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II
IMPORTANT FEATURES OF CONSTITUTION:
Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit – III
PARLIMENTARY FORM OF GOVT. IN INDIA:
President of India - Emergency provisions -National Emergency – Article 352 President Rules – Article 356 - Financial Emergency – Article 360Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary).

Unit – IV
INDIAN FEDERALISM:
Union – State relations; - Legislative , Administrative and Financial relations.Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V
PARLIMENTARY COMMITTEES:
Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150) - Finance Commission (Article – 280) - NeethiAayog (Planning Commission) and - Political Parties.

Text Books: 1) D.D Basu – Indian Constitution.
   2) Dr. D. Surannaidu – Indian Political System.
   3) MadhavKhosla – The Indian Constitution.

COMPLEX VARIABLES AND STATISTICAL METHODS

Subject Code: 18BST204   **External Marks: 60**
Credits: 3   **Internal Marks: 40**

COURSE OBJECTIVES
- Test if a function is analytic, harmonic and then construct a harmonic conjugate function.
- Evaluate integrals using the Cauchy Integral theorem and identify singular points of a function then calculate residues using Residue Theorem.
- Understand the concept of sampling theory and perform t –test, z test, Chi-square test.
- Analyze the testing of hypothesis by t-test, z-test, Chi-square test. .
- Understand curve fitting and calculations of correlation coefficients and regression coefficients

COURSEOUTCOMES

On completion of this course, students will be able to

- Construct a harmonic and conjugate harmonic function.
- Evaluate integrals using the Cauchy Integral formulae and identify singular points of a function then calculate residues using Residue Theorem.
- Execute Central limit theorem for Sampling Distributions and perform t –test, z test, Chi-square test.
- Test for sampling distributions of one mean, two means and their difference at α level of significance.
- Estimate a curve for the give data, calculate correlation coefficients and regression coefficients.

UNIT-I
Complex Functions
Functions of a complex variable-analyticity and its properties-Cauchy-Reimann equations in Cartesian and polar coordinates (without proof).Harmonic and conjugate harmonic functions-Milne-Thompson method.

UNIT-II
Complex Integral formula and Residues
Cauchy's integral theorem (without proof)-Cauchy's integral formula (without proof)-Generalized Cauchy's integral formula (without proof).
Laurent's Theorem (without proof), Singularity-types of singularity (isolated,essential, removable pole) – residue –calculation of residues – residue theorem (without proof) and its applications.

UNIT-III
Sampling Theory
*Discrete Random Variables- *Binomial –Possion's distributions – Continuous random variable – Normal distribution.
 Introduction to Sampling Theory -Population and Samples –Sampling distribution of means(σ known and σ unknown)- central limit theorem-t –test, z-test, Chi-square test.

* Not to be examined

UNIT-IV
Tests of Hypothesis
Hypothesis-null and alternative hypothesis – type-I and type-II error –level of significance –one tail and two tail test – testing concerning one mean, two means, their differences.

UNIT-V
Curve fitting and Correlation
Curve fitting: Straight line, 2nd degree parabola, power curve ($y=ax^b$), exponential curves($y= ab^x$, $y = ae^{bx}$). Concept of correlation–types of correlation-Karl-Pearson correlation coefficient method and its properties-Rank Correlation coefficient.Regression-Linear regression and its properties

Text Books:

1. Complex Analysis And Statistical Methods, T.K.V.Iyengar,B.Krishna Gandhi and Others, S.Chand& Company.
2. Probability and Statistics for Engineers, Miller and John E.Freund, Prentice Hall of India
3. Higher Engineering Mathematics B.S.Grewel.

Reference Books:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt.Ltd.
2. Probability and Statistics ,Athanasios-Papoulis-Pearson education.

ELECTROMAGNETIC FIELD THEORY

Subject Code: 18EET203 **Internal Marks:40**
Credits: 3 **External Marks: 60**

Course Objective:

- Will be able to state and apply the Coulombs Law and Gauss's law to find the Electric filedintensity.
- Will compute capacitance of different configurations and to analyze the behavior of dielectrics at different boundaryconditions.
- Will have abilityto state and apply the Biot-Savartlaw and Ampere's circuit law to find the Magnetic fieldintensity.
- Will gains the knowledge on applying Lorenz force equation and determination of self inductance and mutual inductances for differentconfigurations.
- Will list the Faraday's laws and to Modify the Maxwell's equations for timevarying fields.

Course Outcomes:

CO1: Able to state and apply the Coulombs Law and Gauss's law to find the Electric filedintensity.

CO2: To compute capacitance of different configurations and to analyze the behavior ofdielectrics at different boundary conditions.

CO3: ability to state and apply the Biot-Savart law and Ampere's circuit law to find theMagnetic field intensity.

CO4: Gains the knowledge on applying Lorenz force equation and determination of self inductance and mutual inductances for different configurations.

CO5: To list Faraday's laws and to Modify the Maxwell's equations for time varying fields.

UNIT I:
Fundamentals of electrostatics and its applications: Co-ordinate system-Cartesian, cylindrical, spherical-differential length-area -volume in these co-ordinate systems-importance of divergence, curl, grad and Laplacian. Electrostatic fields- coulomb's law-Electric field intensity- electric field intensity due to a line and a surface charge- Gauss law in integral and point form- applications of Gauss law- Maxwell's first law-work done in moving a point charge in an electric field- potential gradient.

UNIT II:
Conductors, Dielectrics and Capacitors: Current density- conduction and convention current density- ohm's lawin point form-current continuity equation-conductors and dielectric material- behaviorof conductors in an electric field- boundary conditions- -Electric dipole-Dipole moment- capacitance- capacitance of parallel plate, spherical and co-axial capacitors -Laplace and Poisson's equations.

UNIT III:
Magnetostatics: Static magnetic fields- Biot-savart's law- Oersted' experiment-magnetic field intensity(MFI)- MFI due to a straight current carrying filament- MFI due to circular - Maxwell's second equation div(B)=0- Ampere's circuital law and its applications- MFI due to infinite sheet of current and a long current carrying filament- point form of Ampere's circuital law- Maxwell's third equation curl(H)=J.

UNIT IV:
Magnetic materials and Inductance: Magnetic force- moving charges in a Magnetic field-Lorentz force equation- force on straight and long current carrying conductor in a magnetic field- force between two straight, long and parallel current carrying conductors- magnetic dipole and dipole moment-torque on current loop placed in a magnetic field- self inductance of a solenoid, toroid and co-axial cable.

UNIT V:
Electromagnetic waves and Time varying fields: Time varying fields- Faraday's laws of electromagnetic induction- Its integral and point forms- Maxwells fourth equation–statically and dynamically induced EMF'S- simple problems- modification of Maxwell's equation for time varying fields-Displacement current-poynthing theorem and pointing vector.

TEXT BOOKS:
1. Engineering Electromagnetics, W.H. Hayt Jr. McGraw Hill – New York.
2. Elements of Electromagnetics, M.N.O. Sadiku, Oxford press,2002.

REFERENCE BOOKS:
1. EM Waves and Radiating Systems, E.C. Jordan, PHI,1997.
2. Electromagnetics with applications, Kraus and Fleisch, McGraw Hill,1999.
3. Introduction to Electro-dynamics, David J.Griffiths,PHI.

NETWORK ANALYSIS AND SYNTHESIS

Subject Code: 18EET204   **Internal Marks: 40**
Credits: 4   **External Marks: 60**

Course Objective:
- To impart knowledge on two port networks.
- To analyze D.C transient analysis.
- To analyze A.C transient analysis.
- To outline Causality, stability, Hurwitz and Routh's criterion.
- To design Foster forms, Cauer forms.

Course Outcomes:
CO1: Able to describe Two Port Networks and Ladder Networks.
CO2: Knows how to analyze a given DC transient circuits
CO3: Knows how to analyze a given AC transient circuits.
CO4: Gains knowledge on causality, stability, Hurwitz and Routh's criterion.
CO5: Knows how to synthesis networks.

UNIT I:
Two Port Networks: Two port network parameters – Z, Y, ABCD (transmission) and hybrid parameters and their relations, inverse of transmission & Hybrid parameters, Series and parallel two-Port Networks.

UNIT II:
D.C Transient Analysis: Transient response of R-L, R-C & R-L-C series circuits for D.C excitation-Initial conditions-solution method using differential equation and Laplace transforms, Response of R-L & R-C & R-L-C networks to pulse excitation.

UNIT III:
A.C Transient Analysis: Transient response of R-L, R-C &R-L-C series circuits for sinusoidal excitations-Initial conditions-Solution method using differential equations and Laplace transforms.

UNIT IV:
Synthesis-I: Introduction, Causality and stability, Hurwitz polynomial, Routh'scriterion,Positive real functions,Sturm'stheorem,Elementary synthesis procedures.

UNIT V:
Synthesis-II: L-C Immittance functions(Foster form-1,Fosterform-2 , First Cauer form, Second Cauer form), R-C Impedance functions(Cauer forms of RC networks), R-L Impedance or R-C Admittance functions(Cauer forms of R-L Impedance or R-C Admittance), Problems.

TEXT BOOKS:
1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition .

2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.
3. Circuit theory Analysis & Synthesis by Chakrabarti, DhanpatRai Publishing Company (P) Ltd.

REFERENCE BOOKS:
1. Network Analysis by N.C.Jagan, C.LakshmiNarayana BS publications 2nd edition.
2. Electric circuits in SI units by Joseph A Edminister, MSE, 1st Edition.
3. Electrical Circuits by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill.
4. Electrical Circuits by Sreenivasulu.N, Reem Publications.

ELECTRONIC DEVICES AND CIRCUITS

Subject Code: 18EET205   **Internal Marks:40**
Credits:3   **External Marks:60**

Course Objectives:
- To study semiconductor physics, junction diode characteristics, special diodes,
- To design of rectifiers, filters
- To learn about transistors, FETs, transistor biasing, application of transistors.
- To know the concepts of oscillator circuits.

Course Outcomes:
CO1: Ability to analyze the structure of different types of semiconductor devices and ability to design rectifiers and filters.
CO2: Ability to understand the operation of transistor and their characteristics for different configurations, characteristics of JFET, MOSFET.
CO3: Ability to understanding biasing techniques.
CO4: Ability to analyze transistor amplifiers.
CO5: Ability to analyze the operation of oscillators

UNIT I:
Diode Characteristics: Formation of PN junction diode, V-I Characteristics of Diode, Diode current equation, Diode as a switch, Zener Diode Characteristics, Zener Diode as Voltage Regulator, Tunnel diode, LED.

UNIT II:
Rectifiers and Filters: Half wave rectifier, Full wave rectifier, Ripple factor, Efficiency, TUF Advantages of full wave rectifier over Half Wave rectifier, Rectifiers with C- Filter, Inductor filter, LC- Filter.

UNIT III:
Transistor Characteristics: Bipolar Junction Transistors (BJT) - input & output Characteristics of transistor in CB, CE, CC configurations, Relations between α,β,γ. Characteristics of JFET, MOSFET (Enhancement and depletion),Characteristics of UJT

UNIT IV:
Transistor Biasing and Stability: Need for biasing, DC & AC load line,criteria for fixing the operating point, thermal run away, Types of biasing and its stability,Thermal stability, stabilization techniques.

UNIT V:
Application of transistors: Transistor as a Switch, as a Amplifier .features of CE, CB, CC amplifiers.
Oscillators: Condition for oscillations, RC Phase shift oscillator with Transistor, Wien bridge oscillator, Hartley and Colpitt's oscillator

Text Books:
1. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2009.
2. Electronic Devices - FLOYD 5th Edition, Pearson Education.

Reference Books:
1   Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill.
2   Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006.

ELECTRICAL MACHINES-I

Subject Code: 18EET206   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objective
- To analyze the performance of different types of DC machines & Transformers.
- To appreciate the applications of DC machines & Transformers

Course outcomes
CO1: Identify and Define different types of dc generators, interpret their performance under different load conditions.
CO2: Describe the construction and performance of various types of DC motors.
CO3: Determine the performance of DC machines by conducting different tests.
CO4: Distinguish between different types of transformers and compute their equivalent circuit parameters.
CO5: Determine the performance of transformer by conducting different tests.

UNIT I:
D.C generators: Constructional details Principle of operation, Armature winding Lap & Wave, Emf equation, Methods of excitation, Armature Reaction, Commutation.

UNIT II:
Characteristics of D.C. generators: O.C.C, internal-external characteristics, losses-power flow, efficiency calculation
DC Motors: Principle of operation of DC motors, Back EMF, Torque equation, Types of DC motors, Speed-Torque characteristics of DC motors.

UNIT III:
Speed Control & Testing of DC Machines: Starting of DC motors: 3 point starter, 4 point starter, Losses and efficiency, Condition for maximum efficiency, Speed control methods, Brake test, Swinburne's test, Retardation test, Hopkinson's test, fields test.

UNIT IV:
Transformers –I: Constructional features, Principle of operation, , EMF equation, Transformer on No load and Load Phasor diagram, equivalent circuit, Regulation, losses and efficiency, All day efficiency.

UNIT V:
Transformers –II: Open circuit and short circuit test, Sumpner's test, parallel operation, separation of core losses test, auto transformers, 3-Ø transformer connections, Scott connection.

TEXT BOOKS:
1. I.J. Nagrath&D.P.Kothari, " Electrical Machines", Tata McGrawHill.
3. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher.

REFERENCE BOOKS:
1. Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
2. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
3. Husain Ashfaq , " Electrical Machines", DhanpatRai& Sons.
4. Electric Machinery. A.E. Fitzgerald, Charles Kingsley, JR., Stephen D. Umans 6th Edition.

ELECTRONIC DEVICES AND CIRCUITS LAB

Subject Code: 18EEL201   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course objective
- The main objective of this curriculum/course is to make the students well versed with basic electronics components and circuits
- The students can understand the nature and scope of modern electronics.
- Describe physical models of basics components.
- Understand their capabilities and limitations and make decisions regarding their best utilization in a specific situation

Course Outcomes:

Students will be able to
CO1: Measure the frequency of a given waveform using CRO.
CO2: Draw the corresponding V-I characteristics of P-N semiconductor diode, Zener diode and examine its cut-in voltage.
CO3: Draw the V-I characteristics of Bipolar Junction Transistor (BJT) in various configurations, Field Effect Transistor (FET) and Uni Junction Transistor (UJT).
CO4: Determine the response of half wave and full wave rectifiers with and without Filters
CO5: Point out different types of amplifiers.

List of Experiments:
1. Frequency measurement using Lissajous figures.
2. P-N Junction diode characteristics A. Forward bias B. Reverse bias.(cut-in voltage & Resistance calculations)
3. Zener diode characteristics and Zener as a regulator.
4. Transistor CB characteristics (Input and Output) & h Parameter calculations.
5. Transistor CE characteristics (Input and Output) & h Parameter calculations.
6. Rectifier without filters (Full wave & half wave).
7. Rectifier with filters (Full wave & half wave).
8. FET characteristics.
9. CE Amplifier.
10. CC Amplifier (Emitter Follower).

Additional Experiments:
11. UJT Characteristics
12. RC Phase Shift Oscillator

ELECTRICAL MACHINES – I LAB

Subject Code: 18EEL202   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objective
- This lab aims to understand the characteristics and performance of DC machines through the conduction of experiments.

Course Outcomes
CO1: Analyze the performance of DC motor under loaded and unloaded conditions.
CO2: Analyze the characteristics of DC generator
CO3: Determine the critical field resistance and critical speed of DC Generator
CO4: Determine the efficiencies of DC Series and Shunt generators
CO5: Examine various speed control methods of DC shunt motor.

LIST OF EXPERIMENTS:
1. Magnetization characteristics of DC shunt generator.

2. Load test on DC shunt generator.

3. Brake test on DC shunt motor.

4. Load test on DC compound generator.

5. Hopkinson's test on DC shunts machines.

6. Fields test on DC series machines.

7. Swinburne's test on D.C shunt machine.

8. Speed control of DC shunt motor by Field and armature Control.

9. Retardation test on DC shunt motor.

10. Load test on DC series generator.

Additional Experiments:
11. Brake test on DC compound motor.

12. Separation of losses in a DC shunt motor.

BIOLOGY

Subject Code: 18BST209   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Outcomes
After studying the course, the student will be able to:
- Describe how biological observations of 18[th]Century lead to major discoveries in the contemporary world.
- Convey the classification of biology with respect to morphological, biochemical and ecological aspects, Identify and classify microorganisms.
- Highlight the basic principles of Mendel's experiments during the passage of genetic material, convey that all forms of life have the same building blocks though the manifestations are diverse and Identify DNA as a genetic material in the molecular basis of information transfer.
- Classify enzymes and differentiate different mechanisms of enzyme action, Analyze biological processes at the simpler level.
- Apply thermodynamic principles to biological systems.

Unit-I
Introduction
Fundamental differences between science and engineering using live examples (Eye and Camera, Bird fly and Air craft etc.).Exciting and contemporary aspects of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples of Brownian motion and the origin of thermodynamics.

Unit-II
Classification of organisms and Microbiology
Introduction-Discuss classification based on (a) Cellularity- Unicellular or multicellular (b)Ultra structure- prokaryotes or eukaryotes (c) Energy and Carbon utilization - Autotrophs,heterotrophs, litho tropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e)Habitat- aquatic or terrestrial (f) Molecular taxonomy- three major kingdoms of life.
Concept of single celled organisms, Concept of species and strains, Identification and classification of microorganisms, Ecological aspects of single celled organisms, Sterilization and media compositions, Growth kinetics.

Unit-III
Genetics, Bio-molecules and Information Transfer
Mendel's Laws-Concept of segregation and independent Assortment-Concept of Allele-Gene Interaction-Epistasis,Concepts of Recessiveness and Dominance of genes, Meiosis and Mitosis, Discuss about the single gene disorders in humans.
Molecules of life-monomeric units and polymeric structures, Discuss about sugars-starch and cellulose, Amino acids- Proteins and lipids, Nucleotides and DNA/RNA.

Molecular basis of information transfer-DNA as a genetic material, Hierarchy of DNA structure- from single stranded to double helix to nucleosomes, Concept of genetic code,Genetic recombination.

Unit-IV
Enzymes and Macromolecular analysis
Enzymology-Enzyme classification, General properties of Enzymes, Mechanism of enzyme action-examples, Enzyme kinetics and kinetic parameters

Protein Functions, Hierarchy in protein Structure-Primary, Secondary, Tertiary andQuaternary, Proteins as enzymes-transporters-receptors and structural elements

Unit-V
Metabolism
Thermodynamics as applied to biological systems. Exothermic and Endothermic versusEndergonic and Exergoinc reactions, ATP as an energy currency-breakdown of glucose toCO_2+ H_2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO_2 and H_2O (Photosynthesis),Energy yielding and Energy consuming reactions

Text Books:
1) Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd.
2) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: P. S. Verma; V. K. Agarwal, S Chand and CO. Ltd, New Delhi-55.
3) A Text Book of Animal Physiology: A. K. Berry, EMKAY Publications, New Delhi-51.

References:
1) Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wileyand Sons.
2) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freemanand Company.
3) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman andcompany, Distributed by Satish Kumar Jain for CBS Publisher.
4) Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C.Brown Publishers.

ENGINEERING MECHANICS

Subject Code: 18EST103   **Internal Marks: 40**
Credits: 4   **External Marks: 60**

COURSEOBJECTIVES:
- To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
- To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
- To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering
- To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies. .

COURSE OUTCOMES:
CO 1. Determine the resultant of a planar force system using resolution of force and principle of moments.
CO 2. Draw free-body diagrams of given rigid bodies and compute unknown forces using equations of equilibrium of a planar force system by graphical and analytical methods.
CO 3. Comprehend the effect of friction on equilibrium of rigid bodies. Analyze the plane trusses by calculating axial forces in the members using method of joints.
CO 4. Calculate cetroid and moment of inertia of plane figures of triangular, rectangular and circular cross sections.
CO 5. Demonstrate an understanding of the principles of kinematics and kinetics of particles and planar rigid bodies.

UNIT- I
Systems of forces: Introduction – parallelogram law – Forces and components - Resultant of coplanar concurrent forces - vector notation – moment of force – principle of moments – couples - Resultant of planar force systems.

UNIT II
Equilibrium of force systems: Equilibrium – free body diagrams – Equations of equilibrium – equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – Moment of a Force and its applications, Varignon's theorem

UNIT- III
Friction: Introduction, limiting friction – types of friction and friction laws – application of friction - Inclined plane, wedge friction. TRUSSES: Analysis of Plane trusses using method of joints.

UNIT- IV
Centroids and centre of gravity: Centre of gravity – centroids of area and lines – determination of centroids by integration – centroids of composite figures – theorems of Pappus.

Area moment of inertia : Moment of inertia – polar moment of Inertia – Radius of gyration - Transfer theorem for moment of Inertia – Moment of inertia of composite areas. Concept of mass moment of inertia.

UNIT- V
Kinematics: Rectilinear motion-curvilinear motion – Rectangular components of curvilinear motion - Normal and Tangential components of acceleration, Kinematics of rigid bodies - angular motion – fixed axis rotation – Definition and analysis of plane motion.
Kinetics: Kinetics of rigid bodies – equation of plane motion – fixed axis rotation – rolling bodies (simple examples) - general plane motion (Simple examples).

TEXT BOOKS:
1. I.B. Prasad: Applied Mechanics, Khanna Publishers, 19th Edition, 2009.
2. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.
3. A.K. Tayal: Engineering Mechanics, Umesh Publishers, 13th Edition, 2008.

REFERENCES BOOKS:
1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
3. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
4. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
5. Engg. Mechanics / S.S. Bhavikati& J.G. Rajasekharappa.

ELECTRICAL MACHINES-II

Subject Code: 18EET207   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objective:
- Ability to understand the principle of operation, construction and characteristics of three phase induction motor and its application.
- Describe the methods to analyze the construction and performance of synchronous machines and its applications

Course outcomes:
CO1: Acquire knowledge about the working principle and Performance of 3- phase induction motor.
CO2: Summarize different techniques related to speed control and starting of 3-phase induction motor.
CO3: Outline different types of Alternators and their performance criteria**.**
CO4: Identify different types of synchronous motors; interpret their performance under different load conditions.
CO5: Recognize areas of application of synchronous and induction machines

UNIT I:
Three phase Induction Machine – I: Constructional features, salient pole, non salient pole, Rotating magnetic field, Principle of operation, Torque and power equations, Torque- slip characteristics, Equivalent circuit.

UNIT II:
Three phase Induction Machine- II: No load & blocked rotor tests-circle diagram, Starting methods, Speed control methods, Induction generator, Applications.

UNIT III:
Synchronous Machine –I: Constructional features, Armature winding, EMF Equation, Winding Coefficients, Equivalent circuit and phasor diagram, Armature reaction.

UNIT IV:
Synchronous Machine II: O. C. & S. C. tests, Voltage regulation using Synchronous Impedance method, MMF method, Potier's Triangle method, Parallel operation of synchronous generators, Two reaction theory, Applications.

UNIT V:
Synchronous Motor: Principle of operation, Starting methods, Effect of varying field current at different loads, V and Λ curves, Synchronous condenser, Applications.

TEXT BOOKS:

1. I.J. Nagrath&D.P.Kothari, " Electrical Machines", Tata McGrawHill.
3. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher.

REFERENCE BOOKS:

1. Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
2. M.G. Say, "The Performance and Design of AC machines", Pit man & Sons.
3. Husain Ashfaq , " Electrical Machines", DhanpatRai& Sons.
4. Electric Machinery. A.E. Fitzgerald, Charles Kingsley, JR., Stephen D. Umans 6th Edition.

POWER SYSTEMS-I

Subject Code: 18EET208   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objective:
- To impart knowledge about the generation of electrical power to meet the ever increasing demand of electrical power and operation of conventional power plants.
- To impart knowledge about the various aspects and methods of improving Voltage and power factor in distribution system.

Course outcomes:
CO1: Students are able to draw the line diagrams and identify different components in thermal &hydel power generating stations.
CO2: Students can able to understand the operation of Gas, Solar and Nuclear power generation.
CO3: Students can summarize different distribution systems.
CO4: Students can understand the operation of Substations.
CO5: Students can analyze the economic aspects of power generation and different tariff methods.

UNIT I:
Thermal &Hydel Power Stations: Site selection, Line diagram of Thermal Power Station showing paths of coal, steam, water, air, ash and flue gasses- Brief description of TPS components: Boilers, Super heaters, Economizers, Turbines, Condensers, Cooling towers, and Chimney, Electro Static Precipitator, Hydro power plants.

UNIT II:
Gas, Solar and Nuclear power generation: Gas Power station: Principle of operation and component (block diagram approach only). Solar Power generation: Line diagram of solar energy storage, solar energy collector, point focusing collector, solar power generation.
Nuclear Power Stations: Working principle, Nuclear fuels. Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR. Radiation: Radiation hazards and Shielding.

UNIT III:
Distribution Systems: Classification of distribution systems, design features of distribution systems, radial distribution, ring main distribution, voltage drop calculations: DC distributors for following cases: radial DC distributor fed at one end and at ends (equal / unequal voltages), ring main distributor, stepped distributor and AC distribution. Comparison of DC and AC distribution.

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UNIT IV:
Substations: Classification of substations: Air insulated substations - Indoor & Outdoor substations: Substations layout showing the location of all the substation equipment.
33/11 KV substation line diagram.
Gas insulated substations (GIS): Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations.

UNIT V:
Economic Aspects of Power Generation: Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, capacity factor, utilization factor, 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: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods.

TEXT BOOKS:
1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakrabarti, DhanpatRai& Co. Pvt. Ltd., 1999.
2. Electrical Power sytem by S.L.Uppal.

REFERENCE BOOKS:
1. Generation,Distribution and Utilization of Electric Energy by C.L.Wadhawa New age

CONTROL SYSTEMS

Subject Code: 18EET209 **Internal Marks: 40**
Credits: 3 **External Marks: 60**

Course objective:
- To describe the feedback controls with basic components of control systems.
- To formulate mathematical models of physical systems and block diagram representation.
- To analyze stability of the system from transfer function approach.
- To describe and analyze various time domain and frequency domain tools for analysis and design of linear control systems.
- To Represent physical systems in state space form and analyze them.

Course outcomes:
CO1: Able to understand basic components of feedback control systems; formulate mathematical models of physical systems and represent them in block diagrams and signal flow graphs.
CO2: Able to understand the time- domain specifications; Analyze first and second order control systems in time domain;
CO3: Able to understand the concepts of stability; Analyze stability of the system from transfer functions approach and graphical methods.
CO4: Able to Design controllers, compensators for improve the performance specifications.
CO5: Able to Represent physical systems in state space form and analyze them.

UNIT I:
Introduction: Concepts of Control Systems- Open Loop and closed loop control systems- examples- Classification of control systems- Feedback characteristics- Effects of feedback characteristic.
Mathematical models of physical systems: Differential equations- transfer functions and block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula - Translational and Rotational mechanical systems.

UNIT II:
Transfer function of elements of control systems: Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver,
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, and proportional integral derivative systems.

UNIT III:
Concept of stability: The concept of stability – Routh's 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.

UNIT IV:
Frequency response analysis: Introduction, Frequency domain specifications-Bode plots-Determination of Frequency domain specifications and transfer function from the Bode plot-Phase margin and Gain margin-Stability Analysis from Bode Plots.Polar Plots- Nyquist Plots-Stability Analysis.

UNIT V:
Design and Compensation techniques: Introduction and preliminary design considerations-Lag, Lead, Lead-Lag compensation based on frequency response approach.
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.

TEXT BOOKS:
1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2nd edition.

2. Automatic Control Systems byFaridGolnaraghi, Benjamin C. KUO,Wiley india Pvt. Ltd, Ninth Edition.

REFERENCE BOOKS:
1. Control Systems by A.Anand Kumar, PHI Publications,4th edition.

2. Control Systems Engineering by S.Palani,TataMcGraw Hill Publications.

3. Modern Control Engineering, Fifth edition, Kotsuhiko Ogata, Prentice Hall of India Pvt. Ltd.

NUMERICAL METHODS
(Interdisciplinary Elective – I)

Subject Code: 18IET212   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

COURSE OBJECTIVES

- To Solve the algebraic and transcendental equations,using different numerical method.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y=f(x) for an evenly or unevenly spaced points.
- To estimate the value of derivativesusing different numerical methods.
- To evaluate the definite integrals using different numerical methods.
- To calculate the numerical solution of an ordinary differential equation i.eIVP .

COURSE OUTCOMES

On completion of this course, students should be able to

- Solve the algebraic and transcendental equations by identifying suitable numerical methods.
- Estimate a linear and non-linear curve to the given data by the method of least squares.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y = f(x) for an evenly or unevenly spaced points.
- Estimate the value of derivatives and evaluate the definite integrals using different numerical methods and evaluate an IVP.
- Calculate the numerical solution of an ordinary differential equation i.eIVP .

Unit – I
Algebraic and Transcendental Equations:
Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The
Method of False Position – The Iteration Method – Newton-Raphson Method.

Unit-II
Interpolation:
Interpolation**:** Introduction – Finite differences- Forward Differences – Backward differences –Newton's formulae for interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

Unit-III

Numerical Differentiation:
Numerical Differentiation– Differentiation using finite differences- Newton's Forward – Backward- Lagrange's.

UNIT-IV
Numerical Integration:
Numerical Integration using Trapezoidal rule, Simpson's 1/3 Rule, Simpson's 3/8 Rule- Numerical double Integration using Trapezoidal rule, Simpson's 1/3 Rule.

Unit-V
Numerical solution of Ordinary Differential equations:
Solution by Taylor's series – Picard's Method of successive Approximations – Euler'sMethod – Runge–KuttaMethod(4th order).

Text Books:
1. Higher Engineering Mathematics, 43nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.
3. Introductory methods of Numerical analysis by S.S. Sastry.

Reference Books:

1. Mathematical Methods, 6th edition, 2011, Dr. T. K.V.Iyengar& others S. Chand Publications.
2. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
3. Engineering Mathematics Volume-II, 6th edition, 2012, T.K.V Iyengar, &others, S.Chand Co. New Delhi.

COMPUTER AIDED ENGINEERING DRAWING
(Interdisciplinary Elective – I)

Subject Code: 18IET215   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

COURSE OBJECTIVES:
Students will have

1. To practice the computer aided drafting which include points, lines, curves, polygons and dimensioning
2. To practice the types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands
3. To practice computer aided solid modeling which include Isometric projections, orthographic projections of isometric projections
4. To practice isometric projections, Orthographic projections and solids using AutoCAD.
5. To practice computer aided solid modeling in 3D learn about 3D wireframe by using AutoCAD

COURSE OUTCOMES:
Students will get ability

1. Draw points, lines, curves, polygons, dimensioning etc., using Drawing tools by AutoCAD.
2. Draw object by using object selection commands to edit the drawing, 2D wire framing in AutoCAD.
3. Draw the object applying utility and modified commands by AutoCAD.
4. Draw isometric projections, Orthographic projections and solids using AutoCAD.
5. Draw simple solids in 3D learn about 3D wireframe by using AutoCAD.

UNIT – I
INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, Dimensioning.
UNIT – II
TYPES OF MODELING: Object selection commands – edit, zoom, cross hatching, pattern filling.Rotate, text, Mtext and 2D wire frame modeling.
UNIT-III
COMMANDS: Utility commands- limits and shortcuts all commands,and modified commands – join, break, break point, trim, move, extend, mirror, offset, array, and stretch.
UNIT-IV
COMPUTER AIDED SOLID MODELING: Isometric projections, orthographic projections of isometric projections.
UNIT-V
3D MODELING:3D wire frame modeling,modeling of simple solids.

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TEXT BOOKS:
1. Text book of Engineering Graphics, K.C. john, PHI Publications
2. Machine Drawing, K.L.Narayana ,P. Kannaiah and K.Venkatareddy, fourth edition / New age International publishers.

References:
1. Engineering Graphics with Auto CAD, Revised edition,Text Book by D.M.Kulkarni, A.P.Rastogi, A.K.Sarkar PHI learingPvt.LimitedNewDelhi
2. Text book of Engineering Drawing with Auto-CAD, second edition,K.venkatareddy/B.S. Publications.
 3. Engineering drawing by N.D Bhatt ,Charotar publications.

INTRODUCTION TO MATHEMATICAL SIMULATION AND MODELING
(Interdisciplinary Elective – I)
(Except EEE)

Subject Code: 18IET216   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

Course Objectives:

By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

Course Outcomes:

CO1: Translate mathematical methods to MATLAB code.

CO2: Generalize results and represent data visually.

CO3: Apply computer methods for solving a wide range of engineering problems.

CO4: Utilize computer skills to enhance learning and performance in other engineering and science courses.

CO5: Demonstrate professionalism in interactions with industry.

UNIT I
INTRODUCTION TO MATLAB

Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Clearing Operations, Commands, Data types, Operators.

UNIT II
DATA AND DATA FLOW IN MATLAB

Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions.

UNIT III
MATLAB PROGRAMMING

Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

UNIT IV
MATLAB ADVANCED

Plotting graphs, Creating Plot & Editing Plot, MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNITV
SIMULINK

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Introduction to scilab.

Text Books:

1. Getting Started With Matlab: A Quick Introduction for Scientists and Engineers (English) by RudraPratap, OXFORD University Press.
2. Matlab Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

Reference Books:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang ,Wenwu Cao, Tae-Sang Chung, John Morris.

FUNDAMENTALS OF MATERIAL SCIENCE
(Interdisciplinary Elective – I)

Subject Code: 18IET217   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

COURSE OBJECTIVES:
- To understand different engineering materials and their structures.

COURSE OUTCOMES:
On completion of this course, students should be able
CO 1. To gain thorough knowledge in engineering materials and their structures.
CO 2. To gain thorough knowledge in deformation in different engineering materials.
CO 3. Understand necessity of hot and cold working methods.
CO 4. Understand thoroughly mechanical properties.
CO 5. Describe different types material failures.

UNIT-I
Introduction: Introduction, classification of materials, crystal defects.

UNIT-II
Plastic deformation of single crystals: Plastic deformation of single crystals. Deformation by slip,.Deformation of single crystal.Deformation by twinning.

UNIT-III
hot working, cold working. Recovery, recrystallization and grain growth.Solidification mechanism.

UNIT-IV
Mechanical properties: Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

UNIT-V
Impact toughness, Charpy V-Notch, fracture, ductile, brittle, Griffith criteria for brittle failure, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

TEXT BOOKS:
1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.

REFERENCE BOOKS:
1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.
3. Material Science – Callister.

INTRODUCTION TO ELECTRONIC MEASUREMENTS
(Interdisciplinary Elective – I)

Subject Code:18IET219   **Internal Marks:40**
Credits: 2   **External Marks:60**

Course Objectives:
- Study of performance characteristics of different electronic measuring instruments.
- Subject introduces Signal Generator and Wave Analyzers for analysis of EM spectrum.
- Deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- Brief discussion about all AC bridges, design methods and its applications.
- This subject includes transducers for the measurement of non electrical parameters and its signal conditioning techniques using electronic circuitry

Course Outcomes:
CO1: Identify electronic instruments, their Characteristics and use.
CO2: Describe various signal generators, wave analyzers for distortion measurements.
CO3: Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
CO4: Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
CO5: Explain various types of transducers and their applications for measuring non- electrical parameters.

UNIT I
Performance characteristics of instruments: Static characteristics, accuracy, resolution,precision, expected value, error and sensitivity. Errors in measurement and dynamic characteristics: speed of response, fidelity, lag and dynamic error.,**Voltmeters:**Multirange, range extension. **Ammeters:** Shunt and thermocouple type ammeter. **Ohmmeters**: Series type and shunt type.

UNIT II
Signal Generators - standard and AF sine and square wave signal generators, functionGenerators, Wave Analyzers, Harmonic distortion analyzers .

UNIT III
Cathode Ray Oscilloscopes: CRT features, Block Diagram of CRO, Dual beam CRO,measurement of amplitude and frequency, Dual trace oscilloscope, Digital storage oscilloscope.

UNIT IV
AC Bridges:
Measurement of inductance: Maxwell's bridge, Anderson bridge., Measurement of capacitance: Schearing bridge. Wheatstone bridge and Wien Bridge

UNIT V
Transducers: Classification of Transducers**,** Linear Variable Differential Transformer,Thermocouples, thermistors, sensistors, Digital Data acquisition systems.

Text Books:

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

Reference Books:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

UNIX UTILITIES
(Interdisciplinary Elective – I)

Subject Code:18IET21A   **Internal Marks:40**
Credits: 2   **External Marks:60**

Course Outcomes

1. Understands UNIX Architecture and Functions of OS
2. Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
3. Effectively use software development tools including libraries, pre-processors, compilers, linkers, and make files.
4. Prepare simple readable user documentation using shell scripts.
5. Develop shell scripts to perform more complex tasks.

Unit – I
History – System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system – Introduction to system concepts – Kernel data structures – System administration.

Unit – II
Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Command - man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

Unit – III
Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, comm, cmp, diff, tr.

Unit – IV
Introduction to Shells: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Unit – V
Shell Programming: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Text Books

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India.

IT SYSTEMS MANAGEMENT
(Interdisciplinary Elective – I)

Subject Code:18IET21B   **Internal Marks:40**
Credits: 2   **External Marks:60**

Course Objectives:

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for an business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes:

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization.
3. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Characteristics of the network Security that affect user operations.
5. Define, track, and maintain data and data resources and recent trends in IT.

Unit I
IT Infrastructure: Overview
Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit II
Software Management
SDLC, The Waterfall Model, Advantages, Disadvantages, Conventional Software Management performance, Software Economics.

Unit III
Current computing environment
Complexity of current computing, multiple technologies.
IT system Management: Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management, Service level management, Financial Management, Capacity Management, availability management.

Unit IV

Security Management

Computer Security , Internet Security , Physical Security , Identity Management , Access control System, Intrusion Detection. Emerging trends in IT: E-commerce, GSM.

Unit V

Storage Management

Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Text Books:

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-HillEducation. (Unit1,3,4,5)
2. Software Project Management , Walker Royce: pearson Education,2005.(Unit 2)

References:

1.Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Bookfor Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service),2009.
2.Van Haren, Passing the ITIL Foundation, Van Haren Publishing,2011.

ELECTRICAL MACHINES-II LAB

Subject Code: 18EEL203   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course objective:
To develop on hand experience with Transformers, Induction motors, Synchronous generators and motor by allowing them to conduct various experiments.

Course outcomes:
CO1: Explain testing and experimental procedures on different types of electrical machines.
CO2: Prepare laboratory setup (circuits) with proper connections on electrical Transformers and AC-machines
CO3: Analyze the performance of induction motors and synchronous machines
CO4: Summarize experiment results in a written report
CO5: Analyze possible causes of discrepancy in comparison to theory

LIST OF EXPERIMENTS:
1. O.C. &S.C. Tests on single phase transformer.
2. Sumpner's test on a pair of single phase transformers.
3. Brake test on three phase squirrel cage induction motor.
4. No-load& blocked rotor tests on three phase Slip ring Induction motor.
5. Regulation of a three phase alternator by synchronous impedance method.
6. V and inverted V curves of a three –phase Synchronous motor.
7. No-load& blocked rotor tests on single phase induction motor.
8. Determination of Xd and Xq of a salient pole synchronous machine.
9. Parallel Operation of Single Phase Transformers.
10. Separation of core losses of a single phase transformer.

Additional Experiments:
11. Scott connection of Transformers.
12. Regulation of a three phase alternator by ZPF method.

ELECTRICAL CIRCUITS LAB

Subject Code: 18EEL204   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objective:
- To understood and analyze the network theorems

- To understand other network concepts through the conduction of experiments

Course Outcomes:
CO1: Can Understand and verify the network theorems.
CO2: Understood the Locus diagram of RL &RC circuits.
CO3: Understood the Series & Parallel resonance, importance of Quality of factor.
CO4: Know the Calculation of two port network parameters for a given network.
CO5: Able to measure active power for Star & Delta connected loads.

Any 10 of the following experiments are to be conducted:
1) Verification of Thevenin's Theorem

2) Verification of Norton's Theorem

3) Verification of Superposition theorem

4) Verification of Compensation Theorem and Maximum Power Transfer Theorem

5) Verification of Reciprocity, Millmann's Theorems

6) Locus Diagrams of RL and RC Series Circuits

7) Frequency response of Series and Parallel RLC circuit.

8) Determination of Self, Mutual Inductances and Coefficient of coupling of aTransformer.

9) Determination of Z and Y Parameters of Two-Port network.

10) Determination of Transmission and hybrid parameters of Two-Port network.

Additional Experiments:
11) Measurement of Active Power for Star and Delta connected balanced loads

12) Measurement of 3-phase Power by 2 Wattmeter Method for balanced loads

CONTROL SYSTEMS LAB

Subject Code: 18EEL205   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objective:
- To understand the modeling, simulation, transfer function and implementation of a physical dynamical system by a linear time invariant ordinary differential equation.
- To examine electrical modeling of a second order system and analyze the under-damped, over-damped and critically damped cases
- To interpret the effects of poles and zeros location in the s-plane on the transient and steady state behavior.
- To Measure the characteristics of Servo-Motor.
- To Design Lead, Lag and Lag-Lead series compensator on a second order system.

Course Outcomes:
CO1: Students can predict transfer function and implementation of a physical dynamical system by a linear time invariant ordinary differential equation.
CO2: Students can examine electrical modeling of a second order system and analyze the under-damped, over-damped and critically damped cases.
CO3: Students can interpret the effects of poles and zeros location in the s-plane on the transient and steady state behavior.
CO4: Students can measure the characteristics of Servo-Motor.
CO5: Students can design Lead, Lag and Lag-Lead series compensator on a second order system.

ANY TEN OF THE FOLLOWING EXPERIMENTS ARE TO BE CONDUCTED:
1. Time response of Second order system

2. Characteristics of Synchros

3. Effect of feedback on DC servo motor

4. Transfer function of DC motor

5. Effect of P, PD, PI, PID Controller on a second order systems

6. Lag and lead compensation – Magnitude and phase plot

7. Transfer function of DC generator

8. Temperature controller using PID

9. Characteristics of magnetic amplifiers

10. Characteristics of AC servo motor

11. Root locus and bode plot from MATLAB

12. State space model for classical transfer function using MATLAB-verification.

13. Simulation of transfer function using operational amplifiers.

REFERENCE BOOKS:
1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H.Rashid, PHI Publications.
2. MATLAB and its Tool box user's manual and – Math works, USA.

POWER ELECTRONICS

Subject Code: 18EET310   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
This course deals with characteristics of semi conductor device, AC-DC, DC-DC, AC-AC and DC-AC Converters. The importance of using pulse width modulation techniques is also discussed in this course.

Course Outcomes:
Students will be able to:
CO1: Distinguish between different types of power semiconductor devices and their characteristics.
CO2: Evaluate the performance of single Phase controlled converters with different loads.
CO3: Describe the performance of three Phase controlled converters with different loads.
CO4: Explain the operation of AC voltage controllers and Cyclo-converters.
CO5: Analyze and evaluate the operation of DC –DC Choppers and inverters.

UNIT – I
Power Semi Conductor Devices:
Thyristors– Silicon Controlled Rectifiers (SCR's)–TRIAC, Power BJT – Power MOSFET – Power IGBT,IGCT and their V-I characteristics – Turn on methods and Dynamic characteristics of SCR.Two transistor analogy – SCR – UJT firing circuit – Series and parallel connections of SCR's – Thyristor ratings and protection –SCR commutation- Numerical problems.

UNIT – II
Single Phase AC-DC Converters:
Principle of phase control, half wave controlled rectifiers, half wave controlled rectifiers with R, R-L, R-L-E load, Single-phase half-controlled converter with Resistive and RL load, - Derivation of average load voltage,current and input power factor. Fully controlled converters- Midpoint and Bridge connections with Resistive, RL loads and RLE load- Derivation of average load voltage , current and input power factor – Line commutated inverters without and with Freewheeling Diode, Effect of source inductance – Derivation of load voltage and current.

UNIT – III
Three Phase AC-DC Converters:
Three phase converters – Three pulse and six pulse converters – bridge connections with R and RL loads- average load voltage – Effect of Source inductance – Dual converters (both single phase and three phase).

UNIT – IV
AC Voltage Controllers &Cyclo Converters:

Single phase AC voltage controllers with R and RL loads – modes of operation of TRIAC – TRIAC with R and RL loads – Derivation of RMS load voltage, current and input power factor – Firing circuits – Numerical problems.

Cyclo converters – Single phase mid-point cyclo converters with Resistive and inductive load (Principle of operation only) – Bridge configuration of single phase cyclo converter (Principle of operation only).

UNIT – V
DC-DC Convertors & Inverters DC-AC

Choppers – Time ratio control and Current limit control strategies – Step down choppers, Derivation of load voltage and currents with R, RL loads- Step up Chopper – load voltage expression – Buck, Boost and Buck-Boost (Principle of operation only)

Single phase bridge inverters with R, RL loads, 3-phase bridge inverters . Voltage control of single phase inverters –single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

TEXT BOOKS:

1. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
2. Power Electronics : Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998

REFERENCE BOOKS:

1. Power Electronics – by VedamSubramanyam, New Age International (P) Limited, Publishers
2. Power Electronics – by V.R.Murthy , 1st edition -2005, OXFORD University Press
3. Power Electronics-by P.C.Sen,TataMcGraw-Hill Publishing.
4. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradra, A. Joshi and

R. M. K. Sinha, New Age International (P) Limited Publishers, 1996.
5. Power Electronics: converters, applications & design by Nedmohan, Tore M. Undeland, Riobbins by Wiley India Pvt. Ltd.

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: 18EET311   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
- To interpret the essential components of the computer and understand the architecture of 8086 microprocessor.
- To study the instruction set and assembler directives of 8086 microprocessor.
- To interface I/O and advanced peripherals with 8086.
- To study the architectural features of 80386,80486 Pentium and ARM processors.
- To study the Architecture and Assembly Language Programming of 8051 Microcontroller.

Course Outcomes:
At the end of the course student will be able to:
CO 1. Identify a detailed software & hardware structure of the 8086 Microprocessor.
CO 2. Develop assembly level programs with the help of Instruction set of 8086.
CO 3. Develop Interfacing techniques for 8255, 8259A, 8251 and 8257.
CO 4. Compare Architectural features of 8086 with advanced processors 80386,80486, Pentium and ARM processors.
CO 5. Identify a detailed software & hardware structure of the 8051 Microcontroller.

UNIT-I
Microprocessor 8086: Introduction, architecture, register organization, memory organization, signal description and pin diagram, addressing modes, classification of interrupts, interrupt service routine and interrupt vector table, timing diagrams of 8086.

UNIT-II
Assembly Language Programming of 8086: Instruction set-Data Transfer instructions, Arithmetic, logical, Branch instructions, Flag manipulation instructions, machine control instructions , String instructions, assembler directives, procedures and macros, assembly language programs.

UNIT-III
8086 Interfacing with I/O devices: Programmable Peripheral Interface (8255),modes of operation of 8255, interfacing 8255, Programmable interrupt controller (8259A),interfacing 8259A , Functional block diagram of USART(8251).DMA controller 8257.

UNIT-IV
Advanced Microprocessors:
Architecture, Features, register organization, signal description, data types and physical address calculation, mode of operations, segmentation and paging of 80386, comparison of 80486 and Pentium processors

ARM Processor fundamentals: ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table.

UNIT-V
Microcontrollers: Introduction, architecture, signal description, pin diagram, register set, memory organization, interrupts and addressing modes of 8051, Assembly Language Programming of 8051.

TEXT BOOKS:
1. Advanced Microprocessors and Peripherals – A K RAY and K M Bhurchandi, Tata McGraw-Hill Publications, 2000.
2. ARM System Developers guide, Andrew N SLOSS, Dominic SYMES, Chris WRIGHT, Elsevier, 2012
3. Microcontrollers – Ajay V Deshmukh, Tata McGraw Hill publications

REFERENCE BOOKS:
1. Microprocessor 8086 programming and Interfacing – Nagoorkhani, RBA publications
2. The 8051 Microcontroller – Kenneth J. Ayala
3. Microprocessors and Interfacing – Douglas V Hall, McGraw-Hill.

ELECTRICAL MEASUREMENTS

Subject Code: 18EET312   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
- Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current, power, power factor, energy and magnetic measurements.

Course Outcomes:
Students will be able to

CO1: Classify various analog instruments and understand their principle and operation

CO2: Understand the operation of C.Ts and P.Ts and also able to measure the active and reactive powers

CO3: Illustrate knowledge on measurement of energy, P.f. in the power system using energy meter and

   power factor meter respectively

CO4: Evaluate different methods of measuring R,L,C parameters in an electric network

CO5: Understand the principle, operation and applications of potentiometer, flux

 meter and ballistic galvanometer.

UNIT I:
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.

UNIT II:
Instrument transformers & Measurement of Power: CT and PT – Ratio and phase angle errors – .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- Basics of hall effect sensor.

UNIT III:
Measurement of Energy,P.F. meters: 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 – trivector meter, maximum demand meters. Design considerations Type of P.F. Meters – dynamometer and moving iron type – 1-ph and 3-ph meters .

UNIT IV:
D.C. Bridges: Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance ,unbalanced Kelvin's bridge– loss of charge method.
A.C. Bridges: Measurement of inductance,Quality Factor – Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle –Desautybridge.Wien's bridge – Schering Bridge.

UNIT V:
Potentiometers & Magnetic Measurements: Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage.
 A.C. Potentiometers: polar and coordinate types,Drysdale polar potentiometer, Gall-Tinsley(co-ordinate type) A.C.potentiometer,standardization,applications.
Magnetic measurements-Ballistic galvanometer – equation of motion – flux meter – constructional details, comparison with ballistic galvanometer. Analysis of B-H Loop and loss calculation .

TEXT BOOKS:
 1 Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& Co. Publications.
 2 Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.

REFERENCE BOOKS:
 1 Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers.
 2 M.B.Stout, "Basic Electrical Measurements", PHI, 1981.
 3 F.K.Harris, Electrical Measurements", Wiley Eastern Pvt. Ltd., 1974
 4 Electrical Measurements by K.A Bakshi, A.V Bakshi, U.A Bakshi, Technical publications.

POWER SYSTEMS – II

Subject Code: 18EET313   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objective:
- To give the knowledge on modeling and design of electrical transmission line.
- calculate the performance of transmission in terms of efficiency and regulation
- Study the various factors effecting the transmission line performance and transients in power systems.
- To learn the different types of insulators

Course outcomes:
CO1: Solve line parameters for different transmission line conductor configurations.
CO2: Analyze the performance of short, medium and long transmission lines through efficiency and regulation.
CO3: Analyze electrical transients in power systems and concepts of travelling waves on transmission lines.
CO4: Explain the basics of corona, sag and other effects arise in transmission lines.
CO5: Classify the insulators and summarize the issues for better string efficiency.

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 systems.

UNIT II:
Performance of Transmission Lines-I:
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.

UNIT III:
Performance of Transmission Lines-II: 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 IV:
Power System Transients and performance of transmission line: 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). Skin and Proximity effects - Description and effect on Resistance of Solid Conductors -Ferranti effect - Charging Current - Effect on Regulation of the Transmission Line, Shunt Compensation.

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

UNIT V:
Insulators sag and tension calculations: 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 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.

TEXT BOOKS:
1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar,A.Chakrabarthy, DhanpatRai& Co Pvt. Ltd.
2. Power System Analysis by HadiSaadat – TMH Edition.

REFERENCE BOOKS
1. Modern Power System Analysis by I.J.Nagaraj and D.P.Kothari, Tata McGraw Hill, 2nd Edition.
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers, 1998.
3. Power system Analysis-by John J Grainger William D Stevenson, TMC Companies, 4[th]edition
4. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.

INTEGRATED CIRCUITS APPLICATIONS
(Professional Elective – I)

Subject Code: 18EEE311   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives
- To introduce the basic building blocks of linear integrated circuits
- To explain the Linear and Non-linear applications of operational amplifiers
- To categorize the filter applications of op-amp
- To describe about ADC, DAC.
- To discuss the operation of 555 timer.

Course Outcomes
At the end of the course the student will be able to:
CO 1. To analyze the basic building blocks of op-amp.
CO 2. Design circuits using op-amps for various applications
CO 3. Design active filters for given cut_off frequencies.
CO 4. Summarize the Performance of the D to A and A to D converters,
CO 5. Design Pulse and square wave generators using IC 555 for given specifications

UNIT-I
Op-amp characteristics: DC characteristics: input bias current, input offset current, input offset voltage, thermal drift. AC characteristics: frequency response and slew rate.
Operational amplifiers: Block diagram, equivalent circuit, ideal and practical specifications, Open loop and closed loop Op-amp configurations.

UNIT-II
Linear& Non–linear applications of Op-amps: summing, scaling and averaging amplifier, integrator and differentiator, comparators, multivibrators, Schmitt Trigger.

UNIT-III
Active Filters: Introduction, Butterworth filters – 1st order, 2nd order LPF,HPF , Band pass, Band reject and all pass filters.

UNIT-IV
D to A and A to D converters: Introduction, basic DAC techniques, weighted resistor DAC,R-2R ladder DAC, ADCs: parallel comparator, counter type, successive approximation and dual slope ADCs.

UNIT-V
Timers: Introduction to 555 timer, functional diagram, monostable and astable operations and Schmitt Trigger.

TEXT BOOKS:
1. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2003, 2/e.
2. Op-Amps and Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

REFERENCE BOOKS:
1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, McGraw Hill, 1988.
2. OP AMPS and Linear Integrated Circuits concepts and Applications, James M Fiore, Cenage Learning India Ltd

PRINCIPLES OF PULSE AND DIGITAL CIRCUITS
(Professional Elective – I)

Subject Code: 18EEE312   **Internal Marks: 40**
Credits: 3   **External Marks:60**

Course Objectives:
- To introduce Wave shaping concepts in linear circuits
- To understand the concepts of clippers and clampers
- To study about switching characteristics of devices
- To analyze and design the multivibrators
- To Know the basic operating principles of time base generators

Course Outcomes:
At the end of the course the student will be able to:
- **CO 1.** Construct different linear networks like low pass and high pass circuits and determine their response to different signals
- **CO 2.** Determine the transfer characteristics of clippers and clamper circuits
- **CO 3.** Determine the switching characteristics of semiconductor devices and analysis of binary
- **CO 4.** Design astable and monostable multi vibrators
- **CO 5.** Analyze of operation of time base generators

UNIT –I
Linear wave shaping: High pass, low pass RC circuits; response of high pass and low pass RC circuit for sinusoidal, step, pulse, square and ramp inputs; RC circuit as differentiator, integrator and attenuator; RL and RLC circuits.

UNIT –II
Non – Linear Wave Shaping: Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, comparators,clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem.

UNIT –III
Switching Characteristics of Devices: Diode and transistor as switches, Design of transistor switch, transistor-switching times.

BistableMultivibrators: Principle of operation of BistableMultivibrators; Fixed bias and self biased transistor binary circuits, commutating capacitors, triggering in binary, Schmitt trigger.

UNIT –IV
Monostable: Principle of operation of monostable multi vibrator,triggering in monostable multi vibrator.
AstableMultivibrators: Principle of operation of astable multivibrator using transistors, Astable multivibrator as voltage to time converter

UNIT –V
Time Base Generators*: Methodsof generating time base waveform; Miller and Bootstrap time base generators – basic principles; Transistor miller time base generator; Transistor Bootstrap time base generator.

TEXT BOOKS:
1. Pulse, Digital and Switching Waveforms – J. Millman and H. Taub, McGraw-Hill, 1991.
2. Pulse and digital circuits- A.Ananda kumar,PHI,2/e.

REFERENCE BOOKS:
1. Pulse and Digital Circuits – VenkataRao K., Ramasuda K., Manmadharao G., Pearson Education, 2010.
2. Pulse and Digital Circuits – MS PrakashRao, Tata McGrawHill.

COMMUNICATION THEORY
(Professional Elective -I)

Subject Code: 18EEE313   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
- Explain the representation, generation and demodulation of various forms of amplitude modulation.
- Describe the concepts, generation and detection of frequency modulation and demodulation schemes.
- Explain pulse modulation schemes.
- To demonstrate different digital modulation techniques.
- To outline the concept of Information theory and Source coding techniques.

Course Outcomes:
At the end of the course the student will be able to:
CO 1. Explain the need for modulation and elaborately about amplitude modulation and demodulation schemes.
CO 2. Discuss the concepts of angle modulation and demodulation.
CO 3. Describe pulse modulation schemes and concepts of multiplexing.
CO 4. Summarize Digital Communication system and various digitization techniques.
CO 5. Analyze the performance of source encoder
CO 6.

UNIT-I
Amplitude modulation: Need for modulation, Amplitude modulation, Power and BW requirements, Generation of AM:square law Modulator, DSB SC:Balanced Modulators, SSB SC: Filter method, Demodulation of AM : Diode detector, Product demodulation for DSB SC & SSB SC(Qualitative only),Principle and block diagram of Super heterodyne Receiver.

UNIT-II
Angle Modulation: Basic concepts, Frequency Modulation: Single tone frequency modulation, Narrow band FM, Generation of FM Waves: Direct FM, Detection of FM Waves: PLL, Comparison of FM and AM.

UNIT-III
Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, Types of Pulse modulation: PAM, PWM and PPM Generation and Demodulation.Multiplexing: Time Division Multiplexing and Frequency Division Multiplexing.

UNIT-IV
Digital Communication: Elements of digital communication systems, Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, DM, ADM, ADPCM and comparison.

UNIT-V
Information Theory and Coding: Discrete messages and information content, Entropy - Discrete Memory less channels, Shanon's theorem for channel capacity, Source coding theorem - Huffman & Shannon - Fano codes.

TEXT BOOKS:
1. Analog and Digital Communications – Simon Haykin, John Wiley, 3rd edition.
2. Digital and Analog Communication Systems – K Sam Shanmugam,WSE,2006

REFERENCE BOOKS:
1. Communication Systems Analog and Digital – R.P. Singh and SD Sapre, TMH, 2nd Edition, 2008.
2. Principles of Communications – H. Taub and D. Schilling, Gouthamsaha, TMH, Third edition,2nd reprint,2008.
3. Electronic &Communication Systems – Kennedy and Davis, TMH, 4th edition, 2004.

Fundamentals of Fuzzy Logic
(Interdisciplinary Elective – II)

Subject Code:18IET321   **Internal Marks:40**
Credits   :2   **External Marks: 60**

Course Objectives
The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Frame linguistic variables and analyze the fuzzy quantifiers.
- Frame simple fuzzy sets.
- Fuzzify any desired area of classical Mathematics using Fuzzy controllers.
- Apply the concepts of Defuzzification.

Course Outcomes
Student is able to

1. Perform different fuzzy operations on fuzzy sets or membership functions.
2. Construct linguistic variables and estimate the fuzzy quantifiers as per the requirement. 3.Construct a simple Fuzzy set.
4. Develop simple Fuzzy expert system to Fuzzify any desired area with suitable controllers using different inference rules.
5. Apply defuzzification process to convert a Fuzzy set to a crispvalue.

Unit – I
Fuzzy set Theory: Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions-Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations-union, intersection, complement. Properties of Fuzzy Sets, Fuzzy relations – Cartesian product, operations on fuzzy relations.

Unit – II
Fuzzy Logic: Classical Logic – an overview, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference.

Unit – III
Construction of Fuzzy sets: Methods of construction –an overview, Direct methods with one expert, Direct methods with multiple experts, constructions from Sample data –examples.

Unit – IV
Fuzzy Expert System – Fuzzification: Fuzzy Controllers, Fuzzy Expert System- Fuzzification-Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules.

Unit – V

Fuzzy Expert System- Defuzzification: Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method-examples.

Text books:

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.VijayalakshmiPai,PHI.

Reference Books

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3^{rd}edition, John wiley& sons Ltd.

Remote Sensing
(Interdisciplinary Elective – II)

Subject Code:18IET323   **Internal Marks:40**
Credits   :2   **External Marks:60**

Course Objectives
The objective of the course is to
• Study the basics of remote sensing.
• Study the types platforms
• Study the types of Sensors &Resolutions
• Study the procedure of image analysis.
• Study the image classification procedure and know the use of Remote Sensing in various
  Applications.

Course Outcomes
On completion of the course, the students will be able to:

1. Demonstrate about the basics of remote sensing.
2. Explain about types platforms
3. Explain about types of Sensors &Resolutions
4. Understand the procedure of image analysis.
5. Illustrate the image classification procedure and explain the use of Remote Sensing in
   various Applications.

Unit – I
Introduction: Definition, Basic components of remote sensing, Electromagnetic radiation, Electromagnetic spectrum, EMR interaction with atmosphere - EMR interaction with Earth Surface Materials.

Unit – II
Platforms: Introduction, Platforms- Ground borne, Airborne remote sensing, Space borne remote sensing; Orbital Characteristics, Type of Orbits

Unit – III
Sensors & Resolution: Introduction, Sensors- Passive sensors, Active sensors; Spatial Resolution, Spectral Resolution, Temporal Resolution, Radiometric Resolution.

Unit – IV
Image Analysis: Introduction, Digital Image processing, elements of visual interpretations, image enhancement techniques

Unit – V
Image classification: Introduction, Principles of Image classification, Process of image classification supervised classification, unsupervised classification
Applications: Land use/Land Cover, Agricultural Application and Forest Applications

Text Books
1. Remote Sensing and its applications by LRA Narayana University Press1999.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy,BS Publications/BSP Books2012.

References Books
1. Basics of Remote sensing & GIS by S.Kumar, LaxmiPublications.
2. Remote Sensing and Image Interpretation, by Lillesand, Kiefer, Chipman, WillyPublishers, 6thEdition2011.

Renewable Energy Sources
(Interdisciplinary Elective – II)

Subject Code: 18IET324   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

Course Objective:
- To Outline the concept regarding the physics of the sun
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To Outline the concept regarding different types of wind mills and different types of biogas digesters
- To Outline the concept regarding geothermal energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:
   After completion of this course the student can able to
- Define different kind of solar radiation
- Utilize different methods of collection of solar energy and storage of solar energy
- Classify different types of wind mills and biogas digesters
- Classify different types of geothermal energy sources and and utilize different types of extracting techniques
- Distinguish different kinds of direct energy conversion techniques

UNIT – I
Principles of solar radiation:
Role and potential of new and renewable source, the solar energy option, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

UNIT-II
Solar energy collection, storage and applications
Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat . Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

UNIT-III
Wind and biomass energy:
Sources and potentials, horizontal and vertical axis windmills. Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield, I.C.Engine operation and economic aspects.

UNIT-IV
Geothermal and ocean energy: Resources, types of wells, methods of harnessing the energy. OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques,

UNIT-V
Direct energy conversion(DEC):
Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems. Fuel cells, principles, faraday's law's.

TEXT BOOKS:
1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:
1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

Principles of Mechanical Measurements
(Interdisciplinary Elective – II)

Subject Code: 18IET325   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

COURSE OBJECTIVES:
- To provide knowledge on static, dynamic behavior of measuring instruments and get the concepts of physical quantity measurement like pressure.
- To provide knowledge on measuring techniques for physical Quantity like pressure and flow.
- To provide knowledge on measuring techniques for temperature.
- To provide knowledge on measuring techniques for displacement.
- To provide knowledge on measuring techniques for mechanical quantities.

COURSE OUTCOMES:
At the end of the course the student will be able to:
- Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
- Measure pressure and flow using appropriate instruments
- Measure temperature using different transducers.
- Measure Displacement and Acceleration using appropriate devices.
- Measure force, torque speed and power using suitable instruments

UNIT- I
INTRODUCTION TO MEASUREMENTS: Basic functional descriptions of measuring instrument with examples, static and dynamic characteristics of measuring instrument.

UNIT- II
PRESSURE: classification of mechanical pressure gauges, working principles.
FLOW: Rota meter, magnetic flow meter, hot-wire anemometer, ultrasonic flow meter.

UNIT- III
TEMPERATURE: classification of temperature measuring methods according to their range of operation, working principles low temperature measurement and high temperature measurement techniques.

UNIT- IV
DISPLACEMENT: principle and operation of resistive, inductive, capacitive displacement transducers.

UNIT- V
FORCE, TORQUE, POWER, SPEED: Elastic force meter, load cells, Torsion meter, dynamo meter, stroboscope.

TEXT BOOKS:

   1. Measurement Systems: Applications & design by D.SKumar.

   2. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI /PE

REFERENCE BOOKS:

   1. Measurement systems: Application and design, Doblin Earnest. O. Adaptation by Manik and Dhanesh/TMH

   2. Instrumentation and Control systems/ S.Bhaskar/ AnuradhaAgencies.

   3. Mechanical and Industrial Measurements / R.K. Jain/ KhannaPublishers.

Principles of Communications
(Interdisciplinary Elective – II)

Subject Code: 18IET327   **Internal Marks: 40**
Credits   : 2   **External Marks: 60**

Course Objectives
- Explain the fundamental concepts of modulation and demodulation of Amplitude modulation and Angle modulation schemes.
- Understand various pulse modulation schemes.
- Compare the different types of Digital communication systems
- Understand various Digital modulation schemes

Course Outcomes
1. Determine Modulation Index, Bandwidth and power of AM,DSB-SC and SSB-SC for the given specifications and also compare various Demodulation techniques of AM.
2. Compute Modulation parameters of FM and PM waves as per the given specifications and also compare FM and PM in terms of characteristics and applications.
3. Describe Sampling theorem and Compute Nyquist sampling rate for the given signal and also compute Modulation parameters of PAM,PWM and PPM for the given specifications.
4. Analyze the PCM,DM,ADM and ADPCM techniques with respect to baud rate bit error rate and also construct the above said signals as per given conditions.
5. Determine Modulation parameters of ASK,FSK,PSK and DPSK for the given data and also construct the wave forms for the given specifications.

Unit – I
Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation and Demodulation of AM.

Unit – II
Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM. Basic block diagram of super heterodyne receiver , capturing effect.

Unit – III
Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM

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

Unit – V
Digital Modulation: ASK, FSK, PSK, DPSK, M -ary PSK.

Text Books:
1. Principle of Communications, Taub& Schilling, TMH,2003.
2. Communication Systems Analog and Digital – R.P. Singh, SD Sapre, TMH, 20th reprint, 2004

Reference Books:
1. Communication Systems Engineering – John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson.
2. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition,2004.

JAVA Programming
(Interdisciplinary Elective – II)

Subject Code: 18IET328   **Internal Marks: 40**
Credits   : 2   **External Marks: 60**

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

1. Become familiar with the fundamentals and acquire programming skills in the Java language.
2. Understand fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods, using class libraries, etc.
3. Able to understand and apply various object oriented features like inheritance, polymorphism to solve various computing problems and take the statement of a business problem and from this determine suitable logic for solving the problem.
4. Identify Java's standard packages and the different levels of member access and how they relate to packages and implement error handling techniques using exception handling.
5. Explore common issues encountered when creating a cross-platform multi-threaded application and also develop efficient Java applets.

Unit – I
Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Naming Conventions in Java, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements , Input and Output, Arrays   [Chapters [1,3,4,5]- Text Book 1]

Unit – II
Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java, Recursion, final keyword, this keyword.
[Chapters [6, 7] - Text Book 1]

Unit – III
Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance.
Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes.
Interfaces: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces.
[Chapters [8, 9] - Text Book 1]

Unit – IV
Packages: Packages, Different Types of Packages, Access Protection, ImportingPackages.
Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause, Types of Exceptions: Built-in Exception, User Defined Exception. [Chapters [9, 10] - Text Book 1]

Unit – V
Threads: Java Thread Model, Creating a Thread and Running it, terminating the Thread, Creating Multiple Threads, Thread Synchronization, Thread Priorities.

Text Books:
1.   Herbert Schildt, *"Java The complete reference"*, 8th Edition, McGrawHill, 2011.
2.   E.Balaguruswamy, *"Programming with Java A Primer"*, 4th Edition, TataMcGraw-Hill, 2009.

Reference Books:
1   Timothy budd, *"An introduction to object-orientedprogramming"*, 3rd Edition, Pearson Education, 2009.
2.   Y. Daniel Liang, "*Introduction to Java programming"*, 9th Edition, Pearson education, 2012.

Reference Links
   1.   http://en.wikibooks.org/wiki/Java_Programming - Java Learning WikiBook
   2.   http://www.javabeginner.com - Java Beginner Tutorial

PYTHON Programming
(Interdisciplinary Elective – II)

Subject Code:18IET329   **Internal Marks:40**
Credits   :2.0   **External Marks:60**

Course Objectives:
- Help students (who may /may not intend for CS&IT) to feel justifiably confident of their ability to write small programs.
- To provide the basic features of python programming language.
- To make students so that they can compete for jobs by providing competence & confidence in computational problem solving.
- Prepare students from other streams to make profitable use of computational methods in their chosen field.
- Prepare students who have prior programming experience or knowledge of computer science for an easier entry into computer science major.

Course Outcomes:
    On successful completion of the course Students will be able to:

1. Understand PYTHON environment and basic data types.
2. Be fluent in the use of procedural statements, assignments, conditional statements, loops, method calls and arrays.
3. Identify or characterize a problem based on PYTHON sequences.
4. Design, code, and test small Python programs that can handle exceptions and files.
5. Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.

Unit – I
Client /Server environment, Introduction to Python, History, features, python environment setup, Basic syntax, using command interpreter, Variable and Data Types, Basic data types in Python, script structure.

Unit – II
Conditional statements, Boolean expressions, Looping Control Structures, Control Statements: Break, Continue, Pass.

Unit – III
Python sequences: strings, Lists, Tuples, dictionaries, sets, string manipulation, functions, modules & import.

Unit –IV
Errors and Exceptions, Handling exceptions, Files, File input/output, Text processing, file functions.

Unit – V
Object oriented programming: Class, object, Object Oriented Programming concepts.

Text Books:

1. Wesley J. Chun "Core Python Programming", Second Edition, PrenticeHall
2. Allen Downey, "Think Python", Second Edition , Green TeaPress

Reference Books:

1. *Introduction to Computation and Programming Using Python, Spring 2013 Edition, By John V.Guttag.*
2. Programming in Python 3: A Complete Introduction to the Python Language(Developer's Library), by Mark Summerfield, 2^nd^Edition

MICROPROCESSORS AND MICROCONTROLLERS LAB

Subject Code: 18EEL306   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives:
Learning the
- MASAM (MACRO ASSEMBLER) software.
- Learning Addressing modes of 8086.
- Understand the Assembly language programming.
- Learning the instruction set of 8086 microprocessor and 8051 microcontroller.
- Study the interfacing of the processor with various peripheral devices

Course Outcomes
At the end of the course the student will be able to:
CO 1. Develop hands on experience with 8086 Assembly language programming using MASM.
CO 2. Develop DAC interfacing with 8086 to generate step, square, Triangular and Sine waves.
CO 3. Develop Stepper motor, Traffic lights interfacing with 8051 Microcontroller.

List of Experiments (At least Ten experiments are to be done) :

I. Microprocessor 8086

1. Introduction to MASM/TASM.
2. Arithmetic operation – Multi byte Addition and Subtraction, Multiplication and Division – Signed and unsigned Arithmetic operation, ASCII – arithmetic operation.
3. Logic operations – Shift and rotate – Converting packed BCD to unpacked BCD, BCD to ASCII conversion.
4. By using string operation and Instruction prefix: Move Block, Reverse string, Sorting, Inserting, Deleting, Length of the string, String comparison.

II. Interfacing

1. 8255 – PPI: Write ALP to Generate analog signals by Interfacing DAC through 8255 PPI

III. Microcontroller 8051

1. Interfacing stepper motor
2. Interfacing Traffic lights.
3. Interfacing with MIC.

ELECTRICAL MEASUREMENTS LAB

Subject Code: 18EEL307   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives:

- To aware the students about percentage errors in different measuring instruments, measurement of active and reactive powers and applications of measuring instruments.

Course Outcomes: Student will be able to
CO1: Evaluate the percentage error in different meters.
CO2: Examine the calibration of Ammeter and Voltmeter by using D.C Potentiometer.
CO3: Determine the unknown parameters using different Bridges.
CO4: Measure the active and reactive powers.
CO5: Determine the choke coil parameters.

LIST OF EXPERIMENTS:
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. Calibration LPF wattmeter – by Phantom loading.
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. Measurement of 3 phase power with single watt meter and 2 No's of C.T.
10. Dielectric oil testing using H.T. testing Kit
11. Transformer turns ratio measurement using A.C Bridge.
12. A.C. Potentiometer – Polar form/Cartesian form – Calibration of AC Voltmeter,
Parameters of Choke.

SWITCHGEAR AND PROTECTION

Subject Code: 18EET314   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
To Study the various types of the circuit breakers, the arc quenching phenomenon, protection against over voltages, earthing and understand the principle of protective schemes and various faults in power system.

Course Outcomes:
Students will be able to:
CO1: Understand the working of different types of circuit breakers and select a suitable circuit breaker for given application.
CO2: Apply the various principles of analog protection techniques to power systems.
CO3: Identify the suitable protection schemes for Generator & Transformer.
CO4: Describe the protection techniques for feeder and bus bar.
CO5: Evaluate the influence of over voltages and analyze the different grounding techniques at different locations in a power system.

UNIT I:
Circuit Breakers: Elementary principles of arc interruption, Recovery, Restriking Voltage and Recovery voltages- Restriking Phenomenon, Average and Max RRRV - Current Chopping and Resistance Switching - CB ratings and Specifications, Auto reclosures.Description and Operation of Air Blast Circuit Breakers, Minimum Oil Circuit breakers, Vacuum circuit breakers 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, Relays classification: Instantaneous, DMT and IDMT types, Application of relays: Over current relays, Directional relays, Differential Relays and Percentage Differential Relays, Numerical relay, Universal torque equation, Distance relays: Impedance, Reactance and Mho relays, Characteristics of Distance Relays and Comparison, Introduction to Static Relays and its advantages over Electromagnetic Relays, Comparison of electromagnetic, static, and numerical relay.

UNIT III:
Generator & Transformer Protection: Protection of generators against Stator faults, Rotor faults, and abnormal conditions, Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on percentage winding unprotected.
Protection of transformers: Differential Protection, Calculation of CT Ratio, Buchholtz relay.

UNIT IV:
Feeder and Bus - Bar Protection: Protection of Feeders: Over Current, Carrier Current and Three- zone distance relay protection using Impedance relays. Translay relay. Protection of Bus bars: Differential Protection.

UNIT V:
Protection against over voltage and grounding: Causes 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. Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance, Resonant Grounding.

TEXT BOOKS:
1. Power System Protection and Switchgear by Badari Ram, D. N. Viswakarma, TMH
Publications
2. Switchgear and Protection – by Sunil S Rao, Khanna Publishers
3. Power system protection and switchgear- Bhuvanesh A Oza, N.K.C. Nair, R.P. Mehta and V.H.Makwana, Mcgraw hill education-2016

REFERENCE BOOKS:
1. Electrical Power Systems – by C. L. Wadhwa, New Age international (P) Limited,
Publishers, 3rd edition.
2. Fundamentals of Power System Protection by Paithankar and S. R. Bhide., PHI, 2003.
3. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
4. Power system protection static relays with micro processor applications T.S MadhvaRaoTMHPublications.

POWER SYSTEM ANALYSIS

Subject Code: 18EET315   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objectives:
- To model various power system components and carryout power flow, fault analysis and stability studies.

Course outcomes:
Students will be able to:
CO1: Compute the per unit values of system and formulate Y_{bus} for a given power system network
CO2: Calculate the load flows in a power system using various numerical methods.
CO3: Compute Z_{bus} for a given power system network and analyze symmetrical fault calculation.
CO4: Solve an un-balanced three phase network by using symmetrical components and analyze a power system under fault conditions.
CO5: Analyze the steady state and transient stabilities.

UNIT I
Per unit system:
Single line diagram, Per unit representation of a given power system network, Impedance diagram, Numerical problems.

Formation of Y_{BUS}:
Formation of Y_{bus} by direct Inspection and Singular transformation methods, Numerical problems.

UNIT II
Power flow studies:
Need of power flow analysis, Classification of buses, Derivation of static load flow equations, Iterative solution (up to 3 – Bus system) using Gauss- Seidel method including Q-limit check for P-V buses – Algorithm and flow chart. Iterative solution (up to 3-Bus System) using Newton-Raphson (N-R) method (polar form)-Jacobian matrix elements-Algorithm and flow chart. Development of Fast Decoupled Load Flow (FDLF) Method, Algorithm and flow chart, Comparison of the three methods.

UNIT III
Z_{BUS} Formation:
Simple building algorithms for the formation of Zbus matrix (without mutual coupling).
Symmetrical fault analysis:
Importance of short circuit/fault analysis, Symmetrical (or) balanced three phase faults, Short circuit current and MVA calculations, Symmetrical fault calculations using Z_{bus}.

UNIT IV
Fault analysis – Un balanced faults:
Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.
Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.
Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without fault impedance, Numerical Problems.

UNIT V
Power system stability analysis:
Elementary concepts of Steady State, Dynamic and Transient Stabilities, Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability, Methods to improve steady state stability. Derivation of Swing Equation, Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation.

TEXT BOOKS:
1. C.L. Wadhwa, 'Electrical Power Systems', New age International-3rd Edition
2. Jhon J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', McGraw Hill International Book Company, 1994

REFERENCES:
1. I.J. Nagrath and D.P. Kothari, 'Modern Power System Analysis', Tata McGraw-Hill Publishing Company, New Delhi, 1990.
2.D.Das, 'Electrical Power systems',New age International-1 st Edition
3. P.S.R .MURTHY, 'Power System Analysis', BS Publications, 2009
4. P. Kundur, 'Power System Stability and Control, Tata McGraw Hill, Publications, 1994.
5. HadiSaadat, 'Power System Analysis', Tata McGraw Hill Publishing Company, New Delhi, 2002.
6. A.NagoorKani ,'Power System Analysis' RBA publications-1st Edition.
7.Computer Techniques in Power System Analysis by MA Pai, McGraw Hill Education (India) Private Limited (June 18, 2014).

INDUSTRIAL AUTOMATION

Subject Code: 18EET316   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objectives:
- To Introduce history and development of industrial automation
- To understand the generic architecture and components of a Programmable Logic Controller
- To understand PLC & Programmable logic functions
- To be able to write simple ladder logic programs
- To understand the process of SCADA

Course Outcomes:
CO1: Outline history and development of industrial automation
CO2: Identify different components of PLC.
CO3: Able to create ladder diagrams from process control description
CO4: Understand different timers and Counters
CO5: Configure SCADA components as per requirement.

UNIT –I
Introduction to industrial automation:
History & Need of Industrial Automation, Application of Industrial Automation, Basic Components of Automation, Hardware Classification of Automation, control & sensing elements in industrial automation.

UNIT-II
Programmable Logic Controllers (PLC):
Basic of PLC, Capability of PLC, Type of PLC, Hardware & Architecture of PLC, Application and Advantage of PLCs, Sourcing and Sinking concept, Programming Language of a PLC.Introduction to field Device (Input / Output), Data files in PLC Programming, Instruction List.

UNIT-III
Programming of PLC:
Types of programming, Relay ladder logic methodology, Ladder symbols, Ladder diagram, Development of ladder logic for Boolean logic functions, creating ladder diagram form process control description.

UNIT-IV
Programmable Logic Functions:
Latching, PLC timer and counter functions, on delay timer, off delay timer, timer examples,
Upcounter,down- counter and up-down counter, counter examples, Addition, Subtraction, Multiplication, division.

UNIT-V
SCADA
History of SCADA, Definition, components of SCADA systems, Remote terminal unit (RTU),
Discrete control, Analog Control, Master terminal unit (MTU), SCADA interface.

TEXT BOOKS:
1. "PLC and Industrial application", MadhuchhandanGupts and SamarjitSenGupta,pernram international pub. (Indian) Pvt. Ltd., 2011.
2. Ronald L Krutz, "Securing SCADA System", Wiley Publication

REFERENCE BOOKS:
1. GaryDunning,"Introduction to Programmable Logic Controllers", Thomson,2nd Edition.
2. John W Webb, Ronald A Reis,"Programmable Logic Controllers: Principles and Application", PHI Learning,Newdelhi, 5th Edition
3. Stuart A Boyer, "SCADA Supervisory Control and Data Acqusition", ISA, 4th Revised edition
4. FrankpetruzellaD , " programmable logic controllers Tata MC Graw Hill third edition 2010
5. Stuartboyer a, " supervisory control and data acquisition" ISA second edition

PRINCIPLES OF SIGNALS AND SYSTEMS
(Professional Elective-II)

Subject Code: 18EEE321   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course Objective:
 This course covers various types of continuous and discrete-time signals and systems, their properties and representations and different types of transform that are necessary for the analysis of continuous in discrete-time signals and systems.

Course Outcomes:
 Student will be able to
CO1.Characterize and analyze the properties of continuous time(CT) and discrete time(DT) signals and systems
CO2.Analyze CT and DT systems in Time domain using convolution and Conceptualize the effects of sampling a CT signal
CO3.Represent CT and DT systems in the Frequency domain using Fourier analysis tools like CTFS, CTFT, DTFS and DTFT.
CO4.Compute the Laplace transforms of Continuous time signals and analyze continuous systems using Laplace transforms
CO5.Analyze discrete systems using Z Transforms.

UNIT-I
Introduction to Signals and Systems:
Introduction- Continuous time signals, discrete time signals, Basic operations on signals, classification of signals. Introduction to systems-classification and properties of systems.

UNIT-II
Time Domain Analysis of Systems:
Time domain Analysis of Discrete-Time Systems: Time domain representation of   discrete time Linear Time Invariant (LTI) systems, convolution sum, properties of convolution. Stability of LTI system . Time domain analysis of continuous-Time   Systems: Convolution integral, Properties of convolution. Sampling and aliasing, impulse sampling, sampling theorem.

UNIT-III
Fourier Analysis and Fourier Transforms
Fourier theorem- Trigonometric form and exponential form of Fourier series – conditions of symmetry-line spectra and phase angle spectra .Fourier Integrals and Fourier Transforms – properties of Fourier Transforms, applications to electrical circuits, limitations.

UNIT-IV
Laplace Transforms:
Definition of Laplace transform, Region of convergence, properties of Laplace transforms, unilateral Laplace transforms and causality and stability analysis using LT, Inverse Laplace transforms, relation between LT and FT, applications to electrical circuits, limitations.

UNIT-V
Z-TRANSFORMS:
Definition of Z-transform, Z-transform and ROC of finite duration, infinite duration signals, causality and stability analysis using Z-transforms, properties of Z-transforms, inverse Z-transform, applications to electrical circuits, limitations.

TEXT BOOKS:
1. Alan V Oppenheim, Alan S Wilsky and Hamid Nawab S, "Signals & Systems", Prentice
Hall, New Delhi, 2005.
2. Simon Haykin and Barry Van Veen, "Signals & Systems", John Wiley and Sons Inc.New Delhi, 2008.
3.Signals and systems –by A.Anand Kumar, Third edition, PHI learning private
Limited.
4.Signals and Systems by K. Uma Rao, AndhePallavi, I.K International.

REFERENCE BOOKS:
1. Signals and systems –by Ramesh Babu and R.AnanadaNatarajan.
2. Ashok Ambardar, "Introduction to Analog and Digital Signal Processing", PWS
Publishing Company, Newyork, 2002.
3. Rodger E Zaimer and William H Tranter, "Signals & Systems – Continuous and
Discrete", McMillan Publishing Company, Bangalore ,2005

SPECIAL ELECTRICAL MACHINES
(Professional Elective-II)

Subject Code: 18EEE322   **Internal marks: 40**
Credits: 3   **External Marks: 60**

Course objectives:
To develop knowledge on Principles & operation, construction, performance, maintenance, testing and performance of special motors such as BLDC motors, stepper motors and electrical motor drives.

Course Outcomes:
Students will be able to:
CO1: Analyze the structure of Electrical drive system of SRM motor.
CO2: Understand open loop and closed loop control of Stepper motors and also compare the open loop and closed loop systems
CO3: Evaluate torque, speed and position controller of BLDC motor drives.
CO4: Explain the basic properties of magnetic materials as applied to electric machines and applications of LIM.
CO5: Describe the operation of motor drives to meet mechanical load requirements

UNIT I
Switched Reluctance Motor
Principle of operation, Power converter for switched reluctance motor, Control of switched reluctance motor.

UNIT II
Stepper Motors
Stepper Motors Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

UNIT III
Brushless DC motor
Permanent Magnet Brushless DC Motor Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor.

UNIT IV
Linear induction motors
Construction– principle of operation– application of Linear induction drive for traction
Permanent Magnet Motors
Construction – Principle of working – Torque equation and equivalent circuits, electrically commutated DC motor.

UNIT V
Electric Motors for traction
AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction.

TEXT BOOKS:
 1. Special electrical Machines, K.VenkataRatnam, University press, 2009, New Delhi.
 2. Special electrical machines, E.G.Janardhanan, PHI learning private limited.

REFERENCE BOOKS:
1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.

INSTRUMENTATION
(Professional Elective-II)

Subject Code: 18EEE323   **Internal Marks: 40**
Credits: 3   **External Marks: 60**

Course objectives:
Students can understand the monitoring and analysis of any physical system and its control, also describe different testing signals. They can explain the different types of transducers, digital voltmeters. They can explain the operation of signal analyzers and understand the process of measurement of non-electrical quantities.

Course outcomes:
Student will be able to
CO1: Generalize the characteristics of signals and errors.
CO2: Describe the representation of different signals.
CO3: Explain different types of transducers and digital meters.
CO4: Illustrate the operation of signal analyzers.
CO5: Estimate the process of measurement of non-electrical quantities.

UNIT I:
Characteristics of Signals and their representation: Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signal and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation.

UNIT II:
Transducers : Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle of operation of LVDT as a transducer; LVDT Applications, principle of operation of strain gauge, guage factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photo diodes.

UNIT III:
Digital Voltmeters: Successive approximation, ramp, dual-Slope integration continuous balance type-Micro processor based ramp type DVM, digital frequency meter, digital phase angle meter.

UNIT IV:
Signal Analyzers: Wave Analyzers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters.

UNIT V:
Measurement of Non-Electrical Quantities: Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force,Torque. Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

TEXT BOOKS:
1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai& Co.

REFERENCE BOOKS:
1. Measurements Systems, Applications and Design – by D O Doeblin
2. Principles of Measurement and Instrumentation – by A.S Morris, Pearson /Prentice Hall of India
3. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 1995.
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick andW.D.Cooper, Pearson/Prentice Hall of India.

HRD & ORGANIZATIONAL BEHAVIOR
(Interdisciplinary Elective – III)

Subject Code: 18IET331   **External Marks: 60**
Credits   : 2.0   **Internal Marks: 40**

Course Objectives: To introduce the concepts of Human Resource Development with its dynamics of importance, Management Development and work force programmes. Also provides the knowledge on Organizational behavior and its implications for the effectiveness.

Course Outcomes:
Students will be able to
1. Demonstrate the concepts, with importance and evolution of HRD and narrate how it is useful for the professional working in the organizations.
2. Apply HRD activities in Management development in line with counseling and wellness services.
3. Demonstrate the dynamics of workforce with its diversity, impact and programmes for development.
4. Detail organization Behavior and the influence of individual psychological field elements on OB.
5. Narrate Organization Change, Organization Development, and Organization Culture to evaluate Organizational effectiveness.

Unit – I
Human Resource Development – Evolution of HRD - Relationship with HRM - Human Resource Development Functions - Roles and Competencies of HRD Professionals - Challenges to Organization and HRD professionals - Frame work of Human Resource Development - HRD Processes - Assessing HRD Needs - HRD Model Designing Effective HRD Program - HRD Interventions- Creating HRD Programs - Implementing HRD programs - Training Methods

Unit – II
Management Development - Employee counseling and wellness services – Counseling as an HRD Activity - Counseling Programs - Issues in Employee Counseling - Employee Wellness and Health Promotion Programs - Organizational Strategies Based on Human Resources.

Unit – III
Work Force Reduction, Realignment and Retention - HR Performance and Bench Marking - Impact of Globalization on HRD- Diversity of Work Force - HRD programs for diverse employees - Expatriate & Repatriate support and development.

Unit – IV
Organizational Behavior: Nature, Individual Perspective – personality , Personality types– Perception – Motivation, Motivational Theories – Learning – Attitude – Leadership – styles and Techniques of leadership – Group, group Dynamics – conflict Management and Negotiation skills

Unit – V
Organization change, role of change agents– Learning of organization culture, approaches and Measurement of OC – Organization developments, OD Interventions – Organization effectiveness, Nature and Importance

Reference Books

1. Werner &Desimone, HUMAN RESOURCE DEVELOPMENT, Cengage Learning, 2006 William E. Blank, HANDBOOK FOR DEVELOPING COMPETENCY BASED TRAINING PROGRAMMES, Prentice-Hall, New Jersey, 1982.
2. Uday Kumar Haldar, HUMAN RESOURCE DEVELOPMENT, Oxford University Press, 2009 SrinivasKandula, STRATEGIC HUMAN RESOURCE DEVELOPMNET, PHI Learning, 2001
3. Jerald Greenburg and Robert A Baron, BEHAVIOUR IN ORGANISATIONS, PH Learning Private Limited, New Delhi, 2009.
4. PareekUdai. UNDERSTANDING ORGANISATIONAL BEHAVIOUR, Oxford university Press, New Delhi, 2009

ENVIRONMENTAL IMPACT ASSESSMENT
(Interdisciplinary Elective – III)

Subject Code: 18IET332   **Internal Marks: 40**
Credits: 2   **External Marks: 60**

Course Objectives:
This Course is intended to build the following objectives:
- To understand basic concepts of EIA (Environmental Impact Assessment).
- To study different methodologies of EIA.
- To understand the professional roles, ethics, teamwork and multidisciplinary skills to contribute the needs of society in the field of ecosystems and environmental protection.
- To study the importance of EIA for the preparation of environmental audit reports.
- To aim for employment in premier consultancy organizations which are preparing EIA reports for different developmental and industrial establishments.

Course Outcomes:
After studying the course, the student:
- Determine the basic concepts of EIA and demonstrate various aspects of environment and developmental issues to the public effectively. Examine the preliminary EIA reports to different developmental activities before implementing a comprehensive EIA study.
- Interpret the specific and key EIA methodologies and produce the data through assessment and evaluation. Demonstrate and create awareness among the public on the effects of pollution at local level as well as global level.
- Diagnose the assessment of impact of developmental activities on ecosystems, especially on wildlife the key component of ecosystems. Appraise and manage the ecosystem quality through different assessment parameters. Reduce the impacts of development on ecosystems through providing suitable and appropriate remedial measures.
- Illustrate various types of environmental audit protocols to conduct on-site audit to facilitate and improve the performance of the agencies time to time. Produce audit reports through evaluating audit data and derive fruitful conclusions.
- Demonstrate the environmental and legal compliance suitable for the respective developmental activities. Produce Environmental Impact Statement (EIS) reports to a range of developmental activities in the area of environmental domain.

Unit-1:
Basic Concepts of EIA: History and guiding principles of EIA-EIA Process-types of EIA-Initial Environmental Evaluation (IEE)-elements of EIA-factors affecting EIA during impact evaluation and analysis-preparation of environmental base maps and importance-classification of environmental parameters.

Unit-2:
EIA Methodologies: Introduction-criteria for the selection of EIA methodology-EIA Methods: Ad-hoc method-matrix method-networks Method-Environmental Media Quality Index method (EMQIM)-overlay method-cost/benefit analysis.

Unit-3:
Ecosystems Assessment: Assessment of Ecosystems-Assessment of impact of development activities on vegetation and wildlife, mitigation-causes and effects of deforestation-environmental impacts of deforestation.

Unit-4:
Environmental Auditing: Environmental audit definition-objectives of environmental audit-types of environmental audit-audit protocol-stages of environmental audit-onsite audit activities-post audit activities-evaluation of audit data and preparation of audit report.

Unit-5:
Environmental Legislations and Report Writing: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972-case studies and preparation of Environmental Impact Assessment (EIA) statement report for various industries.

Text Books:
1. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications, New Delhi, 2013 edition.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications, Sultan Bazar, Kakinada, .

Reference Books:
1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi.
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers.
3. Environmental Impact Assessment Theory & Practice by M. Anji Reddy, **:** Bs Publication, 2013.

ENERGY AUDIT MANAGEMENTAND CONSERVATION
(Interdisciplinary Elective – III)

Subject Code: 18IET334   **Internal marks: 40**
Credits: 2   **External Marks: 60**

Course Objective:
To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

Course Outcomes:
Students will be able to:
CO1: Apply principles of energy auditing and propose energy conservation schemes.
CO2: Demonstrate principle and organizing energy management program.
CO3: Demonstrate the operating principle of energy efficient motors.
CO4: Analyze power factor improvement methods, illumination methods and demonstrate the operation of various energy instruments.
CO5: Analyze and compute the economic aspects of energy consumption.

UNIT-I
Basic principles of energy audit
Energy audit- definitions, concept, types of audit, energy index, cost index,pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

UNIT-II
Energy management
Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-III
Energy efficient motors
Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT-IV
Power factor improvement, lighting and energy instruments
Power factor – methods of improvement, location of capacitors. Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-V
Economic aspects and analysis
Economics Analysis-Depreciation Methods, time value of money, rate of return, present worthmethod , replacement analysis, life cycle costing analysis.

TEXT BOOKS:
1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing CompanyLtd, New Delhi.

REFERENCE BOOKS:
1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

ELEMENTS OF WORKSHOP TECHNOLOGY
(Interdisciplinary Elective – III)

Subject Code: 18IET335   **External Marks: 60**
Credits   : 2.0   **Internal Marks: 40**

Course Objectives:
- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To provide knowledge on forging tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints

Course Outcomes:
On completion of this course, students should be able to
1. Comprehend different manufacturing processes.
2. Explain the carpentry tools and applications of carpentry joints.
3. Explain the fitting tools and operations.
4. Explain the forging tools and operations.
5. Explain the sheet metal tools and operations and applications.

Unit – I
Methods of manufacturing processes, casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop process, carpentry fitting, hand forging, sheet metal work, cold and hot working of metals.

Unit – II
Carpentry
Marking & measuring tools, Cutting Tools: Saws, Chisels, Planes, Boring Tools, Striking tools, Holding devices, Carpentry joints: Half lap joint, Mortise and tenon joint, bridle joint, dovetail joint.

Unit –III
Fitting:
Marking & measuring tools, Holding Devices, Cutting tools: Hacksaw, Files, Chisels, Drill bits, Reamer, Taps, Dies & sockets, striking tools, Holding devices and Fitting Operations: chipping, filing, sawing, marking, drilling, reaming, tapping, dieing.

Unit – IV
Forging:
Hand forging - Hand tools**:** Anvil, swage block, Tongs, hammers, Chisels, Swages, Fullers, flatters, set hammer, punches and drift, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattering.

Unit – V
Sheet Metal Work:
Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing, Sheet metal joints-Hem joint, seam joint.

Text Books:
   1. Elements of Workshop Technology S. K. Hajra Choudhury, A. K. Hajra Choudhury.
   2. Workshop Technology B. S. Raghuwanshi Dhanpat Rai & Co.,

References Books:
   1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons.

INTRODUCTION TO SIGNAL PROCESSING
(Inter Disciplinary Elective – III)

Subject Code: 18IET336   **Internal marks: 40**
Credits: 2.0   **External Marks: 60**

Course Objectives:
- To study the different types of discrete time signals and systems and their properties.
- To test the different systems based on their properties and calculate the frequency response
- To define the Discrete Fourier series and Discrete Fourier transform properties.
- To calculate the Fourier series and Fourier transform for the different discrete time signals and also calculate the Fourier Transform of a given sequence based on FFT algorithms
- To design a FIR and IIR filters using different techniques

Course Outcomes:
At the end of the course the student will be able to:
CO 1. Determine dynamicity, linearity, causality, stability and time invariance of a given   discrete time system.
CO 2. Compute DFS and DFT of a given sequence.
CO 3. Compute FFT of Bearing vibration detection and earthquake records.
CO 4. Construct structures of FIR filters and make use of MATLAB to design FIR filters.
CO 5. Compare IIR and FIR filters.

Unit-I
Signals and Systems Introduction: Basic elements of DSP, Discrete time signals representation, classification of discrete time signals, linear shift invariant systems, stability and causality of LTI system, Frequency domain representation of discrete time signals and systems.

Unit-II
Discrete Fourier series: Properties of discrete Fourier series, DFS representation of periodic sequences.
Discrete Fourier transform: Properties of DFT, Computation of DFT. Relation between Fourier transform and Z-transform

Unit-III
Fast Fourier Transform: Bearing vibration detection and analysis using enhanced fast Fourier transform algorithm, time-frequency analysis of earthquake records.

Unit-IV
FIR filters:
Transfer function representation of FIR filters, Basic structures of FIR filters - Direct forms and Cascade form. FIR filter implementation using MATLAB.

Unit-V

IIR filters:
Transfer function representation of IIR filters, Pole zero plot of IIR digital Filters, Basic structures of digital filters - Direct forms, Cascade form. IIR filter implementation using MATLAB. Comparison of IIR and FIR filters.

Text Books:
1. Digital Signal Processing, Principles, Algorithms, and Applications – John G. Proakis, DimitrisG.Manolakis, Pearson Education/PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.

Reference Books:
1. Digital Signal Processing – Andreas Antoniou, Tata McGraw Hill , 2006.
2. Digital Signal Processing – MH Hayes, Schaum's Outlines, Tata Mc-Graw Hill, 2007.
3. Bearing vibration detection and analysis using enhanced fast Fourier transform algorithm, Hsiung-Cheng Lin, Yu-Chen Ye, Bo-Jyun Huang and Jia-Lun Su
4. Time-Frequency Analysis Of Earthquake Records Carlos I Huerta-Lopez1 , Yongjune Shin2 , Edward J Powers3 And Jose M Roesset

SIMULATION AND MODELING
(Interdisciplinary Elective – III)

Subject Code: 18IET338   **External Marks: 60**
Credits: 2.0   **Internal Marks: 40**

Course Objectives
• Educate students with fundamental knowledge of continuous and discrete system models
 • Gain some fundamental knowledge about system simulation techniques
• Gain idea about continuous system simulation and different models of continuous system simulation
• Gain knowledge probability theory and probability functions.
 • Acquire knowledge queuing theory with solutions
• gain knowledge on discrete system simulation and different models of discrete system simulation
 • Familiarize with discrete system programming tasks.
• Acquire knowledge about simulation programming techniques.
• Explain some elementary features of SIMSCRIPT and GPSS algorithms.

Course Outcomes: Upon completion of this course, students shall be able to:
1. Differentiate continuous and discrete system models and describe system simulation techniques.
 2. Describe the steps in continuous system simulation and list the continuous simulation methods
 3. Analyze stochastic variables and probability functions, Outline methods for discrete simulation
4. Articulate queuing disciplines with mathematical solutions
5. Assess problems and propose solutions to SIMSCRIPT and GPSS algorithms.

Unit – I Introduction to Modeling and Simulation Nature of Simulation: Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, concept of simulation, Components of a simulation study, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models Introduction to Static and Dynamic System simulation, Advantages, Disadvantages and pitfalls of Simulation.

Unit – II System Simulation and Continuous System Simulation Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed LagModels, Cobweb Model.Continuous System models, Analog and Hybrid computers, DigitalAnalog Simulators, Continuous system simulation languages, Hybrid simulation, Real Time simulations.

Unit – III System Dynamics & Probability concepts in Simulation Exponential growth and decay models, logistic curves, Generalization of growth models,
System dynamics diagrams, Multi segment models, Representation of Time Delays. Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers, Generation of a Random numbers, Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

Unit – IV Simulation of Queuing Systems and Discrete System Simulation Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Application of queuing theory in computer system. Discrete Events, Generation of arrival patterns, Simulation programming tasks, Gathering statistics, Measuring occupancy and Utilization, Recording Distributions and Transit times.

Unit – V Introduction to Simulation languages and Analysis of Simulation output GPSS: Action times, Succession of events, Choice of paths, Conditional transfers, program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements. Estimation methods, Replication of Runs, Batch Means, Regenerative techniques, Time Series Analysis, Spectral Analysis and Autoregressive Processes.

Text Books
 1. Gorden G., System simulation, Prentice Hall. 2. Seila, Simulation Modeling, Cengage Learning

Reference Books
 1. Law. Simulation Modeling And Analysis, McGraw Hill.
2. Deo, System Simulation with Digital Computer, PHI.
3. Harrington, Simulation Modeling methods, McGraw Hill. 4. Severance, " System Modeling & Simulation, Willey Pub.

FUNDAMENTALS OF IMAGE PROCESSING
(Interdisciplinary Elective – III)

Subject Code: 18IET339   **External Marks: 60**
Credits   : 2.0   **Internal Marks: 40**

Course Objectives:
- To study the need of image processing and their fundamentals.
- To study the image enhancement techniques
- To study the image compression procedures.
- To study image restoration procedures.
- To study image segmentation and edge techniques.

Course Outcomes:
1. Understand the need for basic relationship between pixels, sampling and quantization.
2. Develop any image processing application.
3. Categorize various compression techniques.
4. Learn Various Morphological Algorithms.
5. Interpret image segmentation and representation techniques.

Unit-I

Digital Image Fundamentals: Introduction to Image Processing –Applications of Image Processing, Components in Image Processing, Image Sampling and Quantization, Basic Relationship Between Pixels.

Unit-II

Image Enhancement: Basic Gray level Transformations, Histogram processing, Arithmetic/Logical Operations- Image Subtraction and Image Averaging, Basics of Spatial Filtering-Smoothening Spatial Filters, Sharpening Spatial Filters.

Unit-III

Image Compression: Redundancy- Coding, Inter Pixel, Psycho-Visual, Fidelity Criteria, Image Compression Models-The Source Encoder and Decoder, Variable Length Coding, LZW Coding, Bit-Plane Coding, Image Compression Standard – JPEG.

Unit-IV

Image Morphology: Basic Concepts of Set Theory, Logical Operations Involving Binary Images, Dilation and erosion, opening and closing, The Hit or Miss Transformation, Basic Morphological algorithms-Boundary Extraction, Thinning, Thickening, Pruning.

Unit-V

Image Segmentation: Detection of discontinuities-point detection, line detection, edge detection, Thresholding-Basic Global Thresholding, Basic Adaptive Thresholding, Region-Based Segmentation-Basic Formulation, Region growing, Region Splitting and Merging.

Text books:

1. Digital Image Processing – R.C. Gonzalez & R.E. Woods, Addison Wesley / Pearson Education, 4th Edition, 2017.

2. Digital Image Processing – S Jayaraman, S Esakkirajan, T Veerakumar, Tata McGraw Hill Education Pvt. Ltd., 5th Edition, 2015.

Reference books:

1. Digital Image Processing using MATLAB-Rafael C. Gonzalez, Richard E woods and Steven K. Eddins, Tata McGraw Hill, 2010.

POWER ELECTRONICS LAB

Subject Code: 18EEL308   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives:
- To develop hands o experience about SCRs, MOSFETs & IGBTs.
- To verify the operation of phase-controlled rectifiers both for R & RL loads.
- To learn the operation of R, RC &UJT firing circuits and commutation circuits in detail .
- To verify the performance of AC voltage regulators, series & parallel inverters experimentally.
- To experience the behavior of single phase step down type of cyclo-converter with R & RL loads.

Course Outcomes:
Students will be able to
CO1: Analyze the working of thyristors with their characteristics.
CO2: Understand the analysis of half controlled & full controlled rectifiers.
CO3: Distinguish between forced commutation & line commutation & their application.
CO4: Interpret the use of different types of firing circuits.
CO5: know the working of inverters, cyclo-converters & ac voltage regulators& they can understand the four quadrant operation of a dc motor by using a dual converter.

LIST OF EXPERIMENTS:
1. Study of characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCRs.
3. Single phase half controlled converter with R & RL loads.
4. Single phase fully controlled bridge converter with R & RL loads.
5. Single phase AC voltage controller with R & RL loads
6. Single phase parallel inverter with R & RL loads.
7. Single phase step-down cyclo-converter with R &RL loads.
8. Four quadrant operation of a DC motor using dual converter.
9. Three phase half controlled bridge converter with R & RL loads.
10. Single phase bridge inverter with R & RL loads.

Additional Experiments:
11. Study of DC-DC Buck Converter and DC-DC Boost Converter.
12. Study of DC-DC Buck-Boost Converter

INDUSTRIAL AUTOMATION LAB

Subject Code: 18EEL309   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Outcomes:

Students will be able to

CO1:: Draw the ladder logic diagram for Boolean logic and monitor with SCADA.

CO2: Draw the ladder logic and ladder latching logic diagrams for timers, counters, combinations and monitor with SCADA.
CO3: Draw the ladder latching logic diagram for counters and timers.
CO4: Develop ladder logic for traffic signal Control and flash a light once in every one second and monitor with SCADA
CO5: Development of ladder logic for various practical applications

List of Experiments
1. Switch on light/off light for logic gates *AND, NOR, NAND, NOR, NOT, XOR, HALF, ADDER, FULL ADDER) by using Ladder Logic and SCADA monitoring.

2. Develop the ladder logic for the below Boolean logic function before and after simplification.

$$Y = \overline{\overline{(AB\bar{C}D + AB\bar{C}\bar{D} + \bar{A}BCD + \bar{A}\bar{B}CD)} + D}$$

3. Switch on light/off light with timers (on Delay and Off Delay) , counters (up & Down) and their combination by using Ladder logic and SCADA monitoring.

4.Switch on light/off with timers and switch on light/off light with counter by using Ladder latching logic and SCADA monitoring.

5. Write small ladder logic programs for traffic signal control and controlled by SCADA.

6. Develop a ladder logic program that will flash a light once every one second and controlled by SCADA

7. Develop a ladder logic for the motor which is controlled by two switches. The start switch will start the motor and the Stop switch will stop it. If the Stop switch was used to stop the motor, the start switch must be thrown twice to start the motor (The Stop switch will be wired as normally closed). And monitoring by scada.

8. Develop a ladder logic for the motor which is controlled by two switches. The start switch will start the motor after 10 seconds delay and the Stop switch will stop the motor after 10s delay. If the Stop switch was used to stop the motor, the start switch must be thrown twice to start the motor. When the motor is active a light should be turned on. And monitoring by scada

9. Develop a ladder logic for oven started with a Start button that seals in the Auto mode. This can be stopped if the Stop button is pushed. (Remember: Stop buttons are normally closed.) When the Auto goes on initially the TON timer is used to sound the horn for the first 5 seconds to warn that the oven will start, and after that the horn stops and the heating coils start. When the oven is turned off the fan continues to blow for 300s or 10 sec after. And monitoring by scada

10. Develop ladder logic for conveyor run by switching on or off a motor. We are positioning parts on the conveyor with an optical detector. When the optical sensor goes on, we want to wait 1.5 seconds, and then stop the conveyor. After a delay of 2 seconds the conveyor will start again. We need to use a start and stop button - a light should be on when the system is active. And monitoring by scada

Additional Experiments:

11. To study the variable frequency drive based 3phase induction motor operation by key pad.

PROFESSIONAL COMMUNICATION SKILLS LAB

Subject Code: 18HSL302   **Internal Marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objectives

- ➢ To assist students acquire effective and adequate presentation skills
- ➢ To get students learn to collect comprehensive data for a project report
- ➢ To help students master techniques of being successful in group discussions
- ➢ To improve communication skills of students by making them participate in different language activities
- ➢ To prepare students for facing interviews self-assuredly

Course Outcomes

- ➢ Students will be able to present and interpret data on select topics using pre-existing slides.
- ➢ Students will be able to collect data extensively on a social issue and make it public for the sake of enlightening populace.
- ➢ Students will be able to contribute proactively and extrapolate in group discussions.
- ➢ Students will be able to make extempore speeches
- ➢ Students will be able to prepare Job Application and <u>Résumé</u> / CV of their own, and face interviews confidently.

<u>**Course Syllabus**</u>
Unit I: Power Point Presentation
Unit II: Project Reports on Social Issues
Unit III: Group Discussion
Unit IV: Debate—Public Speaking—JAM
Unit V: Job Application and <u>Résumé</u>/ CV Writing— Mock Interviews

<u>**Suggested Readings**</u>**:**

Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.
Communication Skills.Sanjay Kumar and PushpaLata.Oxford University Press. 2011.
Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
Technical Communication.Meenakshi and Sangeetha.OUP. New Delhi.

HUMAN VALUES

Subject Code: 18HST402   **Internal Marks: 40**
Credits: 2.0   **External Marks: 60**

OBJECTIVES:

- To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
- To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence.
- To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.
- To Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

COURSE OUTCOMES:
- Upon completion of this course students can aware of ethical behavior in the work place
- To shapes the students by the end of this curriculum being harmony himself
- To understand the human relationship and values
- To understand the Nature and its existence of connectivity
- Learn the importance of Human values and universal order

UNIT-I

Understanding the need, basic guidelines, content and process for Value Education- Self Exploration - what is it?- Continuous Happiness and Prosperity Morals, Values and Ethics – Integrity – Work Ethics – Service Learning- Respect for others- Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment Self-confidence – Spirituality

UNIT-II

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'- Understanding the needs of Self ('I') and 'Body'- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

UNIT-III

Understanding Harmony in the Family and Society Harmony in Human-HumanRelationship- Understanding harmony in the Family- the basic unit of human interaction Understanding values in human-human relationship- Trust (Vishwas) and Respect (Samman) as the foundational values of

relationship- Understanding the meaning of Vishwas; Difference between intention and competence - Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

UNIT- IV
Understanding Harmony in the Nature and Existence - Whole existence as Co-existence-Understanding the harmony in the Nature- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature- Holistic perception of harmony at all levels of existence.

UNIT-V

Implications of the Holistic Understanding of Harmony- Natural acceptance of human values - Definitiveness of Ethical Human Conduct- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Books:
1. A N Tripathy, 2003, Human Values, New Age International Publishers
2. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press
3. M Govindrajan, S Natrajan& V. S Senthilkumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

References:
1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. "Professional Ethics and Human Values" by Prof. D.R. Kiran.
3. "Engineering Ethics & Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.

MANAGERIAL ECONOMICS & MANAGEMENT SCIENCE

Subject Code: 18HST404   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objectives:
1. To understand Managerial Economics
2. To understand Law of demand, Elasticity of demand and Demand forecasting techniques
3. To understand theory of production cost analysis and its application in business
4. To understand market structure different types of competition and pricing strategies
5. To understand Principles of management. Leadership styles and social responsibility of an organisation
6. To understand the concept of marketing and human resources management.

Course outcomes:
CO1. Recognize managerial Economics skills to the solution of engineering problems\
CO2. Explain the cost and production theories in engineering problems
CO3. Explore and develop the management qualities
CO4. Enhance the problem solving skills in various business areas
CO5. Evaluate the future threats and application theories.

Unit I
Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Factors Governing Demand Forecasting ,Methods of Demand Forecasting viz. Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to Demand Forecasting.

Unit II
Theory of Production and Cost Analysis: Production Function in Isoquants and Isocosts, MRTS, Least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale.
Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, Out of pocket costs & Imputed costs, Break-Even Analysis (BEA), Determination of Break-Even Point (simple problems), Managerial Significance and Limitations of BEA.

Unit III
Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in Case of Perfect Competition and Monopoly, Concept on different Pricing Strategies.

Unit IV
Introduction to Management : Concept of Management and Organization : Nature, Importance and Functions of Management, Taylor's Scientific Management Theory, Fayal's Principles of Management, Mayo's Hawthorne Experiments , Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Y, Hertzberg's Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit V
Introduction to Marketing and Human Resources Management (HRM): Function of Marketing, Marketing Mix, Marketing Strategies based on Product Lifecycle, Channels of Distribution.
Human Resources Management (HRM): Concept 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.

Text Books:
1. Managerial Economics – Varshney and Maheswari, Sultan and Chand, New Delhi, 2003
2. Principles of Management – Ramaswamy,T, Himalaya Publishing House, Mumbai, 2008.
3. Marketing Management – Phillip Kotler and Kevin Lane Keller, PHI Learning Private Limited, 2006,   12/e.
4. Personnel and Human Resource Management: Text and Cases – P.Subba Rao, Himalaya Publishing
   Houses, Mumbai.

 Reference Books:
1. Managerial Economics, Dwivedi, Vikas Publications, 2009, 6/e.
2. Principles of Management – Koonz, Weihrich and Aryasri, Tata McGraw Hill, 2004.
3. Marketing Management: Texts and Cases – Tapan K. Panda, Excel Books, 2008, 2/e.
4. Marketing Management – Rajan Saxena, Tata Mc Graw Hill, 2009, 4/e.
5. Human Resource Management – Aswathappa, Mc Graw Hill, 2009.
6. Personnel Management – Edwin B.Flippo, Mc Graw Hill, 2003.

ELECTRIC DRIVES
(Professional Elective-III)

Subject Code: 18EEE431   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course Objectives:
1. The course provides the basic understanding of types of electrical drives, mechanical loads & their joint characteristics.
2. It covers in detail the basic and advanced speed control techniques using power electronic converters that are used in industry.
3. It is equally important to understand the four quadrant operation of electric drives and slip power recovery schemes in induction motors.

Course Outcomes:
Upon completing this course students must be able to
CO1. Understand the concept of single and multi quadrant drives including motoring and braking modes, and the applications of dual converters
CO2. Choose their electric drive system based on their applications. And analyze any type of 1Φ & 3Φ control converter fed to DC motors
CO3. Analyze chopper fed to DC motors.
CO4. Examine the stator side control of induction motor.
CO5. Illustrate the concept of rotor side control of induction motor and speed control of synchronous motor.

UNIT I:
Electrical braking & Four Quadrant Operation: Electric Braking – Plugging, Dynamic and Regenerative braking operations. Introduction to Four quadrant operation – Motoring operations, four quadrant operation of DC motors by dual converters –Closed loop operation of DC motor,Applications.

UNIT II:
Control Of DC Motors By Single phase & Three phase Converters: Introduction to Thyristor controlled Drives, Single Phase semi and Fully controlled converters connected to DC separately excited and DC series motors – continuous current operation – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque Characteristics.
Three phase semi and fully controlled converters connected to DC separately excited and DC series motors – output voltage and current waveforms – Speed and Torque expressions – Speed – Torque characteristics. Applications.

UNIT III:
Chopper fed DC drives: Single, Two and four quadrants chopper fed DC separately excited and series excited motors – Continuous current operation – Output voltage and current wave forms – Speed torque expressions – speed torque characteristics, Closed Loop Operation.

UNIT IV:
Control of induction motor from stator side: Variable voltage characteristics-Control of Induction Motor by AC Voltage Controllers-speed torque characteristics. Control of Induction Motor through Stator Frequency-Variable frequency characteristics Variable frequency control of induction motor by Voltage source and current source inverters - PWM control – Comparison of VSI and CSI operations – Speed torque characteristics, closed loop operation of induction motor drives.

UNIT V:
Control of induction motor from rotor side and synchronous motors: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics – advantages and applications, Separate control & Self control of synchronous motors.

TEXT BOOKS:
1. Fundamentals of Electric Drives by G K Dubey, 2nd edition, Narosa Publications, 2001.
2. Electrical drives: Modelling, Analysis and Control by R. Kristnan, Prentice Hall of India, 2007

REFERENCE BOOKS:
1. Modern Power Electronics and AC Drives by B.K.Bose, PHI, NewJersy, 1986.
2. Thyristor Control of Electric drives by VedamSubramanyam Tata McGraw Hill Publilcations. 1998.
3. A First course on Electrical Drives – S K Pillai, New Age International(P) Ltd. 2nd Edition.

High Voltage D.C. TRANSMISSION
(Professional Elective-III)

Subject Code: 18EEE432   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course Objectives:
• This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters and MTDC systems and also design of AC filters.

Course Outcomes: Students will be able to
CO 1. Understand the basics of HVDC Transmission systems, Learning about advantages and disadvantages of DC with AC Transmission. To have Knowledge about the Modern trends in HVDC Transmission.
CO 2. Analyze HVDC converters and characteristics of 6 and 12 pulse converters with and without overlapping.
CO 3. Understand the converter control characteristics, Various controlling methods of converters such as firing angle, current and extinction angle control. Learn the converter faults and their protection schemes.
CO 4. Illustrate generation of harmonics, its adverse effects and also the design of filters for harmonic elimination. Learn about Multi terminal DC systems.
CO 5. Design of AC filters.

UNIT I:
Introduction to HVDC: Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links - Apparatus required for HVDC Systems - Comparison of AC &DC Transmission, Application of DC Transmission System - Planning & Modern trends in D.C.Transmission.

UNIT II:
Converter: Choice of Converter configuration - analysis of Graetz - characteristics of 6 Pulse & 12 Pulse converters - Cases of two 3 phase converters in star – star mode - their performance.
HVDC System Control: Principal of DC Link Control - Converters Control Characteristics - Firing angle control - Current and extinction angle control - Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

UNIT III:
Reactive Power Control in HVDC: Reactive Power Requirements in steady state-Conventional control strategies-Alternate control strategies sources of reactive power - shunt capacitors synchronous condensers.

Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC load flow - P.U. System for d.c. quantities-solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT IV:
Converter Fault & Protection: Converter faults - protection against over current and overvoltage in converter station - surge arresters - smoothing reactors - DC breakers - Audible noise space charge field-corona effects on DC lines-Radio interference.

UNIT V:
Harmonics & Filters: Generation of Harmonics-Characteristics harmonics, calculation of AC Harmonics, Non- Characteristics harmonics, adverse effects of harmonics - Calculation of voltage & Current harmonics - Effect of Pulse number on harmonics Types of AC filters, Design of Single and double tuned tuned filters –Design of High pass filters.

TEXT BOOKS:
1. Kamakshaiah, S and Kamaraju, V, 'HVDC Transmission', 1st Edition, Tata McGraw Hill Education (India), Newdelhi 2011.
2**.** Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., 2010.

REFERENCE BOOKS:
1. Arrilaga, J., 'High Voltage Direct Current Transmission', 2nd Edition, Institution of Engineering and Technology, London, 1998.
2. Kimbark, E.W., 'Direct Current Transmission-vol.1', Wiley Inter science, New York, 1971.

FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-III)

Subject Code: 18EEE433   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objectives:
- To understand the need for FACTS.
- To learn shunt and series compensation techniques.
- To educate on static VAR compensators and their applications.
- To learn the concept of unified power flow controller.
- To provide knowledge on UPFC.

Course outcomes: Students will be able to
CO1: Understand the operations of different FACTS devices.
CO2: Summarize about Static VAR Compensators.
CO3: Analyze the different FACTS devices in different stability conditions.
CO4: Select an appropriate FACTS device for a particular application.
CO5: Analyze the Static series compensation.

UNIT-I
FLEXIBLE AC TRANSMISSION SYSTEM: Transmission inter connections, flow of power in ac systems, loading capability, dynamic stability considerations, basic types of FACTS controllers.

UNIT-II
STATIC SHUNT COMPENSATORS: Objectives of shunt compensation, static var compensators, STATCOM configuration, characteristics and control, comparison between STATCOM and SVC.

UNIT-III
STATIC SERIES COMPENSATION: Objectives of series compensation, Variable Impedance type series compensators, switching converter type series compensators, external control for series reactive compensators.

UNIT-IV
UPFC: Principle of operation and characteristics, independent active and reactive power flow control, comparison of UPFC with the series compensators and phase angle regulators.

UNIT-V
IPFC: Principle of operation and characteristics and control aspects.
CUSTOM POWER DEVICES:
Introduction to custom power devices, DSTATCOM and DVR operating principles, their applications In Distribution Systems

TEXT BOOKS

1. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age InternationalPublishers, 2007.

2. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modeling and Control", SpringerVerlag, Berlin, 2006.

REFERENCES

1. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible ACTransmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.

2. K.S.Sureshkumar ,S.Ashok , "FACTS Controllers & Applications", E-book edition, Nalanda DigitalLibrary, NIT Calicut,2003

3. G T Heydt , Power Quality, McGraw-Hill Professional, 2007

4. T J E Miller, Static Reactive Power Compensation, John Wiley and Sons, Newyork, 1982

POWER SYSTEM OPERATION AND CONTROL
(Professional Elective-IV)

Subject Code: 18EEE441   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objectives:
- Learn the characteristics of generation unit/output curves and study the optimal allocation of total load among the generation units without and with transmission losses.
- To develop the mathematical modeling of long range hydro thermal scheduling and to study the kirchmayer's method for short term hydro thermal co-ordination.
- Learn how generating units are committed to meet load over the hours of a week using dynamic programming.
- It emphasizes on single area and two area load frequency control.
- To understand about reactive power control and the methods of compensation.

Course outcomes: Students will be able to
CO1: Explain how optimal allocation of total load among the generation units is done with and without losses.
CO2: Solve Unit Commitment problem using dynamic programming technique for a given power system.
CO3: Develop the block diagram for an isolated power system and also analyze the dynamic response of it with & without integrated control.
CO4: Draw the block diagram model for a two area power system.
CO5: Explain Reactive power control and its compensation methods.

UNIT I:
Economic Operation of Power Systems: Optimal operation of Generators in thermal PowerStation, - heat rate Curve – Cost Curve- Incremental fuel and Production costs, input – output characteristics, and optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses – Loss coefficients, General transmission line loss formula.

UNIT II:
Hydrothermal Scheduling: Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems – Short term hydrothermal scheduling problem.
Unit commitment: Optimal unit commitment problem – Need for unit commitment –constraints in unit commitment – solution methods – dynamic programming.

UNIT III:
Single Area Load Frequency control: Modeling of speed governing, steam turbine and generator-Necessity of keeping frequency constant-Definition of Control area – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response –Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation.

UNIT IV:
Two – Area Load Frequency Control: Introduction-Block diagram representation of two area system with Load frequency control –Static and dynamic response -uncontrolled case and controlled case.

UNIT-V
Reactive Power Control: Overview of Reactive Power controls – Reactive Power compensation in transmission systems- advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator-Line compensation-Introduction to Flexible Alternating Current Transmission Systems(FACTS).

TEXT BOOKS:
1 J. Duncan Glover, M.S.Sarma & Thomas J. overbye, 'Power system analysis and design', 5th Edition, 2011
2. D P Kothari, I J Nagrath 'Modern Power System Analysis', 3rd Edition, 2011.

REFERENCES:
1. Hadi Saadat, 'Power System Analysis ', Tata McGraw - Hill Education, 2 nd Edition, 2002.
2. J.C.Das, 'Power System Analysis', Short-Circuit Load Flow and Harmonics', 1 st Edition, 2002.
3. Arthur R. Bergen, 'Power System Analysis', Peterson Education India, 2 nd Edition, 2009.

HIGH VOLTAGE ENGINEERING
(Professional Elective-IV)

Subject Code: 18EEE442   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objectives:
• To understand various numerical methods for field calculations.
• To develop knowledge on generation and measurement of high voltage DC, AC(power frequency and high frequency) voltages and currents.
• To understand thoroughly various high voltage testing techniques of power apparatus.

Course outcomes: Students will be able to
CO1: Read the terms and numerical methods used in High Voltage engineering.
CO2: Discuss different breakdown mechanisms in dielectrics.
CO3: Analyze the concept of Generation and measurement of High Voltage, High Currents.
CO4: Read the non-destructive test techniques in High Voltage Engineering.
CO5: Identify the industrial applications of high voltage engineering.

UNIT I:
Introduction to High Voltage Technology: Electric Field Stresses, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control.

UNIT II:
Break down phenomenon:
Gaseous Gaseous insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases,Paschen's law.
Liquid Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids.
Solid Break down in solid dielectrics, Intrinsic breakdown, electromechanical breakdown, thermal breakdown.

UNIT III:
Generation and Measurement of high voltages and High currents: Generation of High Direct Current Voltage, Generation of High alternating voltages and currents. Measurement of High Direct Current voltages, Measurement of High alternating Voltages and Currents.

UNIT IV:
High voltage testing of material and electrical apparatus: Measurement of D.CResistivity, Measurements of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, Testing of circuit breakers, Testing of cables, Testing of Transformers.

UNIT-V
Industrial Application of High Voltage Engineering: Electro Static applications- Electrostatic precipitator, Electro static separator, Electro static coating, Electro Static copying, pulsed power.

TEXT BOOKS:
1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH Publications, 5th Edition 2017.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

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 and Technology by Ryan, IET Publishers3rd edition 2013.
4. High Voltage Engineering fundamentals by Kuchler, Springer, 1st edition, 2018.

POWER QUALITY MANAGEMENT SYSTEMS
(Professional Elective-IV)

Subject Code: 18EEE443   **Internal marks: 40**
Credits: 3.0   **External Marks: 60**

Course objective:
Introduction to custom power and study of factors governing power quality. Study of Power factor compensation techniques with power electronic devices and active Harmonic filtering. Introduction to measuring & solving power quality problems and particular standards relating to them.

Course outcomes: Students will be able to
CO1: Examine different power quality issues and prepared to take up prospective projects assignments
CO2: Describe power distribution protection techniques and its impact on voltage quality.
CO3: Plan to trained the work for improvement and betterment of power quality.
CO4: Distinguish basic harmonic phenomena, methods for dealing with harmonic distortion.
CO5: Discuss theoretically and practically for monitoring of power quality.

UNIT I:
Introduction To Electrical Power Quality: Definition of Power Quality, power quality terminology, Power Quality Issues, Power Quality v/s Equipment Immunity, Responsibility of supplier and users of electric power, Electric Power Quality Standards.

UNIT II:
Power Frequency Disturbances: Common Power Frequency Disturbances, Voltage Sag, cures of low frequency disturbances.

UNIT III:
Electrical Transients: Types and Causes of Transients-Atmospheric Causes, Switching Loads On or Off, Interruption of Fault Circuits, Capacitor Bank Switching, Power Factor Correction.

UNIT IV:
Harmonics: Definition of Harmonics Causes of Voltage and Current Harmonics. Individual and Total Harmonic Distortion, Effect of Harmonics on Power System Devices, Harmonic Current Mitigation, power factor.

UNIT- V:
Measuring Power Quality Problems: Power Quality Measurement Devices, Harmonic Analyzers, Oscilloscopes, Data Loggers and Chart Recorders, True RMS Meters, Power Quality Measurements.

TEXT BOOKS:
1. R.C. Dugan, M.F. McGranaghan and H.W. Beaty, Electric Power Systems Quality, McGraw-Hill.3rd edition. .
2. C.Sankaran, "Power Quality", First Indian reprint, CRC press, 2009.

REFERENCE BOOKS:
1. G.T. Heydt, Electric Power Quality. 2nd ed. West Lafayette, IN: Stars in a Circle, 1994.
2. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002.
3. D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley, 1985.
4. J. Arrillaga, N. R. Watson, S. Chen, "Power System Quality Assessment", John Wiley & Sons, 2000.

ELECTRICAL DISTRIBUTION SYSTEMS

Subject Code: 18EET147   **Internal marks:40**
Credits: 3.0   **External Marks:60**

Course objectives:
Students can explain different types of loads and able to compute substation rating, also calculate voltage drop, power loss calculations. They can explain different types of protection types and how to coordinate them, different voltage control methods, power factor improvement techniques.

Course outcomes:
Student will be able to
 CO1: Classify types of Loads and develops relationship between load factor and loss factor.
 CO2: Compute distribution substation rating, to list the derived through optimal substation location
 CO3: Determine voltage drop and power loss calculations for Radial 3-phase balanced networks.
 CO4: List the types of faults and protection devices, to explain the purpose of protection device.
 CO5: Explain the types of power factor improvement; also determine the Capacitor (KVAR) rating for improving the power factor.

UNIT I:
General Concepts: Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

Distribution Feeders: Design Considerations of Distribution Feeders: Radial and loop types primary feeders; basic design practice of the secondary distribution system.

UNIT II:
Substations: Location of Substations: Rating of distribution substation- square and hexagonal type service area, Substation Service Area with n Primary Feeders. Benefits derived through optimal location of substations

UNIT III:
System Analysis: Voltage drop and power-loss calculations in Non-Three phase Primary lines: 1-Phase 2-wire laterals with ungrounded neutral, 1-Phase 2-wire ungrounded laterals, 1-Phase 2-wire laterals with multi grounded common neutrals, 2-Phase plus neutral (open-wye) laterals, calculation of power factor for which voltage drop is maximum.

UNIT IV:
Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes and circuit breakers**.**
Coordination: Coordination of Protective Devices, General coordination procedure, Fuse-to Fuse coordination, Recloser-to-Recloser coordination, Recloser-to-Fuse coordination, Fuse to- Circuit Breaker coordination, Recloser-to-Circuit Breaker coordination.

UNIT-V
Compensation for Power Factor Improvement: Capacitive compensation for power-factor control. Different types of power capacitors, shunt and series capacitors, effect of shunt capacitors (Fixed and switched), Power factorcorrection**.**
Voltage Control: Equipment for voltage control, effect of series capacitors, effect ofAVB/AVR, line dropcompensation.

TEXT BOOKS:

1. "Electric Power Distribution Engineering" – by TuranGonen, 3rd edition CRC press.

REFERENCES:

1. Electric Power Distribution – by A.S. Pabla, Tata McGraw-hill Publishing Company, 4th edition 1997.
2. Electrical Power Distribution Systems by V.Kamaraju, Tata McGraw-hill, 1 st edition 2017.

PROJECT MANAGEMENT
(Interdisciplinary Elective-IV)

Subject Code: 18IET441   **Internal marks:40**
Credits: 2.0   **External Marks:60**

Objective:
The objective of this course is to lay an important foundation to students in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation

Outcomes:
1. Understand the concept of Project Planning.
2. Understanding key principles and techniques for evaluating capital expenditure proposals.
3. To understand Financing of Projects.
4. To Understand and assist in implementation of Projects.
5. To understand and evaluate current and future trends in project management.

Unit – I

Project Planning and Formation: Project meaning and concepts **–** Overview of total Project Management Cycle – Classification of Projects and Project Formation –Strategic Planning and Capital budgeting – Generation and Screening of Project Ideas – Generation of Ideas – Monitoring the Environment – Corporate Appraisal – Tools for Identify Investment opportunities – Scouting for Project Ideas – Preliminary Screening – Project Rating Index.

Unit - II
Project analysis and Selection: Issues in Project Analysis - **Market and Demand Analysis –**conduct of Market Survey, Demand forecasting. **Technical analysis** – Manufacturing Process Technology, Material Inputs and Utilities, Plant Capacity, Location and Site – Machineries and Equipments, Structures and Civil Works, Environment Aspects. **Financial Estimations and projections** – Cost of Projects, Means of Finance – Estimates of sales and Productions, Working capital Requirement and its financing, Profitability Projections, Projected Cash flow Statement, Projected Balance Sheet –Time Value of Money. **Selection Criteria** – Net Present Value, Benefit Cost Ratio, Internal Rate of return, Urgency, Payback Period, Accounting Rate of Return, Assessment of Various Methods, Investment Evaluation in Practice. Project Selection Under Risk – Risk Analysis in Practice, How Financial Institutions Analyse Risk.   Social Cost Benefit Analysis, Rationale for SCBA – UNIDO Approach.

Unit – III
Project Financing and Contracts: Financing of Projects **–** Capital Structure, Working Capital**,** Financing Infrastructure Projects, Public Private Partnership, Venture Capital **-** Private Equity, Credit Risk Management. **Contracts** - Definitions of contract and Contractor. Elements of contracts, offer acceptance and consideration, Valid Contracts, Department execution of work – Master Roll Form 21 – Piece work Agreement form – Work order. Types of Contracts – Lump sum Contract, Lump sum and Schedule contract, Item rate Contract, Sub Contracts, Joint ventures, Arbitration Disputes and claim Settlement. **Tender** - Contract system with tenders, Quotation, Earnest Money, Security Money – Tender Notice, Tender Form, Bidding – Procedure – Irregularities in Bidding – award

Unit – IV

Project Implementation: Forms of Project organisation – Human Aspects – of project Management – Pre requisites for successful project implementation – Project Monitoring and Controlling – Parameters for monitoring and Control – Process of Monitoring –Network Techniques for Project Management – Development of Project Network - Time Estimation –Determination of Critical path – Scheduling when Resources are Limited - PERT Model – CPM Model – Network Cost System.

Unit – V

Project Completion, Evaluation and Management: Completion of project and Managing Transition Period – Closure of Contracts – Completion of Assets of Projects – Post Project Evaluation and Completion Audit Report. **Management** – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personal Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

Text Books:
   1. Narendra Singh, Project management and Control, Himalaya Publishing House, Mumbai 5th Edition
   2. Prasanna Chandra: Projects, TMH, New Delhi, 2014, 8th Edition.
   3. K.Nagarajan: Project Management, New Age International, New Delhi, 2010
   4. PERT and CPM – L.S Srikanth
   5. PERT and CPM – Punmia
   6. Construction Management and Planning – Guna and Sen Gupta, B.

References:

   1. Gray, Larson: Project Management-Tata McGraw Hill-2015
   2. Jeffery K.Pinto: Project Management-Pearson Education-2015
   3. Enzo Frigenti: Project Management-Kogan, 2015
   4. R. Panneerselvam, P. Senthilkumar: Project Management, PHI, 2015 Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

ENTREPRENEURIAL DEVELOPMENT
(Interdisciplinary Elective-IV)

Subject Code: 18IET443   **Internal marks:40**
Credits: 2.0   **External Marks:60**

OBJECTIVE:
The objective of this course is to expose the students to the subject of entrepreneurial development, so as to prepare them to establish a new enterprise and effectively manage the enterprise.

OUTCOME:
1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Create appropriate business model and develop well presented business plan that is feasible for the student.
4. Understanding how to manage effectively the selected business.
5. Explain how various disciplines of the venture can be managed.

Unit I : Entrepreneur and   Entrepreneurship :
Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship,, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

Unit II : Entrepreneurship Development in India :
Nature and development of Entrepreneurship in India **-** emergence of entrepreneurial   class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) **-** need and objectives of EDPs ,Designing Appropriate training programme for existing and new entrepreneurs . Institutions supporting for EDP **-** NIESBUD, EDII, NAYE,TCOs, MSMEDI,DICs, commercial Banks, Universities and Engineering colleges.

Unit III : Creating and starting the venture :
Steps to start an MSME. Meaning of a project. Project Identification**-** Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection **-** meaning of project report (Business Plan)& Formulation of a project report, Preparation of sample project report of any one product and service.

Unit IV : Government and Institutional support to Entrepreneurs:
MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, , EXIM Bank and commercial Banks, APSFC, etc. AP Industrial policy (2015-20) **-** incentives and subsides, industrial estates, AP Skill Development Corporation.

Unit V : Managing the venture:
Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:
1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

References:
1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd, 2009
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi,2012
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

GEOGRAPHICAL INFORMATION SYSTEM (GIS)
(Interdisciplinary Elective-IV)

Subject Code: 18IET444   **Internal marks:40**
Credits: 2.0   **External Marks:60**

COURSE OBJECTIVES:
- To interpret map projections
- To describe GIS components and operations.
- To apply the concepts of DBMS in GIS
- To analyze spatial data and modeling in GIS
- To apply GIS in real time applications

COURSE OUTCOMES:
After the completion of this course, student will be able to
- Interpret map projections
- Describe GIS components and operations.
- Apply the concepts of DBMS in GIS
- Analyze spatial data and modeling in GIS
- Apply GIS in real time applications

UNIT I
Fundamental Concepts of Map: Introduction; Classification of Maps; Scale of maps; Spatial referencing System; Map Projections- Classification; commonly used map projections and their comparisons- Grid systems.

UNIT II
Basic Concepts of Geographical Information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data; GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.

UNIT III
Data Base Management Systems: Introduction - Functions of DBMS; Components of DBMS-GIS Data file Management- Simple List, Ordered Sequential Files; Data Base Models- Hierarchical Database Models, Network Systems.

UNIT IV
Spatial Data Modeling: Introduction; stages of GIS data modeling; Graphical representation of Raster data, Graphical representation of Vector data; Raster GIS Model, Vector GIS Model.

UNIT V
Applications of GIS: Land use and Land cover, agriculture, forestry, geology, urban applications, flood zone delineation and mapping.

TEXT BOOKS:
1. Peter A Burrough, Rachael A. Mc Donnell and Christopher D. Lloyd (2016), Principles of Geographical Information Systems, 3rd edition, Oxford University Press.
2. M.Anji Reddy(2012), Text Book of Remote Sensing and Geographical Information systems, 4th edition, BS Publications/BSP Books

REFERENCES:
1. Chor Pang Lo and Albert K.W. Yeung (2016), Concepts & Techniques of GIS, Pearson Education
2. Kang – tsung Chang (2017), GIS, 4th edition, McGraw-Hill Education

POWER QUALITY MONITORING
(Interdisciplinary Elective-IV)

Subject Code: 18IET445   **Internal marks: 40**
Credits: 2.0   **External Marks: 60**

Course objective:
Introduction to custom power and study of factors governing power quality. Study of Power factor compensation techniques with power electronic devices and active Harmonic filtering. Introduction to measuring & solving power quality problems and particular standards relating to them**.**

Course outcomes: Students will be
CO1: Examine different power quality issues and prepared to take up prospective projects assignments
CO2: Describe power distribution protection techniques and its impact on voltage quality.
CO3: Plan to trained the work for improvement and betterment of power quality.
CO4: Distinguish basic harmonic phenomena, methods for dealing with harmonic distortion.
CO5: Read theoretically and practically for monitoring of power quality.

UNIT I:
Introduction To Electrical Power Quality: Definition of Power Quality, power quality terminology, Power Quality Issues, Power Quality v/s Equipment Immunity, Responsibility of supplier and users of electric power, Electric Power Quality Standards.

UNIT II:
Power Frequency Disturbances: Common Power Frequency Disturbances, Voltage Sag, cures of low frequency disturbances.

UNIT III:
Electrical Transients: Types and Causes of Transients-Atmospheric Causes, Switching Loads On or Off, Interruption of Fault Circuits, Capacitor Bank Switching, Power Factor Correction.

UNIT IV:
Harmonics: Definition of Harmonics Causes of Voltage and Current Harmonics. Individual and Total Harmonic Distortion, Effect of Harmonics on Power System Devices, Harmonic Current Mitigation, power factor.

UNIT- V:
Measuring Power Quality Problems: Power Quality Measurement Devices, Harmonic Analyzers, Oscilloscopes, Data Loggers and Chart Recorders, True RMS Meters, Power Quality Measurements.

TEXT BOOKS:

1. R.C. Dugan, M.F. McGranaghan and H.W. Beaty, Electric Power Systems Quality, McGraw-Hill.3rd edition. .
2. C.Sankaran, "Power Quality", First Indian reprint, CRC press, 2009.

REFERENCE BOOKS:

1. G.T. Heydt, Electric Power Quality. 2nd ed. West Lafayette, IN: Stars in a Circle, 1994.
2. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002.
3. D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley, 1985.
4. J. Arrillaga, N. R. Watson, S. Chen, "Power System Quality Assessment", John Wiley & Sons, 2000.

FUNDAMENTALS OF ROBOTICS
(Interdisciplinary Elective – IV)

Subject Code: 18IET446   **External Marks: 60**
Credits   : 2.0   **Internal Marks : 40**

Course Objectives:
- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

Course Outcomes:
On completion of this course, students should be able to
1. Describe commonly used robot configurations, end effectors, drives along with robotics applications.
2. Describe working principles of various sensors and actuators commonly used in a robot.
3. Solve forward and inverse kinematic problems of common robot configurations.
4. Discuss methods of programming and programming languages.
5. Discuss robot manufacturing & non-manufacturing applications of robots.

Unit – I
Fundamentals of Robotics: Introduction to Robotics & Overview –Robotics & Automation – Robotics – Classification of Robots based on Configuration & Control – Terminology - Components of Industrial Robots – DOF .

Unit – II
Robot Actuators & Sensing Systems: Introduction to Robotic Actuators – Classification of actuators – Difference between Electric, Pneumatic and Hydraulic actuators Sensing systems – Overview of sensing – Functions of sensing – Types – position sensors: potentiometer, resolvers, and encoders.

Unit – III
Homogeneous transformations: Introduction – Fundamental transformations – Properties – Homogeneous transformations

Unit – IV
Programming: Introduction to robot programming – methods of programming – programming languages

Unit – V
Applications: Introduction – Manufacturing & Non-manufacturing applications – Selection of robot for a particular application (Case study)

Text Books:
   1. Industrial Robotics, M. P. Groover, Pearson Education Pub.
   2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Pub.

Reference Books:
   1. Robotics, K. S. Fu, Lee, McGraw Hill Pub.
   2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Pub., London.
   3. Robotic Engineering, Richard D. Klafter, Prentice Hall Pub.
   4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Pub.
   5. Introduction to Robotics, John J Craig, Pearson Education Pub.
   6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley&Sons (ASIA) Pub.

BASICS OF MOBILE CELLULAR COMMUNICATIONS
(Interdisciplinary Elective-IV)

Subject Code: 18IET447　　　　　　　　　　　　　　**Internal Marks: 40**
Credits: 2.0　　　　　　　　　　　　　　　　　　　**External Marks: 60**

Course Objectives:
- Provide the fundamentals of cellular mobile communications those are important to any mobile communication system.
- Explain different signal propagation methods. This course also deals with handoff, dropped calls and cell splitting.
- Describe antennas used in mobile communications and hand off techniques. cell coverage for signal and traffic, signal reflections in various terrains, various cell sites and mobile antennas and their analysis.
- Introduce frequency management and channel assignment techniques.
- Provide the student with an understanding of multiple access techniques and digital cellular systems like GSM.

Course Outcomes:
At the end of the course student will be able to
CO 1. Identify the limitations of conventional mobile telephone system and explain the operation of cellular system.
CO 2. Analyze mobile signal propagation methods.
CO 3. Interpret handoff mechanisms.
CO 4. Analyze frequency management and channel assignment strategies.
CO 5. Understand Digital Cellular Data Access techniques.

Unit-I
Cellular Mobile Systems: Limitations of conventional mobile telephone system, Performance criteria, Types of cells, Operation of cellular systems, frequency reuse. Types of Interferences, co-channel interference reduction factor

Unit- II
Mobile Signal Propagation: Types of propagation models, fading in propagation, Signal reflections in flat and hilly terrains, foliage loss.

Unit-III
Handoff Mechanism: Types of handoff, Types of handoff initiations, and, Dropped call rates and estimation.

Unit-IV
Frequency Management and Channel Assignment: Numbering, Grouping and, Channel assignments techniques, Channel sharing and borrowing.

Unit-V
Digital Cellular Data Access: TDMA, FDMA, CDMA. Introduction to GSM, 4G technologies.

Text Books:
1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2nd Edn., 2006.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
3. G. Sasibhushana Rao, "Mobile Cellular Communications", Pearson Education, 1st
   Edition, 2012.

Reference Books:
1. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
2. Wireless Communication and Networking – Jon W. Mark and Weihu Zhqung, PHI, 2005.
3. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

INTRODUCTION TO CLOUD COMPUTING
(Interdisciplinary Elective – IV)

Subject Code: 18IET449 **Internal Marks: 40**
Credits   : 2.0 **External Marks :60**

Course Objectives:
- Understand various basic concepts related to cloud computing technologies
- Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- To enable students exploring some important cloud applications
- To gain competence in Virtualization and Cloud platforms
- To understand and be able to cloud environment is collaborating with various databases
-

Course Outcomes:
1. Understanding the key computing paradigms and fundamentals of Cloud Computing
2. Assessment of key cloud services requirements and deployment models, for selecting cloud computing for own organization
3. Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
4. Understand various virtualization concepts and cloud platforms: AWS, Microsoft Azure
5. Evaluate various storage classifications and technologies.

Unit – I
Computing Paradigms : High-Performance Computing, Parallel Computing,   Distributed Computing, Cluster Computing ,Grid Computing Cloud Computing , Bio computing, Mobile Computing, Quantum Computing, Optical Computing , Nano computing, Network Computing, Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing: NIST Definition of Cloud Computing

Unit – II
 Cloud Computing Is a Service, cloud Computing Is a Platform,   Principles of Cloud computing Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models: SaaS,Paas,IaaS, Cloud Ecosystem, Requirements for Cloud Services , Cloud Application , Benefits and Drawbacks

Unit – III
Using Cloud Services : Collaborating on Calendars, Schedules, Task Management, Event Management, Contact Management, Project Management

Unit – IV
Virtualization **:**Introduction , Characteristics of Virtualized Environments , Taxonomy of Virtualization Techniques, Virtualization and Cloud Computing, Pros and Cons of Virtualization , various Cloud Platforms in Industry : Amazon Web Services, Microsoft Azure

Unit – V
Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, Google file system. Apache Hadoop, *NoSQL* Databases

Text Books:
1. K. Chandrasekaran, Essentials of cloud computing, CRC Press Taylor & Francis Group(unit-1,2)
2. Michael Miller, Cloud Computing: ‒Web-Based Applications That Change the Way You Work and Collaborate Online‖,1st Edition, Pearson Education, New Delhi 2009.(unit-3)
3. Dan C Marinescu "Cloud Computing, Theory and Practice", , MK Elsevier.(unit-5)
4. Arshadeep Bahga, Vijay Madisetti Cloud Computing, A Hands on approach, , University Press

Reference Books:
1. Anthony T Velte, Toby J Velte, Robert Elsenpeter Cloud Computing, A Practical Approach, ,TMH
2. Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi,Mastering Cloud Computing, Foundations and Application Programming,TMH(unit-4)

Reference Links
1. https://nptel.ac.in/courses/106/105/106105167/

INTRODUCTION TO DBMS
(Interdisciplinary Elective – IV)

Subject Code: 18IET44A   **Internal Marks: 40**
Credits   : 2.0   **External Marks: 60**

Course Objectives:
        To introduce basic RDBMS concepts, SQL, Database Design and Query processing. And also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval.

Course Outcomes:
Students will be able to:
CO1: Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
CO2: Interpret, Design and Implement an E-R Model.
CO3: Create /Modify the Structure and write optimized SQL Queries to extract and modify information from Tables or Views.
CO4: Apply proper Techniques such as Normalization and analyze the applicability of a specific Normal form in designing a Database.
CO5: Compare various Indexing, Hashing and File Organization Techniques.
CO6: Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery.

Unit I
Database System Applications, History of Data base Systems, Database Systems versus file Systems, View of Data : Data Abstraction, Instances and Schemas, Data Models :The ER Model, Relational Model, Other Data Models, Database Languages: DDL , DML, Database System Structure.

Unit II
Database Design and ER diagrams: Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model, Introduction to the Relational Model, Integrity Constraint Over relations.

Unit III
The Form of a Basic SQL Query, Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators; Aggregative Operators, NULL values, Comparison using Null values, Logical connectives AND, OR, and NOT, Outer Joins, Disallowing NULL values.

Unit IV
Schema refinement and Normal forms: Problems Caused by Redundancy, Decomposition, Properties of Decomposition, Functional Dependencies, Reasoning about FDS: FIRST, SECOND, THIRD Normal forms.

Unit V
Transaction Concept; Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability. File Organization and Indexing: Cluster Indexes, Primary and Secondary Indexes; Hash Based Indexing, Tree based Indexing, B+ Trees.

TEXT BOOK:
1. Database System Concepts - Silberschatz, Korth, McGraw hill, 5th Edition

REFERENCE BOOKS:
1. Fundamentals of Database Systems - Elmasri, Navrate, Pearson Education, 6th Edition
2. Database Management Systems - Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill , 3rd
3. An introduction to Database System – Bipin Desai, Galgotia Publications
4. Data base Systems design Implementation and Management - Peter Rob, Carlos Coronel, Cengage Learning, 7th Edition
5. Introduction to Database Systems - C.J.Date, Pearson Education, 4th Edition
6. Database Management Systems - Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill , 3rd

EMBEDDED SYSTEMS
(Interdisciplinary Elective – IV)

Subject Code: 18IET44B   **Internal Marks: 40**
Credits   : 2.0   **External Marks :60**

Course Objectives:

- This course helps to develop an understanding of the technologies behind the embedded computing systems, technology capabilities and limitations of the hardware, software components.

Course Outcomes:

Upon the completion of the course the students will be able to
1. Familiarize with the basics of an embedded system.
2. Design, implement an embedded system by using the components.
3. Familiarize with the architecture of 8051 micro controller.
4. Identify the unique characteristics of real-time systems
5. Define the unique design problems and challenges of real-time systems

UNIT-I:
Introduction to Embedded systems: What is an embedded system Vs. General computing system, history, classification, major application areas, and purpose of embedded systems.

UNIT-II:
Embedded System Components : Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components.

UNIT-III:
8—bit microcontrollers architecture: Characteristics, quality attributes application specific, domain specific, embedded systems. Factors to be considered in selecting a controller, 8051 architecture, memory organization, registers, source current, sinking current, design examples.

UNIT-IV
RTOS and Scheduling, Operating basics, types, RTOS, tasks, process and threads, multiprocessing and multitasking, types of multitasking, non preemptive, preemptive scheduling.

UNIT-V:
Task communication of RTOS, Shared memory, pipes, memory mapped objects, message passing, message queue, task communication/synchronization issues, racing, deadlock,live lock,the dining philosopher's problem, the producer-consumer problem.

TEXT BOOK:
1. Shibu. K.V, "Introduction to Embedded Systems", 2e, Mc graw Hill, 2017
2. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013

REFERENCE BOOKS:
1.Raj Kamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.

EMPLOYABILITY SKILLS
(Common to all branches)

Subject Code: 18HSL406 **Internal Marks: 100**
Credits: 1.5

AITAM has an independent Department of Training and Placement Cell, committed to provide all possible assistance to its students and also to meet the needs of organizations.

OBJECTIVES:

➢ Department provides necessary training to impart employability skills to its students.
➢ Department provides necessary arrangements for company visits.
➢ Department ensures the students to secure placements.
➢ Department makes the students to feel comfortable to face several competitive examinations with confidence and competence.
➢ Department is instrumental in entering into MOU's with reputed companies.

Employability skill training starts from 2nd year onwards for all the branches in the college. The training modules cover Aptitude, Technical, Objective general English and Soft Skills (in the areas of Corporate Culture Team Work, Leadership Skills, Creative Thinking, Motivation Mind-Set Management, Resume Writing, Group Discussions and Interview facing techniques etc.).
Apart from the regular syllabus oriented training classes, Department conducts special training classes whenever there is a Placement Drive by any IT or Non-IT Company to increase the number in selection.

TRAINING SHEDULE:

Year/Semester	ECE/CSE/IT	EEE/Mech./Civil
II B. Tech. (1st Sem.)	GA/Technical (Module 1)	GE/Soft Skills (Module 1)
II B. Tech. (2nd Sem.)	GE/Soft Skills (Module 1)	GA/Technical (Module 1)
III B. Tech. (1st Sem.)	GA/Technical (Module 2)	GE/Soft Skills (Module 2)
III B. Tech. (2nd Sem.)	GE/Soft Skills (Module 2)	GA/Technical (Module 2)
IV B. Tech. (1st Sem.)	Company specific training.	
IV B. Tech. (2nd Sem.)		

Minimum teaching hours for each module is 15 clock hours

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

GENERAL APTITUDE SYLLABUS

MODULE 1:

Arithmetic: Number Systems, Ratio & Prepositions, Average, Problem Solving, Mensuration, Partnership, Percentage, Profit & Loss.

Reasoning: Number Series, Letter Series, Analogy & Classification, Coding & Decoding, Direction Test, Ranking Test, Calendar, and Clock.

MODULE 2:

Arithmetic: Permutations & Combinations, Probability, SI & CI, Time & Distance, Problems on trains, Boats & Steamers, Time & Work, work and wages, pipes & cisterns , Mixture & Allegation.

Reasoning: Problems on Alphabet, Seating Arrangement, Blood relations, Puzzle Test, Data Interpretation, Data Analysis, Data Inequalities, Syllogism, Statement & Conclusion, Statement & Arguments, Statements & Assumption,   Critical reasoning, Cubes and Dies, Nonverbal Reasoning

TECHNICAL SYLLABUS

MODULE 1:
C – Language (for EEE/Mech./Civil): Introduction to 'C', Operators in 'C', Control structures, Iterative loops, Arrays, Pointers.

C – Language (for ECE/CSE/IT): Introduction to 'C', Operators in 'C', Control structures, Iterative loops, Arrays, Pointers, Functions – modular programming, Structure and union.
MODULE 2:

C – Language (for EEE/Mech./Civil): Functions – modular programming, Structure and union, File Handling, OOPS Concepts. C – Language & **JAVA (for ECE/CSE/IT):** DS concepts using 'C', Introduction to JAVA, JAVA tokens, Control structures, Class and object, Inheritence, Interfaces. JAVA (for CSE/IT): Packages, Exception Handling.

SOFT SKILLS SYLLABUS

MODULE 1:
Business Communications, Art of Communication, Know Your Industry, Communication Planning and Feedback, Effective Listening, Non Verbal Communication, Interpersonal Relationships - JOHARI Window, 7 Habits of Highly Effective People.

MODULE 2:

Time Management & Professionalism of work, Anger and Stress Management, Stages of Competence, CV Format, Telephone Etiquette, Skpe/Telephonic Interview, Public Speaking & How to set Goals, Mock Interviews, Group Discussions & GD.

GENERAL ENGLISH SYLLABUS

MODULE 1:
One Word Substitutions, Words often Confused, Phrasal Verbs, Verbal Analogies, Tenses, Voice, Speech, Degree of Comparison, Simple, Compound and Complex, Subject-Verb Agreement, Articles, Prepositions.

MODULE 2:

Synonyms & Antonyms, Idiomatic Expressions, Email Etiquette, Business Letter Writing, Reading Comprehension, Theme Detection, Cloze Test, Jumbling Exchanges, Essay Writing, Correction of Sentences/ Spotting Errors, Sentence Completion.

ELECTRICAL SIMULATION LAB

Subject Code: 18EEL410   **Internal marks: 40**
Credits: 1.5   **External Marks: 60**

Course objective:
To enable the students gain sufficient knowledge on the programming and simulation in the area of electrical circuits, power electronics, control systems, power systems and electrical machines.

Course outcomes: Student will be able to
CO1 Correlate with the basic concepts and properties of electrical circuits and networks.
CO2 Practice computer skills (ORCAD PSPICE and Capture) for the analysis and design of circuits.
CO3 Demonstrate proficiency in the use of high-performance engineering modeling and analysis software (MATLAB and SIMULINK) for control system analysis and design in this course and for subsequent engineering practice.
CO4 Develop the simulation of power electronics circuits with different loads.
CO5 Observe several concepts and procedures learned in power system modeling and analysis and also electrical machines.

List of experiments:

1) Analysis of three phase circuit representing the generator, transmission line and load. Plot three phase currents and neutral current using PSPICE.
2) PSPICE Simulation of Transient Response of RLC Circuits a) Response to pulse input. b) Response to step input. c) Response to sinusoidal input.
3) PSPICE Simulation of Single phase full converter using RL & E load without freewheeling diode.
4) PSPICE Simulation of Three phase full converter using RL & E Load.
5) PSPICE Simulation of single phase AC Voltage controller using RL load.
6) Modeling of transformer and simulation of transmission line using PSPICE
7) Simulation of single phase inverter with sinusoidal pulse width modulation control using MATLAB/SIMULINK
8) Development and Simulation of 3-phase PWM Inverter with sinusoidal pulse-width modulation using MATLAB/SIMULINK
9) Simulation of Resonant pulse commutation circuit and buck chopper using MATLAB/SIMULINK
10) Simulation of capacitor start-run single phase induction motor using MATLAB/SIMULINK.
11) Gauss-Seidel method of Power flow solution of given power system network using MATLAB.
12) Linear system analysis (Time domain analysis, Error analysis) using MATLAB.

POWER SYSTEMS LAB

Subject Code: 18EEL411   **Internal marks: 40**
Credits: 1.5   **External Marks: 60**

Course Objective:
- To understand the various properties of Transmission lines to study the various concepts of protection in the Transmission lines.
- To analyze the performance of power system networks by conducting various experiments.
- To study the different power system protective equipment by conducting suitable experiments.
- To study the performance of transmission lines and relays
- To study the different types of short-circuit faults which occur in power systems

Course Outcomes:
Students will be able to
CO1: Detect the fault locations in underground cables.
CO2: Analyze performance characteristics of relays.
CO3: Analyze the performance characteristics of photo voltaic system andalso analyze Performance characteristics of Fuse and miniature circuitbreaker.
CO4: Evaluate the parameters and performance of a long transmission lines and gain the Knowledge on Ferranti effect.
CO5: Describe the series and shunt compensation in transmission lines.

List of Experiments:
1. Identification of fault location in underground cable using Varley loop test.
2. Study of Characteristics of micro controller based over current relay.
3. Study of the (I-V) and (P-V) Characteristics curves of photo voltaic system. And Modeling in MATLAB/SIMULATION.
4. Observation of the FERRANTI EFFECT using high voltage transmission line analyzer.
5. Determination of transmission line parameters (ABCD parameters) using high voltage Transmission line analyzer.
6. Study of Characteristics of normal FUSE and MCB.
7. Study of Shunt reactor and shunt capacitor compensation using high voltage transmission line analyzer.
8. Study of BUCHHOLZ RELAY for major and minor faults.
9. Study of over current relay, over voltage relay and under voltage relay for different load Conditions using high voltage transmission line analyzer.
10. Study of micro controller based biased 3-phase differential relay.

Additional Experiments:
11. Study of series reactor compensation using high voltage transmission line analyzer.
12. Determination of positive, negative and zero sequence impedance of an alternator.

UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective-V)

Subject Code: 18EEE451   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objective:
To study electric drive characteristics and understand various factors affecting the choice of motor.
To study electrical heating and electrical welding and appreciate their merits over other methods.
To learn the fundamentals of illumination and various illumination methods.
To understand system of electrical traction and mechanics of train movement.

Course outcomes: Upon successful completion of this course, students will:
CO1: Be able to select an appropriate motor for given application.
CO2: Gain insight into different electrical heating and welding techniques.
CO3: Be able to understand basic principles of light control and design lighting schemes.
CO4: Be able to differentiate existing electric traction system in India.
CO5: Acquire knowledge to calculate tractive effort, power, and specific energy consumption for given run.

UNIT I: Selection of Motors and Applications: Type of electric drives, choice of motor, starting and running characteristics, temperature rise, particular applications of electric drives, continuous, intermittent and variable loads, load equalization. Energy star rating of equipment.

UNIT II: Electric Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT III: Illumination: Introduction, terms used in illumination, laws of illumination, Discharge lamps, MV and SV lamps – comparison between tungsten, filament lamps and fluorescent tubes, stroboscopic effect, Basic principles of light control, Types and design of lighting and floodlighting.

UNIT IV: Electric Traction–I: System of electric traction and track electrification. Review of existing electric traction systems in India, 25 kV AC traction system and its advantages, Special features of traction motor, Mechanics of train movement. Speed -time curves for different services – trapezoidal and quadrilateral speed time curves

UNIT V: Electric Traction – II: Calculations   of   tractive   effort,   power,   specific energy consumption for given run, effect of varying acceleration and   braking retardation, adhesive weight and braking retardation adhesive weight and coefficient of adhesion.

TEXT BOOKS:
1. Utilization of Electrical Power including Electric drives and Electric traction - N. V. Suryanarayana, New Age International (P) Limited Publishers, 2017.
2. Art &Science of Utilization of electrical Energy – Partab, DhanpatRai& Sons, 2004.

REFERENCE BOOKS:
1. Utilization of Electrical Energy in SI Units - E. Openshaw Taylor, Orient Longman Pvt. Ltd.
2. Utilization of Electric Power and Electric Traction - J B Gupta, S K Kataria& Sons.
3. .Generation, distribution and utilization of electrical energy, C.L Wadhwa, Wiley Eastern Limited,1993
4. Electrical Power, S. L. Uppal, Khanna pulishers, 1988.

ADVANCED CONTROL SYSTEMS
(Professional Elective-V)

Subject Code: 18EEE452   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objective

3. Solve state equation and test for controllability and observability
4. Design pole placement
5. Estimate stability for nonlinear systems
6. Understood Adaptive control functions
7. Understood different optimal control problems

Course outcomes

At the end of the course student can be able to:

CO1: Compute solution of state equation and estimate the controllability and observablity
CO2: Design the observers for pole placement
CO3: Apply liapunov theory and analyze the stability
CO4: Associate the functions of adaptive control with their applications
CO5: Distinguish the optimal control problems

UNIT I:
State Space Analysis: State space representation, solution of state equation, state transition matrix and its properties, concepts of controllability and observability, test for controllability and observability by Gilberts and Kalman test

UNIT II:
Modern Control: Effect of state feedback on controllability and observability, Pole placementby state feedback, Full order observer and reduced order observer

UNIT III:
Liapunov Stability Analysis: Stability of equilibrium state, asymptotic stability, graphical representation, Liapunov stability theorems, stability of linear and non linear systems, and construction of liapunov functions using krasovskii method, variable gradient method.

UNIT IV:
Adaptive Control: Definition of adaptive control system, functions of adaptive control, gain scheduling, model reference, series and parallel schemes and their industrial applications.

UNIT V:

Optimal Control: Formulation of optimal control problem, Minimum Time, Minimum energy, Minimum fuel problems, state regulator problem, output regulator problem, tracking problem.

TEXT BOOKS:

3. "Modern control system Theory", M.Gopal, Wiley eastern Ltd., New delhi,2014.
4. "Modern control Engineering", K. OGATA, 3ed.prentice Hall of India(p) Ltd., New delhi

REFERENCES:

1. "Modern Control Systems", Richard C.dorf and Robert H. Bishop, 11th Edition, Pearson Edu, India,2009
2. "Optimal Control Theory – an introduction", Kirk D.E., Prentice Hall, N.J. 1970
3. "Adaptive Control",Astry,S. and Bodson., Prentice Hall, 1989
4. "Adaptive Control and Optimization Techniques",Eveleigh, V.W.,McGraw-Hill,1967
5. "Linear Control System Analysis and Design Conventional and Modern", John J D'Azzo and C.H. Houpis, McGraw Hill Book Company,1988

ELECTRICAL MACHINE DESIGN
(Professional Elective-V)

Subject Code: 18EEE453   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course objective
1. To understand and appreciate the design aspects of various electrical machines.
2. Acquire knowledge of armature winding design for both DC and AC rotating electrical machines.
3. To study the design of transformers, DC machines, induction machines and synchronous machines.

Course outcomes
Upon successful completion of this course, students will:
CO1: Be able to estimate number of conductors, slots, conductor dimension and slot dimension for DC machine based on given specifications.
CO2: Be able to design field system, interpoles of a DC machine
CO3: Learn how to calculate the cross section of core and yoke, number of cooling tubes, resistance, leakage reactance, losses and efficiency of a transformer.
CO4: Learn how to design stator and rotors for squirrel cage and wound rotor induction motors
CO5: Be able to explain the effect of Short-circuit ratio on synchronous machine performance

UNIT I:
Introduction to Electrical Machine Design, Armature Windings (DC &AC): Design Concepts, Factors, Review Of Basic Principles, Material Selection, Modern Manufacturing Techniques, Cooling Techniques, DC Windings –Single, Double Layer Winding – Lap, Wave Winding(developed form) ,AC Winding-Mush Winding, Integral Slot Winding, Introduction to Permanent Magnet Motor design, Linear Motor design.

UNIT-II:
DC Machines
Output Equation –Choice of Specific Electric and Magnetic Loadings-Separation of D and L for Rotating Machines. Estimation of Number of Conductors / Turns-Coils-Armature Slots-Conductor Dimension. Choices of Number of Poles-Length of Air gap –Design of Field System, inter Poles.

UNIT III:
Transformers: Construction –Comparison of Core and Shell Type, Single and Three Phase Transformer Comparison. Core and Yoke Design-Cross Section, Number of Cooling Tubes. Transformer Windings, Coil Design, Output Equation, Determination of Number of Turns.

UNIT IV:
Induction Motors: Principles of Operation, Choice of Specific Electric And Magnetic Loadings, Stator Design (Frames), Output Equation, Stator Winding, Stator Slots, Squirrel Cage Rotor Design –Air Gap Length, Rotor Slots and Rotor Bars. Design of Wound Rotor- Rotor Slots, Windings.

UNIT V:
Synchronous Machines: Constructional Features-Short Circuit Ratio-Output Equation – Specific Loadings-Main Dimensions-Stator Design –Design of Salient Pole Field Coil.

TEXT BOOKS:
1. A course on Electrical Machine Design, A.K Sawhany, DhanpathRai & sons, 1984.
2. Electrical machine design by Nagoorkani, RBA Publications, 2000.

REFERANCE BOOKS:
1. "Design of Electrical Machines"V.N.Mittle,A.Mittle,Standerd Publishes Distributors, Delhi.
2. "Albert E. Clayton and Hancock,N.N, "The performance and Design of Direct Current Machines", Oxford & IBH Publishing Co., Pvt., Ltd., New Delhi, 1990.
3. M.G.Say; "Alternating Current Machines", ELBS & Pitman, London, 5th edition, 1992", Pitman,ELBS.

DIGITAL CONTROL SYSTEMS
(Professional Elective-VI)

Subject Code: 18EEE461   **Internal Marks:40**
Credits: 3.0   **External Marks: 60**

Course objective
- Summarize the sampling techniques.
- Computing the Z- transforms and inverse Z transforms.
- Determining stability of digital control systems.
- Understanding state equations.
- Testing controllability and observability in state space analysis.

Course outcomes
CO1: Students can understand the modeling of sampling process.
CO2: Students can operate the Z- transforms and inverse Z transforms.
CO3: Students can determine stability of digital control systems.
CO4: Students can understand state equations & their various state responses.
CO5: Students can test controllability and observability in state space analysis.

UNIT I:
Sampling: Advantages of sampling process in Control Systems, mathematical analysis of the sampling process – mathematical description of the ideal sampling process. The ideal sampler sampling theorem - S-plane properties. Reconstruction of sampled signals, zero-order hold - First – order hold -fractional order hold and exponential hold devices.

UNIT II:
Z transforms & Applications: Review of Z transforms, Mapping between S-plane and Zplane, inverse Z-transform, Limitations of the Z-transform, Applications of Z transforms, pulse-transfer function, pulse transfer function of the zero-order hold.

UNIT III:
Stability tests: Stability tests of the Digital control Systems JURY's stability tests, extension of Routh-Hurwitz criterion to Digital Control Systems. Root Locus for Digital Control Systems. Controllability and Observability.

UNIT IV:
Discrete State equations –1: State equations of digital systems, state transition equations of digital systems, solution of the time-invariant Discrete State Equations by the Z-transformations.

UNIT V:
Discrete State equations – 2: Relation between state equation and transfer function, computing the state transition matrix by the Z-transform method, Relation between state equations and high order difference equations via canonical form, Analysis of the state diagrams of the Sam pled Data Control Systems.

TEXT BOOKS:
1. Discrete – time Control Systems, OGATA, PHI Publications, 2nd edition, 2015.
2. Digital Control Systems, Benjamin C.Kuo, Oxford HED Edition, 2012.

REFERENCE BOOKS:
1. Digital Control and State Variable MethodsM.Gopal, Tata McGraw-HillPublishing Co. Ltd.,New Delhi (1997).
2. Digital Control Systems, C.H. Houpis and G.B.Lamount, McGraw-Hill Book Company(1985).

OPTIMIZATION TECHNIQUES
(Professional Elective-VI)

Subject Code: 18EEE462   **Internal Marks: 40**
Credits: 3.0   **External Marks: 60**

Course Objectives:
• To be able to formulate linear or nonlinear optimization problems as a solution for industrial problems.
• To be able to solve various kinds linear and nonlinear, single and multiple variable, unconstrained and constrained optimization problems using standard optimization algorithms.

Course Outcomes:
CO1: Should be able to solve linear multivariable optimization using linear programming and perform sensitivity analysis.
CO2: Should be able to solve single-variable, non-linear, unconstrained optimization problems
CO3: Should be able to solve geometric programming optimization problems using standard techniques for each case.

UNIT I:
Introduction to Classical Optimization Techniques: Single variable optimization with and without constraints, multi – variable optimization without constraints, multi – variable optimization with constraints – method of Lagrange multipliers, Kuhn-Tucker conditions

UNIT II:
Linear programming: Two-phase simplex method, Big-M method, duality, interpretation, applications

UNIT III:
Assignment problem: Hungarian's algorithm, Degeneracy, applications, unbalanced problems, traveling salesman problem.

UNIT IV:
One dimensional Optimization methods: Elimination Methods: - Fibonacci, Golden Section.
Interpolation Methods: - Quadratic, Cubic.
Direct Root Methods: - Newton, Quasi-Newton, Secant Methods. Gradient of a function, steepest descent method.

UNIT V:
GEOMETRIC PROGRAMMING: Polynomials – arithmetic - geometric inequality – unconstrained G.P- constrained G.P

Text Books:
1. Engineering Optimization, Theory and Applications, S.S. Rao, New Age International.
2. Optimization for Engineering Design – Kalyanmoy Deb, PHI Publishers

References:
1. Optimization Techniques, Theory and Practice, M.C.Joshi, K.M.Moudgalya, Narosa Pub.
2. Engineering Optimization, ARavindran, K M Ragsdell, G V Reklaitis

NON CONVENTIONAL ENERGY SOURCES
(Professional Elective-VI)

Subject Code: 18EEE463   **Internal   Marks:40**
Credits: 3.0   **External Marks: 60**

Course objectives:
To emphasize the applications of solar energy in day to day life.
To classify and understand the working of wind turbines.
To describe the working of ocean thermal and geothermal energy systems.
To summarize the concept of bio mass.
To demonstrate MHD power generation and Fuel cells.

Course Outcomes:
CO1: Discuss various applications of solar energy.
CO2: Emphasize the working of wind turbines (Horizontal and Vertical Axis Turbines)
CO3: Outline the working of Ocean thermal &Geothermal energy systems.
CO4: Generalize the concepts of Bio mass energy.
CO5: Demonstrate MHD power generation and Fuel cells.

UNIT I:
Solar energy: Introduction to Non-Conventional Sources of Energy, concept of solar radiation, Different types of solar collectors. Solar energy applications: water heaters, cooking, drying, distillation and power generation, storage of solar energy - Introduction to Photovoltaic cells.

UNIT II:
Wind energy: Introduction to Wind energy, extraction of maximum power, Types of wind machines- Horizontal axis and Vertical Axis wind Machines, comparison of wind energy with other forms of Non-Conventional energy sources.

UNIT-III:
Ocean Thermal & Geothermal Energy: Sources of Ocean thermal energy, Ocean Thermal Energy Conversion Systems (Open and Closed Cycles), Different types of Tidal power plants Sources of Geo thermal energy, Geothermal Power Plants (Principle of Operation, Indirect Condensing Cycle, Direct Non-Condensing Cycle)

UNIT IV:
Bio- mass Energy: Introduction to Energy from Bio-mass, sources of bio mass, Bio conversion processes, classification of bio mass energy conversion, advantages and disadvantages.

UNIT V:
MHD Power Generation & Fuel Cells: Introduction to MHD: Joule's effect, Seebeck effect, Thomson effect, Peltier effect, Principle of MHD Generators and types of MHD Generators, Fuel cells types and applications.

TEXTBOOKS:
1. Non-Conventional Energy Sources, G.D.Rai, Khanna publishers, Fourth Edition, 2009.
2. Renewable Energy Resources third edition John Twidell and Tony Weir, 2015.

REFERENCE BOOKS:
1. Solar Energy: Principles of Thermal Collection and Storage, Sukhatme, S.P., Tata McGrawHill, New Delhi.
2. Fuel Cell Systems, James Larminie , Andrew Dicks , John Weily& Sons Ltd.
3. Wind Energy Explained, J.F.Manwell, J.G.McGowan, A.L.Rogers, John Weily& Sons Ltd.