

**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 EndExaminations. 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 ($3 \times 10 = 30M$) 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. ($5 \times 12M = 60M$)

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 required to 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.Tech Programme

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

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

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.

**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 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 fulfillsthe 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.

Students, who fail to complete their three year Course of study within six years or fail to acquire the totalcredits 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. Minimum Academic Requirements:

3.1 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.

3.2 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.Tech Programme

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)

3.3 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:

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

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.

3.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme:

The CGPA is calculated as below:

$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad (\text{for entire programme})$$

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

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

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

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 in any 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 ControllersLab)	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	Microprocessor and Micro controller	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 (Microprocessor and Micro controller 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	Fundamentals of 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

Professional Elective - V

Code	Subject
18EEE451	Utilization of Electrical Energy
18EEE452	Advanced Control Systems
18EEE453	Renewable Energy systems

Professional Elective - VI

Code	Subject
18EEE461	Digital Control Systems
18EEE462	Electrical Distribution Systems
18EEE463	Special Electrical Machines

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 Computer Graphics	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 management	ECE/MECH/ CIVIL/CSE/IT
18IET446	MECH	Fundamentals of ROBOTICS	ECE/EEE/ CIVIL/CSE/IT
18IET447	ECE	Basics of Mobile 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
Credits: 4.0

Internal Marks: 40
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, 43rd 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
Credits: 4.0

Internal Marks: 40
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 (O₂, CO) - Atomic and ionic sizes - ionization energies - electron affinity and electronegativity – 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****Credits: 4.0****Internal Marks: 40****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
Credits: 2.0

Internal Marks: 40
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 complement, 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 (Semester-I/II)

Subject Code: 18ESL103
Credits: 1.5

Internal Marks: 40
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) Bridle 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
Credits: 1.5

Internal Marks: 40
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 colorimeter etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colorimeter), 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 colorimeter etc.

CO4: Synthesize a small polymer molecule and analyze a salt sample.

CO5: Estimate iron (by colorimeter), 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. Colorimetric 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 demonstrate 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
Credits: 1.5

Internal Marks: 40
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
Credits: 0

Internal Marks: 40
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 speak 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 - Biogeographical 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 – biomedicalwastes - 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 International edition.
5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications.

ENGLISH**Subject Code: 18HST101****Credits: 2.0****Internal Marks: 40****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 Heasley. Cambridge University Press. 2006.

DIFFERENTIAL EQUATIONS AND TRANSFORM THEORY (For ECE & EEE)

Subject Code: 18BST102
Credits: 4.0

Internal Marks: 40
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, 43rd 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
(Common for EEE, ECE, CSE & IT)

Subject Code: 18BST106
Credits: 4.0

Internal Marks: 40
External Marks: 60

COURSE DESCRIPTION:

This course encompasses 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 Publishers
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**(Common to all Branches)****Subject Code: 18EST102****Credits: 3.0****Internal Marks: 40****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. Gilberg 3rd Edition

REFERENCES

1. YashwantKantakar. 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
Credits: 2.0

Internal Marks: 40
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, 6th 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, Dhanpat Rai Publishing Company (P) Ltd.
2. Network Analysis by N.C. Jagan, C. Lakshmi Narayana BS publications 2nd edition.
3. Electric circuits in SI units by Joseph A Edminister, MSE, 1st Edition
4. Electrical Circuits by A. Sudhakar and Shyam Mohan S Palli, Tata McGraw- Hill

ENGINEERING GRAPHICS AND DESIGN (Semester I/II)

Subject Code: 18ESL104
Credits: 02

Internal Marks: 40
External Marks: 60

COURSE OBJECTIVES:

- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice versa
- 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****Credits: 1.5****Internal Marks: 40****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
Credits: 1.5

External Marks: 60
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
Credits: 1.5

Internal Marks: 40
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 3 values.
 - c) Calculate the grades of a student.

4.
 - a) Arithmetical operations using switch-case.
 - b) Read a number and display its 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.

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 nonrecursion.
 - b) GCD using recursion and nonrecursion.

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

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. Gilberg 3rd Edition

REFERENCES

1. Yashwant Kantikar. 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> › C programming › C – Home
4. <https://www.programiz.com/c-programming>

CONSTITUTION OF INDIA

Subject Code: 18MCT203
Credits: 0

Internal Marks: 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 rigidity 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**PARLIAMENTARY FORM OF GOVT. IN INDIA:**

President of India - Emergency provisions - National Emergency – Article 352 President Rules – Article 356 - Financial Emergency – Article 360 Prime 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**PARLIAMENTARY COMMITTEES:**

Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptroller 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. Suranaidu – Indian Political System.

3) MadhavKhosla – The Indian Constitution.

COMPLEX VARIABLES AND STATISTICAL METHODS

Subject Code: 18BST204
Credits: 3

External Marks: 60
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

COURSE OUTCOMES

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 –Poisson'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 field intensity.
- Will compute capacitance of different configurations and to analyze the behavior of dielectrics at different boundary conditions.
- Will have ability to state and apply the Biot-Savart law and Ampere's circuit law to find the Magnetic field intensity.
- Will gain the knowledge on applying Lorenz force equation and determination of self inductance and mutual inductances for different configurations.
- Will list the Faraday's laws and to Modify the Maxwell's equations for time varying fields.

Course Outcomes:

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

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

CO3: ability to state and apply the Biot-Savart law and Ampere's circuit law to find the Magnetic 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 law in point form-current continuity equation-conductors and dielectric material- behavior of 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 $\text{div}(\mathbf{B})=0$ - 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 $\text{curl}(\mathbf{H})=\mathbf{J}$.

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-poynting 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
Credits: 4

Internal Marks: 40
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's criterion, Positive real functions, Sturm's theorem, Elementary synthesis procedures.

UNIT V:

Synthesis-II: L-C Immittance functions (Foster form-1, Foster form-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****Credits:3****Internal Marks:40****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****Credits: 3****Internal Marks: 40****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- \emptyset 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****Credits: 1.5****Internal Marks: 40****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****Credits: 1.5****Internal Marks: 40****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
Credits: 3

Internal Marks: 40
External Marks: 60

Course Outcomes

After studying the course, the student will be able to:

- Describe how biological observations of 18th 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 and Quaternary, Proteins as enzymes-transporters-receptors and structural elements

Unit-V

Metabolism

Thermodynamics as applied to biological systems. Exothermic and Endothermic versus Endergonic and Exergonic reactions, ATP as an energy currency-breakdown of glucose to $\text{CO}_2 + \text{H}_2\text{O}$ (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 Wiley and Sons.
- 2) Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
- 3) Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, 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
Credits: 4

Internal Marks: 40
External Marks: 60

COURSE OBJECTIVES:

- 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 centroid 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

Credits: 3

Internal Marks: 40

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

Credits: 3

Internal Marks: 40

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 rods, 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.

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
Credits: 3

Internal Marks: 40
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 by Farid Golnaraghi, 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, Tata McGraw Hill Publications.
3. Modern Control Engineering, Fifth edition, Kotsuhiko Ogata, Prentice Hall of India Pvt. Ltd.

NUMERICAL METHODS

(Interdisciplinary Elective – I)

Subject Code: 18IET212
Credits: 2

Internal Marks: 40
External Marks: 60

COURSE OBJECTIVES

- To Solve the algebraic and transcendental equations, using different numerical methods.
- 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 derivatives using different numerical methods.
- To evaluate the definite integrals using different numerical methods.
- To calculate the numerical solution of an ordinary differential equation i.e IVP .

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.e IVP .

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’s Method – Runge–Kutta Method (4th order).

Text Books:

1. Higher Engineering Mathematics, 43rd 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
Credits: 2

Internal Marks: 40
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.

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 learningPvt.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

Credits: 2

Internal Marks: 40

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.

UNIT V
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
Credits: 2

Internal Marks: 40
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 of 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, modulus 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 – Schackelford.
3. Material Science – Callister.

INTRODUCTION TO ELECTRONIC MEASUREMENTS

(Interdisciplinary Elective – I)

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

Internal Marks:40
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**Credits: 2****Internal Marks:40****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-Hill Education. (Unit 1,3,4,5)
2. Software Project Management , Walker Royce: pearson Education,2005.(Unit 2)

References:

- 1.Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for 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 X_d and X_q 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****Credits: 1.5****Internal Marks: 40****External Marks: 60****Course Objective:**

- To understand 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 a Transformer.
- 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****Credits: 1.5****Internal Marks: 40****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 Synchronos
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
Credits: 3

Internal Marks: 40
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
Credits: 3

Internal Marks: 40
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
Credits: 3

Internal Marks: 40
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.Sawhney Dhanpat Rai & 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
Credits: 3

Internal Marks: 40
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, 4thedition
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

Credits: 3

Internal Marks: 40

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 monostablemultivibrator,triggering in monostablemultivibrator.

AstableMultivibrators: Principle of operation ofastablemultivibrator using transistors, Astablemultivibrator as voltage to time converter

UNIT –V

Time Base Generators :Methods of 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
Credits: 3

Internal Marks: 40
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

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, Shannon'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
Credits :2

Internal Marks:40
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 their 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 crisp value.

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, 3rd edition, John wiley& sons Ltd.

Remote Sensing (Interdisciplinary Elective – II)

Subject Code:18IET323
Credits :2

Internal Marks:40
External Marks:60

Course Objectives

The objective of the course is to

- Study the basics of remotesensing.
- Study the typesplatforms
- Study the types of Sensors &Resolutions
- Study the procedure of imageanalysis.
- Study the image classification procedure and know the use of Remote Sensing invarious Applications.

Course Outcomes

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

1. Demonstrate about the basics of remotesensing.
2. Explain about typesplatforms
3. Explain about types of Sensors &Resolutions
4. Understand the procedure of imageanalysis.
5. Illustrate the image classification procedure and explain the use of Remote Sensingin variousApplications.

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 Press 1999.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy, BS Publications/BSP Books 2012.

References Books

1. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
2. Remote Sensing and Image Interpretation, by Lillesand, Kiefer, Chipman, Wiley Publishers, 6th Edition 2011.

Renewable Energy Sources (Interdisciplinary Elective – II)

Subject Code: 18IET324
Credits: 2

Internal Marks: 40
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
Credits: 2

Internal Marks: 40
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, dynamometer, 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
Credits :2

Internal Marks:40
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**Credits : 2****Internal Marks: 40****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, Importing Packages.

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-oriented programming*”, 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
Credits :2.0

Internal Marks:40
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 problemsolving.
- 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](#), 2nd Edition

MICROPROCESSORS AND MICROCONTROLLERS LAB

Subject Code: 18EEL306
Credits: 1.5

Internal Marks: 40
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
Credits: 1.5

Internal Marks: 40
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
Credits: 3

Internal Marks: 40
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, Buchholz 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 MadhvaRaoTMH Publications.

POWER SYSTEM ANALYSIS

Subject Code: 18EET315
Credits: 3

Internal Marks: 40
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 Z_{bus} 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-1st 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
Credits: 3

Internal Marks: 40
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 from 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,pernam 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 Acqusion”, 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**Credits: 3****Internal Marks: 40****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 and 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, Andhe Pallavi, I.K International.

REFERENCE BOOKS:

1. Signals and systems – by Ramesh Babu and R. Ananada Natarajan.
2. Ashok Ambardar, “Introduction to Analog and Digital Signal Processing”, PWS Publishing Company, New York, 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
Credits: 3

Internal marks: 40
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, Clarendon press, T.J.E. Miller, 1989, Oxford.

INSTRUMENTATION **(Professional Elective-II)**

Subject Code: 18EEE323
Credits: 3

Internal Marks: 40
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, gauge 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 Doebelin
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 and W.D.Cooper, Pearson/Prentice Hall of India.

ENERGY AUDIT MANAGEMENT AND CONSERVATION (Interdisciplinary Elective – III)

Subject Code: 18IET334
Credits: 2

Internal marks: 40
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 worth method, 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.

POWER ELECTRONICS LAB

Subject Code: 18EEL308

Credits: 1.5

Internal Marks: 40

External Marks: 60

Course Objectives:

- To develop hands on 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
Credits: 1.5

Internal Marks: 40
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
Credits: 1.5

Internal Marks: 40
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 Résumé / CV of their own, and face interviews confidently.

Course Syllabus

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 Résumé/ CV Writing— Mock Interviews

Suggested Readings:

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. 2013.