AR-20

ACADEMIC REGULATIONS

COURSE STRUCTURE

AND

DETAILED SYLLABUS OF

ELECTRICAL AND ELECTRONICS ENGINEERING

For

B.TECH. FOUR YEAR DEGREE COURSE
(Applicable for the batches admitted from 2020-2021)

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 JNTUGV, Vizianagaram,
K.Kotturu, Tekkali, Srikakulam-532 201,
Andhra Pradesh.

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that efficiency for employability increases on a continued basis.

VISION OF THE DEPARTMENT

The department of Electrical and Electronics Engineering is committed to innovation and excellence in teaching, research, service and provide programs of the high quality, collaborative efforts with industry to produce world class engineering professionals.

MISSION OF THE DEPARTMENT

M1. To inculcate value based, socially committed professionalism to the cause of overall development of students and society.

M2. Cultivate the spirit of entrepreneurship and the connection between engineering and business that encourages technology commercialization.

M3. Improve continuously the engineering pedagogical methods employed in delivering its academic programs.

M4. Evolve thoughtfully in response to the needs of industry, society and the changing world.

PROGRAM EDUCATIONAL OBJECTIVES

On successful completion of under graduation in Electrical and Electronics Engineering, the graduates are expected to attain the following program educational objectives.

PEO1: The graduates would be employed as a practicing engineer in fields such as design, research, development, testing and manufacturing.

PEO2: The graduates would be engaged in lifelong self-directed learning to maintain and enhance professional skills and to undertake higher studies.

PEO3: The graduates will be able to create new methods to meet the society needs or to become an entrepreneur with their gained knowledge and confidence.

PEO4: The graduates will be able to exhibit their communication skills, team spirit, leadership skills and ethics with social responsibility.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO-PROGRAM SPECIFIC OUTCOMES

PSO1: Ability to exhibit the basics of Engineering to identify, formulate, design and solve complex problems of Electrical and Electronics Engineering.

PSO2: Practice the application of appropriate techniques of hardware and software tools in power systems, power Electronics and Industrial Automation.

PSO3: To Exhibit success in higher studies and competitive examinations in the field of Multi-Disciplinary Environments.

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K. Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh, India

Academic Regulations 2020 (AR20) for B. Tech

(Effective for the students admitted into I year from the Academic Year 2020-21 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.

Registered for **160** credits and he/she must secure total **160** credits.

Students, who fail to complete their four-year 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.

S. 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
07	42-CSM	CSE (Artificial Intelligence and Machine Learning)
08	44-CSD	CSE (Data Science)

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

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

S. No	Course	Credits
1	Mandatory Course	0
2	Theory Course	3
3	Laboratory Course	1.5
4	Integrated Course	4.5
5	Interdisciplinary/Open Elective Course	3
6	Skill-Oriented/Skill-Advanced/Soft Skills Course	2
7	Internship	1.5/03
8	Project work	12

4. Interdisciplinary/Open Electives:

There are two interdisciplinary electives in II year II semester and III year I semester and one open elective in IV year I semester. The student can choose any one interdisciplinary elective/open elective courses offered in the 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.

5. MOOCs:

Explore all possibilities to run at least one subject in every semester from II year I semester onwards as a MOOCs.

6. NCC/NSS activities:

All undergraduate students shall register for NCC/NSS activities. A student will be required to participate in an activity for two hours in a week during II year I semester or II year II semester and evaluated during the II year II Semester. Grade shall be awarded as Satisfactory or Unsatisfactory in the mark sheet on the basis of participation, attendance, performance and behavior. If a student gets an unsatisfactory Grade, he/she shall repeat the above activity in the subsequent years, in order to complete the degree requirements.

7. Evaluation Methodology:

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

7.1 Mandatory Courses:

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

- Induction Program
- Constitution of India
- Environmental Science
- Human Values

No marks or letter grade shall be allotted for all mandatory non-credit courses.

7.2 Theory course (100 marks):

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

7.2.1 Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks and will be scaled down to **25** 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 examination.

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

7.2.2 Objective test (5 marks):

For theory courses of each semester, there shall be **2** Objective tests to be conducted along with Midterm exam. Each Objective test is to be held for **10** marks with the duration of **10** minutes and will be scaled down to **5** marks.

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

7.2.3 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 **10** marks. Each course shall consist of six units of syllabus. The student should answer total **6** questions. (6X10M=60M)

7.3 Laboratory Course (100 marks):

For laboratory course, 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 evaluation, **5** marks for record and **10** marks to be awarded for internal laboratory written test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

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

For the 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.

7.4 Integrated Course (100 marks):

Integrated courses are exclusively designed to provide a unique learning experience of layered learning where students have a chance to practice while learning. These courses are designed by blending both theory and laboratory components one over the other.

Assessment for **100** marks as given below:

Category	Marks	Assessment
Internal	20	Internal assessment of Laboratory carried out for 40 marks will be scaled down to 20 marks.
	20	Internal assessment of Theory carried out for 40 marks will be scaled down to 20 marks.
End examination	40	End examination of Laboratory carried out for 60 marks will be scaled down to 40 marks.
	20	End examination of Theory carried out for 60 marks will be scaled down to 20 marks.

For Integrated courses, the evaluation of Theory and Laboratory are carried out separately as per evaluation method given in 7.2 and 7.3.

A candidate shall be declared to have passed in integrated 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; in addition to that he/she has to secure minimum of **14** marks (out of **40**) in Laboratory end examination and minimum of **7** marks (out of **20**) in Theory end examination.

7.5 Skill Oriented/Skill Advanced Course (100 marks):

Out of a total of **100** marks for the Skill-Oriented/Skill-Advanced Course, **40** marks shall be for the internal evaluation and **60** marks for semester-end examination.

The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her Skill-Oriented/Skill-Advanced Course, which was evaluated by internal committee constituted by HOD.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consists of an External examiner, Head of the department and Internal supervisor of the Skill-Oriented/Skill-Advanced Course.

7.6 Soft Skills (100 marks):

One Soft Skills course is there in III year II semester and Soft skills shall be evaluated for **100** marks. Evaluation pattern of Soft Skills course is similar to the Theory course and evaluation is purely internal.

7.7 Internship (100 marks):

All the students shall undergo Community Internship as well as Industrial Internship. Community Internship is for a minimum period of **2** weeks after II year II Semester and Industrial Internship is for a minimum period of **4** weeks after III year II Semester.

Self study report for the Community Internship after the II year II Semester shall be submitted and evaluated during the III year I Semester and Self study report for the Industrial Internship after the III year II Semester shall be submitted and evaluated during the IV year I Semester.

The Self study report will be evaluated for a total of **100** marks consisting of **40** marks for internal assessment and **60** marks for semester-end examination.

Internal assessment for **40** marks shall be done by: internal supervisor in case of community internship and internship supervisor in industry in case of internship in an industry based on day to day observation.

The semester-end examination (Viva-Voce) shall be conducted by the committee, consisting of an External examiner, Head of the department and Internal supervisor of the Internship.

7.8 Project (200 marks):

Out of a total of 200 marks for the Project, **80** marks shall be for Project Internal Evaluation and **120** marks for the semester-end Examination.

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 the semester).

The semester-end examination (Viva – Voce) shall be conducted by the committee, consisting of an External examiner, Head of the Department and Supervisor of the Project. The evaluation of project shall be made at the end of IV year.

7.9 Honors/Minor Programme:

The curriculum provides flexibility to enable the competent students to register for B. Tech. degree with Honors/Minor by earning additional 20 credits which are over and above 160 credits for the award of B. Tech. (Regular) degree. The students registered for B. Tech (Honors) shall not be permitted to register for Minor or vice versa.

He/She shall register Honors/Minor during II B.Tech II semester provided he/she secures ≥ 8 CGPA and clearing all the courses in single attempt till II B.Tech I semester. In case of students admitted through lateral entry, the CGPA compliance will be considered from II B.Tech I semester onwards.

If a student is detained due to lack of attendance, he/she shall not be permitted to register the courses of Honors/Minor.

All the students who maintain ≥ 8 CGPA are eligible to enroll for B. Tech with Honors/Minor; however, registration for Honors/Minor degree will be limited to maximum of 35% of the total intake in a particular batch of students.

The students shall have the scope to earn these additional 20 credits from II year II semester to IV year I semester and at any point of time if he/she wishes to withdraw from B. Tech (Honors/Minor) program, the additional credits acquired till that time will get lapsed and cannot be used to compensate with those 160 credits needed for the award of B.Tech degree.

To acquire 20 additional credits, the students shall register for four 4-credit courses under the list of the courses offered by the respective departments and acquire the balance 4 credits by taking two MOOCs NPTEL courses with not less than 8 weeks duration. The student can complete these two MOOCs NPTEL courses during II year II semester to IV year I semester and evaluated and included in the IV year II Semester grade memo.

For the award of B. Tech. degree with Honors the additional 20 credits shall be earned by taking the courses offered by the respective department of study in one domain. A set of four courses are offered under each of the domains preferably from the new emerging areas as recommended by the BoS.

For the award of B. Tech degree with Minor the additional 20 credits shall be earned by taking the inter-disciplinary courses offered preferably from the new emerging areas by other departments.

These additional courses offered by the program may change from time to time based on the demand and resources availability. The courses may be offered in different modes i.e. guided learning/taught courses/Blended mode or combination.

Evaluation methodology of Honors/Minor courses will be similar to the regular B.Tech theory course/laboratory course/integrated course. No Supplementary examination for the courses offered in B.Tech Honors/Minor Program. If a student fails in a course (offered under B.Tech Honors/Minor Program), that course will not be reflected in Grade Memo. The courses passed under Honors/Minor program will not be counted for CGPA/SGPA calculation.

The student who acquires 20 additional credits and maintained ≥ 8 CGPA and acquiring 160 credits in regular B.Tech course and clearing all the courses in single attempt will be awarded the B.Tech degree with Honors/Minor. Any student who fails to fulfill these conditions will automatically get deregistered for B. Tech (Honors)/B.Tech (Minor) without any notification.

Honors/Minor shall not be awarded under any circumstances without completing the regular B. Tech programme in which a student got admitted.

The student is not permitted to repeat any course offered by any department to fulfil credit requirement for Honors/Minor program.

8. Attendance Requirements:

A student shall be eligible to appear for the semester-end examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.

Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below **75%**) in each semester with genuine reasons shall be approved by a committee duly appointed by the college. The condonation approved otherwise can be reviewed by the College Academic Committee. A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

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

A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. He/she may seek re-admission for that semester when offered next.

The overall attendance in each semester of regular B. Tech course and Honors/Minor course shall be computed separately.

A student shall maintain an attendance of 75% in each course of Honors/Minor to appear for semester end examination of Honors/Minor. Condonation of shortage of attendance up to **10%** (**65%** and above and below **75%**) in each course with genuine reasons shall be approved by a committee duly appointed by the college. A separate fee stipulated by the college shall be payable towards condonation of shortage of attendance in Honors/Minor.

A student detained due to lack of attendance in Honors/Minor course shall not be permitted to continue Honors/Minor programme, but he/she can continue regular B. Tech programme.

9. Minimum Academic Requirements:

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

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.

On passing a course of a programme, the student shall earn assigned credits in that Course.

9.2 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

Marks Range	Level	Letter Grade	Grade Points
>= 90%	Outstanding	A+	10
80 – 89%	Excellent	A	9
70 – 79%	Very Good	B	8
60 – 69%	Good	C	7
50 – 59%	Fair	D	6
40 – 49%	Satisfactory	E	5
< 40%	Fail	F	0
-	Absent	AB	0

9.3 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:

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

Where CR = Credits of a Course
GP = Grade points awarded for a course

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

The CGPA is calculated as below:

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

Where CR = Credits of a course
GP = Grade points awarded for a course

- Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.
- As per the AICTE regulations, conversion of CGPA into equivalent percentage as follows:
  Equivalent Percentage = (CGPA – 0.75) x 10

9.5 Award of Class:

Class Awarded	CGPA to be secured	Remarks
First Class with Distinction	≥ 7.75 (Without any supplementary appearance)	From the CGPA secured from 160 Credits
First Class	≥ 6.75	
Second Class	≥ 5.75 and < 6.75	
Pass Class	≥ 5.0 and < 5.75	

9.6 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.7 Conditions for Promotion:

(i) A student will be promoted to second year if he/she satisfies 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 the number of credits is in fraction, it will be rounded off to a 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.

10. 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 when absent for it or failed in the end examinations he/she 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 well with the regulations he/she first admitted.

11. Minimum Instruction Days:

The minimum instruction days for each semester shall be **90**.

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

13. **General:**

(i) Wherever the words “he,” “him,” “his,” occur in the regulations, they include “she,” “her,” “hers” as well.

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

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

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

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Academic Regulations 2020 (AR20) for B. Tech (Lateral Entry Scheme)

(Effective for the students admitted into II year from the Academic Year 2021-22 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.

Registered for **121** credits and he/she must secure total **121** credits.

Students, who fail to complete their three-year course of study within **6** years or fail to acquire **121** Credits for the award of the degree within **6** academic years from the year of their admission shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

2. Promotion Rule:

A lateral entry student will be promoted from II year to III year if he satisfies the minimum required attendance in II year.

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

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

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DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phone with any student or students in or outside the exam hall with respect to any matter	Expulsion from the examination hall and cancellation of the performance in that subject only. 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 practical's 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 the 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 the answer book or additional sheet or takes out or arranges to send out the question paper 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 the seat.
5	If the student uses objectionable, abusive or offensive language in the answer script 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 walkout or instigates others to walk out or threatens the officer-in charge or any person on duty in or outside the examination hall or causes any injury to any of his relatives either by words 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 relatives, or indulges in any other act of misconduct or mischief which results in damage or destruction of property in the examination hall or any part of the	In case of students of the college, they shall be expelled from examination hall 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.

	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	
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 the 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 clauses 6, 7, 8	In case of 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 already appeared including practical examinations and project work of that semester/year examinations.

Aditya Institute of Technology and Management, Tekkali
R20 – COURSE STRUCTURE (1ST B.Tech.)
(Proposed for EEE)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (1st Sem)	MC	20MCT101	Induction Program	3 weeks			0
	BS	20BST101	Linear Algebra and Calculus	2	1	0	3
	BS	20BST105	Applied Physics	3	0	0	3
	PC	20EET101	Electronic Devices and Circuits	3	0	0	3
	ES	20EST101	Basic Electrical Engineering	3	0	0	3
	ES	20ESL102	Workshop and Manufacturing practice	1	0	4	3
	BS	20BSL101	Physics Lab	0	0	3	1.5
	ES	20ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
	PC	20EEL101	Electronic Devices and Circuits Lab	0	0	3	1.5
Total				**12**	**1**	**13**	**19.5**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (2nd Sem)	MC	20MCT102	Environmental Science	2	0	0	0
	HS	20HST101	English	3	0	0	3
	BS	20BST102	Differential Equations	2	1	0	3
	BS	20BST107	Chemistry	3	0	0	3
	ES	**20ESI102**	Programming for Problem Solving	3	0	3	4.5
	ES	20ESL103	Engineering Graphics & Design	1	0	4	3
	HS	20HSL101	Language Proficiency Lab	0	0	3	1.5
	BS	20BSL102	Chemistry Lab	0	0	3	1.5
Total				**14**	**1**	**13**	**19.5**

Aditya Institute of Technology and Management, Tekkali
R20 – COURSE STRUCTURE (2nd B.Tech.)
(Proposed for EEE)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (1st Sem)	MC	20MCT203	Constitution of India	2	0	0	0
	BS	20BST203	Complex Variables and Statistical Methods	3	0	0	3
	PC	20EET202	D.C Machines & Transformers	2	1	0	3
	PC	20EET203	Electric Circuit Theory	3	0	0	3
	PC	20EET204	Electrical Measurements	3	0	0	3
	PC	20EET205	Electrical Power Generation & Distribution	3	0	0	3
	PC	20EEL202	D.C Machines Lab	0	0	3	1.5
	PC	20EEL203	Electrical Circuits Lab	0	0	3	1.5
	PC	20EEL204	Electrical Measurements Lab	0	0	3	1.5
	SC	20EES201	Skill Oriented Course – I	1	0	2	2
Total				**17**	**1**	**11**	**21.5**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B. Tech. (2nd Sem)	MC	20MCS204	NCC/NSS	2	0	0	0
	ES	**20ESI204**	Python Programming	3	0	3	4.5
	ES	20EST203	Engineering Mechanics	3	0	0	3
	PC	20EET206	A.C Machines	2	1	0	3
	PC	20EET207	Control Systems	3	0	0	3
	OE	20IET21X	Interdisplinary Elective – I	3	0	0	3
	PC	20EEL205	A.C Machines Lab	0	0	3	1.5
	PC	20EEL206	Control Systems Lab	0	0	3	1.5
	SC	20EES202	Skill Oriented Course – II	1	0	2	2
Total				**15**	**1**	**11**	**21.5**
Honors/Minor Course: Electric Vehicles							
	HM	20EVT201	Introduction to Electrical Vehicle Technology	3	1	0	4
Community Internship (2 weeks) (Mandatory) during summer vacation							

II-II

Subject Code	Offered by Dept.	Interdisciplinary Elective – I	Offered for Dept.
20IET211	BS&H	Transform Theory	MECH/CIVIL
20IET212	BS&H	Numerical Methods	ECE/EEE
20IET213	BS&H	Introduction to Number Theory	CSE/IT
20IET214	CIVIL	Elements of building planning	MECH
20IET215	CIVIL	Remote Sensing	ECE/EEE/CSE/IT
20IET216	EEE	Mathematical Modeling and Simulation	ECE/MECH/CIVIL/CSE/IT
20IET217	MECH	Fundamentals of Material Science	ECE/EEE/CIVIL/CSE/IT
20IET218	ECE	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
20IET219	CSE	UNIX Utilities	ECE/EEE/MECH/CIVIL
20IET21A	IT	Fundamentals of Data Structures	ECE/EEE/MECH/CIVIL
20IET21B	TPC	Advanced Coding – I	CSE/IT
20IET21C	TPC	Competitive Programming – I	ECE/EEE/MECH/CIVIL

Aditya Institute of Technology and Management, Tekkali
R20 – COURSE STRUCTURE (3rdB.Tech.)
(Proposed for EEE)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (1st Sem)	MC	20MCT305	Human Values	2	0	0	0
	PC	20EET308	Electro Magnetic Field Theory	3	0	0	3
	PC	20EET309	Electric Power Transmission	3	0	0	3
	PC	20EET310	Power Electronics	3	0	0	3
	PE	20EEE31X	Professional Elective– I	3	0	0	3
	OE	20IET32X	Interdisciplinary Elective – II	3	0	0	3
	HS	20HSL302	Professional Communication Skills Lab	0	0	3	1.5
	PC	20EEL307	Power Electronics Lab	0	0	3	1.5
	SC	20EES303	Skill Advanced Course – I	1	0	2	2
	I/P	20EEP301	Community Internship	0	0	0	1.5
Total				**18**	**0**	**8**	**21.5**
Honors/Minor Course: Electrical Vehicles							
	HM	20EVT302	Special Electrical machines	**4**	**0**	**0**	**4**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (2nd Sem)	PC	**20EEI311**	Power System Analysis	3	0	3	4.5
	PC	20EET312	Micro Processors and Micro Controllers	3	0	0	3
	PC	20EET3I3	Switchgear and Protection	3	0	0	3
	PE	20EEE32X	Professional Elective– II	3	0	0	3
	PE	20EEE33X	Professional Elective– III	3	0	0	3
	PC	20EEL308	Power System Protection Lab	0	0	3	1.5
	PC	20EEL309	Micro Processor and Micro Controllers Lab	0	0	3	1.5
	SC	20SSS301	Soft Skills	1	0	2	2
Total				**16**	**0**	**11**	**21.5**
Honors/Minor Course: Electrical Vehicles							
	HM	20EVT303	Battery Technologies	**4**	**0**	**0**	**4**
Industrial Internship 4 weeks (Mandatory) during summer vacation							

III-I

Subject Code	Offered by Dept.	Interdisciplinary Elective –II	Offered for Dept.
20IET321	BS&H	Fundamentals of Fuzzy Logic	All
20IET322	CIVIL	Geographical Information System	ECE/EEE/MECH/CSE/IT
20IET323	EEE	Renewable energy sources	ECE/MECH/CIVIL/CSE/IT
20IET324	MECH	Fundamentals of ROBOTICS	ECE/EEE/CIVIL/CSE/IT
20IET325	ECE	Principles of communications	EEE/MECH/CIVIL/CSE/IT
20IET326	CSE	JAVA Programming	ECE/EEE/MECH/CIVIL
20IET327	IT	Introduction to DBMS	ECE/EEE/MECH/CIVIL
20IET328	TPC	Advanced Coding–II	CSE/IT
20IET329	TPC	Competitive Programming–II	ECE/EEE/MECH/CIVIL

Aditya Institute of Technology and Management, Tekkali
R20 – COURSE STRUCTURE (4thB.Tech.)
(Proposed for EEE)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. (1st Sem)	HS	20HST403	Managerial Economics and Management Science	3	0	0	3
	PC	20EET414	Utilization of Electrical Energy	3	0	0	3
	PE	20EEE44X	Professional Elective – IV	3	0	0	3
	PE	20EEE45X	Professional Elective – V	3	0	0	3
	OE	20OET41X	Open Elective	3	0	0	3
	PC	20EEL410	Electrical Simulation Lab	0	0	3	1.5
	PC	20EEL411	Industrial Automation Lab	0	0	3	1.5
	SC	20EES404	Skill Advanced Course – II	1	0	2	2
	I/P	20EEP402	Industrial Internship	0	0	0	3
Total				**16**	**0**	**8**	**23**
Honors/Minor Course: Electrical Vehicles							
	HM	20EVI404	Electric Vehicle Engineering	4	0	0	4

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. (2nd Sem)	I/P	20EEP403	Project work	0	0	0	12
Total							**12**
Honors/Minor Course: Electric Vehicles							
	HM	20EVM405	MOOC Course – I				2
	HM	20EVM406	MOOC Course – II				2

AR 20 – B.Tech – EEE
IV-I

Subject Code	Offered by Dept.	Open Elective	Offered for Dept.
20OET411	MBA	HRD & Organizational behavior	All
20OET412	MBA	Project Management	All
20OET413	MBA	Entrepreneurial Development	All
20OET414	MBA	Digital Marketing	All
20OET415	CIVIL	Environmental impact assessment	All
20OET416	EEE	Energy Audit Conservation and Management	All
20OET417	MECH	Optimization Techniques	All
20OET418	CSE	Blockchain Technologies	All
20OET419	IT	IT systems Management	All
20OET41A	CSE-M	API and Micro Services	All

Professional Elective-I

Code	Subject
20EEE311	Instrumentation
20EEE312	Principles of Pulse and Digital Circuits
20EEE313	Switching Theory and Logic Design

Professional Elective-II

Code	Subject
20EEE321	Linear Digital Integrated Circuits
20EEE322	Advanced control systems
20EEE323	Flexible AC Transmission Systems

Professional Elective-III

Code	Subject
20EEE331	Principles of Signals & Systems
20EEE332	High Voltage DC Transmission
20EEE333	Digital Control Systems

Professional Elective - IV

Code	Subject
20EEE441	Power System Operation and Control
20EEE442	High Voltage Engineering
20EEE443	Power Quality and Harmonics

Professional Elective - V

Code	Subject
20EEE451	Artificial intelligence & machinelearning
20EEE452	Smart grid
20EEE453	Non-Conventional Energy Sources

LINEAR ALGEBRA AND CALCULUS
(Common to all Branches)

Subject Code:20BST101

L	T	P	C
2	1	0	3

Course Objectives:

- Understand the process of calculation of rank, solution of System of Linear Homogeneous and Non Homogeneous equations by Gauss Elimination method.
- Learn the process of calculating the Eigen values, Eigenvectors and Quadratic Forms.
- Understand the concepts of multiple integrals and their usage.
- Learn the properties of Gamma and Beta Functions, their relation and evaluation of improper integrals.
- Understand the concepts of gradient, divergence, curl of scalar and vector point functions.
- Understand and calculate Line Integral, Surface Integral, Volume Integral, concepts of Green's, Stokes and Gauss Divergence theorems in converting one integral form to another

Course Outcomes:

The student will be able to:

1. Calculate the rank and solve linear homogeneous and non homogeneous equations by Gauss Elimination method.
2. Calculate eigen values, eigen vectors and estimate the nature of the matrix..
3. Evaluate multiple integral in both Cartesian and polar coordinates.
4. Apply Beta and Gamma functions to solve improper integrals.
5. Calculate gradient, divergence, curl of a scalar and vector point functions and derive vector identities.
6. Solve a Line Integral, Surface Integral, Volume Integral, apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

Unit – I

Linear System of Equations: Matrices – Rank- echelon form – Normal form – System of Linear Homogeneous and Non Homogeneous equations – Gauss Elimination method- Applications- Matrix representation for a Graph-Current in an electrical circuit. (8 hrs)

Unit – II

Eigen Values, Eigen Vectors, Quadratic Forms: Eigen values – Eigenvectors – Properties (an over view)-Diagonalization- Quadratic Forms- Reduction of Quadratic Forms to Canonical Form- Rank-Nature-Index-Signature. (8 hrs)

Unit – III

Multiple Integrals: Double integral (Cartesian and polar form) -Change of order of integration -Change of variables (Cartesian to polar)- Triple integrals – Change of variables (Cartesian to spherical/cylindrical). (8 hrs)

Unit – IV

Special functions: Gamma and Beta Functions – Properties - Relation between Beta and Gamma functions- Evaluation of improper integrals. (8 hrs)

Unit – V

Vector Differential Calculus: Scalar and Vector point functions- Vector differentiation - Directional derivatives – Gradient, Curl and Divergence- Vector identities. (8 hrs)

Unit – VI

Vector Integral Calculus: Vector Integration –Line Integral, Surface Integral, and Volume Integral – Green Theorem, Stokes Theorem and Gauss Divergence theorem (without proofs with simple illustrations only). (8 hrs)

Text Books

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

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **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.

APPLIED PHYSICS
(Common to all Branches)

Subject Code:20BST105

L	T	P	C
3	0	0	3

Course Description

This course encompass Fundamental Concepts of Physics that include

- Wave Optics
- Lasers
- 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 Lasers
- To Infer the Principles of Fiber Optics
- To Recognize the shortcoming of classical physics and describe the need for modifications to classical theory
- To Identify the interaction of electromagnetic fields
- To summarize the characteristics of semiconductor materials.

Course Outcome

Students will be able to

1. Apply the principles of optics in designing optical devices
2. Illustrate the Principles of Lasers
3. Outline the Principles of Fiber Optics
4. Resolve the discrepancies in classical estimates through quantum principles
5. Analyze the interaction of electromagnetic fields.
6. Interpret the characteristics of semiconductor materials.

Unit – I

Wave Optics

Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light.

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution.

Unit – II

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Unit – III

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Applications of Optical Fibers in Communication

Unit – IV

Modern Physics Quantum Mechanics - Wave Particle Duality, de-Broglie's Hypothesis of Matter Waves, Heisenberg's Uncertainty Principle, Physical Significance of Wave Function. Time independent wave equation and Particle in One Dimensional Potential Box

Unit – V

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

Unit – VI

Semiconductors Physics: Introduction- Intrinsic and Extrinsic Semiconductors, Dependence of Fermi Level on Carrier Concentration and Temperature, Diffusion and Drift Currents. Hall Effect –Mobility, Sign of Charge Carriers, Conductivity, Resistivity.

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

Reference books

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

ELECTRONIC DEVICES AND CIRCUITS

Subject Code: 20EET101

L	T	P	C
3	0	0	3

Course objectives:

- To understand the working, characteristics of PN Junction diode, Zener diode andLED.
- To describe the working, parameters of rectifiers andfilters.
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET andMOSFET.
- To understand the need for biasing and to explore the transistor biasingmethods.
- To explain how transistor acts as a switch and amplifier and also understands types of feedbackamplifiers and characteristics of negative feedback amplifier.
- To understand the condition for oscillations and analyze RC Phase shift oscillator, Wien bridge oscillator, Hartley and Colpitt's oscillator usingBJT.

Course Outcomes:

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

- CO1: Describe the working principle of PN Junction diode, Zener diode andLED.
- CO2: Explain the operation and analyze the parameters of rectifiers andfilters.
- CO3: Describe the working and behavior of transistor (BJT) in different configurations, JFET and MOSFET.
- CO4: Describe the need for biasing and transistor biasingmethods.
- CO5: Explain how transistor acts as a switch and amplifier and also understand types of feedback amplifiers and characteristics of negative feedback amplifier.
- CO6: Understand the condition for oscillations and analyze RC Phase shift oscillator, Wienbridge oscillator, Hartley and Colpitt's oscillator usingBJT.

UNIT I:

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

UNIT II:

Rectifiers and Filters: Half wave rectifier, Full wave rectifier, Ripple factor, Efficiency, TUF, Comparison betweenfull wave rectifier and Half Wave rectifier, Rectifiers with C- Filter, L- filter.

UNIT III:

Transistor Characteristics:

Bipolar Junction Transistors (BJT) - input & output Characteristics of transistor in CB, CE, CC configurations, Relationship between α, β and γ.

Field effect transistors (FET) -Characteristics of JFET, MOSFET (Enhancement and depletion)

UNIT IV:

Transistor Biasing and Stabilization: Need for biasing, DC & AC load line, Criteria for fixing the operating point, Types of biasing and its stability, thermal run away, Thermal stability.

UNIT V:

Applications of Transistor: Transistor as a switch, Transistor as an Amplifier (CE),

Feedback amplifiers: Concept of feedback, classification of feedback amplifiers, general characteristics of negativefeedback amplifiers

UNIT VI:

Oscillators: Condition for oscillations, RC Phase shift oscillator, Wien bridge oscillator, Hartley and Colpitt's oscillator using BJT.

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-GrawHill.
2 Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006.

http://www.vidyarthiplus.in/2011/11/electronic-device-and-circuits-edc.html

BASIC ELECTRICAL ENGINEERING

Subject Code:20EST101

L	T	P	C
3	0	0	3

Course objectives:

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with network reduction techniques.
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To become familiar with DC Generator.
- To understand the concept of DC Motor.

Course outcomes:
CO1: Able to summarize different electrical circuits.
CO2: Able to construct network reduction techniques
CO3: Able to outline the basics of AC circuits.
CO4: Able to state magnetic circuits.
CO5: Able to examine DC Generator.
CO6: Able to explain DC Motor.

UNIT –I Introduction to Electric Circuits
Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sourcesIndependent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, , simple problems.

UNIT-II Network Reduction Techniques
Star-Delta transformation, Nodal Analysis, Super node, Mesh analysis, super mesh-Problems.

UNIT-III 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, simple problems.

UNIT-IVMagnetic circuits
Basic definitions of magnetic flux, flux density, Reluctance, Magneto motive force (m.m.f), magneticfield intensity, magnetic permeability and susceptibility. Comparison between magnetic and electrical circuits, inductively coupled circuits, coefficient of coupling, dot convention,simple problems on magnetic circuits.

UNIT-VDC Generator

Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

UNIT-VI DC Motor

Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter,Applications.

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.

WORKSHOP AND MANUFACTURING PRACTICE

Subject Code: 20ESL102

L	T	P	C
1	0	4	3

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:

On completion of this course, students should be able to:

CO 1. Make half-lap, mortise &tenon, corner dovetail or bridle wooden joints.
CO 2. Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
CO 3. Forge MS rod from round to square cross-section, or into L- or S- bend.
CO 4. Fabricate MS pieces into either a straight, square, dovetail or V-fit.
CO 5. Connect a staircase or a tube light house-wiring electrical circuit.

I. Wood Working Technology - Familiarity with different types of wood and tools used in wood Working technology.

Tasks to be performed:

1) Half – Lap joint 2) Mortise and Tenon joint
3) Corner Dovetail joint 4) Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.

Tasks to be performed:

1) Square Tray 2) Taper side Tray
3) Conical Funnel 4) Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...

Tasks to be performed:

1) round M.S rod to square bar 2) L bend in given M.S. Rod.
3) S bend in given M.S. Rod. 4) heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.

Tasks to be performed:

1) "V" – fitting 2) square fitting
3) Dovetail fitting 4) Straight fitting

V.HOUSE WIRING

1) Tube light connection
2) Staircase connection

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

PHYSICS LAB
(Common to all Branches)

Subject Code:20BSL101

L	T	P	C
0	0	3	1.5

Course Description

This Laboratory course is intended to apply the scientific method to expedite experiments that include

- Error analysis
- Waves Fundamentals
- Mechanics
- Physical 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 Sensitive Instruments for precision measurements
- To Identify 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 Determine relevant parameters associated with Interference and Diffraction phenomena using Travelling Microscope and Spectrometer.
- To Exhibit 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

1. Demonstrate the ability for precision measurements to design instrumentation
2. Estimate the Error for targeted accuracy
3. 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
4. Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens
5. Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
6. 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 Tensional 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. Verify the characteristic curve of NTC Thermistor.
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 bookslinks, Vijayawada)

BASIC ELECTRICAL ENGINEERING LAB

Subject Code: 20ESL101

L	T	P	C
0	0	3	1.5

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 & Characteristics of generator.

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. Magnetization characteristics of DC shunt generator.
7. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
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.

ELECTRONIC DEVICES AND CIRCUITS LAB

Subject Code: 20EEL101

L	T	P	C
0	0	3	1.5

Course Objective:

- To measure the voltage, time period and phase usingCRO.
- To observe the characteristics of PN junction diode &Zener diodeexperimentally.
- To find ripple factor of half and full wave rectifiers with and withoutfilter.
- To observe the characteristics of BJT in CB and CE configurations and also analyze the frequency response of CE Amplifierexperimentally.
- To observe the characteristics of JFETexperimentally.
- To measure the frequency of oscillations of RC Phase ShiftOscillator.

Course Outcomes:

Students will be able to
CO1: Measure the voltage and time period using cathode ray oscilloscope (CRO).
CO2: Analyze the V-I characteristics of P-N diode, Zener diode and examineits cut-in voltages.
CO3: Analyze the half wave and full wave rectifiers with and withoutFilters
CO4: Differentiate the characteristics of Bipolar Junction Transistor (BJT) in CB and CEconfigurations and also analyze the frequency response of CEAmplifier.
CO5: Draw the characteristics of Field Effect Transistor (FET).
CO6: Determine the frequency of oscillations of RC Phase Shift Oscillator.

List of Experiments:

1. Measurement of voltage and time period using cathode ray oscilloscope(CRO)
2. PN Junction diode forward and reverse bias characteristics (cut-in voltage, static and dynamicresistance).
3. Zener diodecharacteristics.
4. Rectifier without filters (Full wave & halfwave).
5. Rectifier with filters (Full wave & halfwave).
6. Transistor CB characteristics (Input andOutput)
7. Transistor CE characteristics (Input andOutput)
8. Frequency response of CEAmplifier

9. FETcharacteristics

10. RC Phase ShiftOscillator

ENVIRONMENTAL SCIENCE

Course Code: 20MCT102

L	T	P	C
2	0	0	0

Course Objectives:

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

Course Outcomes: By Studying this Course Student will

1. Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
2. Explain and demonstrate the ecosystems setup, assess.
3.Recognize andconserving of diversity to upkeep.
4. Examine a range of pollution problems along with controland their eco-friendlydisposal methods.
5. Translate the sustainable development practice through clean development mechanisms.
6. Evaluate the changing trends of world population and compile the information in order to document theenvironmental assets.

Unit – I (*6lectures*)

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 andEnvironment

Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – conceptof sustainable agricultural methods - case study

Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use ofrenewable and alternate energy sources

Unit – II (*3lectures*)

Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers.Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrientcycles (Carbon cycle and Nitrogen cycle). Ecological succession

Unit-III(*3lectures*)

Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

Unit – IV (*6lectures*)

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 – V (*6 lectures*)

Social Issues and the Environment: Concept of Unsustainable and Sustainable development –Water conservation: Rain water harvesting- Watershed management – Globalenvironmental 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 ofPollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

Unit – VI (*4lectures*)

Human Population and the Environment: Population growth patterns - variation amongnations - Population problems - control -Environment and human health - Role of informationTechnology 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
(Common to all Branches)

Subject Code: 20HST101

L	T	P	C
3	0	0	3

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 help students learn rules of using punctuation marks and prepositions appropriately in writing
- To aid students acquire appropriate and adequate letter writing skills
- To get students develop reading skills and enhance their essay writing skills

Course Outcomes

1. Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
2. Students will be able to write short texts masterly.
3. Students will be able to construct grammatically correctsentences.
4. Students will be able to use punctuation marks and prepositions correctly in speech and writing.
5. Students will be able to communicate through letters and emails effectively.
6. Students will be able to comprehend unfamiliar passages, and will be able to write*essays.*

Unit–I*Father's Help* by RK Narayan
Synonyms and Antonyms — One-word substitutes

Unit–II*My Early Days* by APJ Abdul Kalam
Tense— Voice — *If* clauses

Unit – III*The Road Not Taken* by Robert Frost
Reported Speech—Degrees of Comparison —Simple, Compound, Complex Sentences

Unit – IV *Politics and the English Language* by George Orwell
Punctuation —Prepositions

Unit–V*Mother's Day* by J. B. Priestly
Letter Writing — E-mail Writing

Unit–VI *Chipko Movement*
ReadingComprehension—Essay Writing

Text Books

1. *On Writing Well.* William Zinsser. Harper Resource Book. 2001
2. *Practical English Usage*. Michael Swan. Oxford University Press. 1995.
3. *Study Writing.* Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
4. *Hugging the Trees: The Story of the Chipko Movement*. Thomas Weber. Viking Publishers, New Delhi, 1988.

DIFFERENTIAL EQUATIONS
(Common to all Branches)

Subject Code:20BST102

L	T	P	C
2	1	0	3

Course Objectives:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- Derive the Fourier series expansion of one variable functions.
- Understand Taylor's, Maclaurin's series expansion and rules of calculating extreme value of two or more variable functions.
- Learn the methods of solving first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
- Understand the method of solving a linear Partial differential equation with constant coefficients by method of Separation of Variables, solve a one dimensional Wave and a one dimensional Heat equation.

Course Outcomes

The student will be able to:

1. Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
2. Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.
3. Estimate the Fourier series expansion of one variable functions.
4. Estimate the Taylor's, Maclaurin's series expansion of two variable functions and extreme values of two or more variable functions.
5. Evaluate a first order quasi-linear (Lagrange) partial differential equations and first order non-linear partial differential equations.
6. Evaluate a one dimensional Wave and Heat equation.

Unit – I

Ordinary differential equations of first order: Linear type - Bernoulli type–Exact type - Equations reducible to exact type- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay. (8 hrs)

Unit – II

Ordinary differential equations of higher order: Higher order homogenous and non-homogenous linear differential equations with constant coefficients- Complimentary Functions-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, Applications- LCR circuits. (8 hrs)

Unit – III

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**(8 hrs)**

Unit – IV

Partial Differentiation: Functions of two or more variables-Partial differentiation-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). (8 hrs)

Unit- V

Partial Differential Equations of first order: Partial differential Equations - Formation of partial differential equations– solutions of first order quasi-linear (Lagrange) partial differential equations and first order non-linear (standard type) partial differential equations. (8 hrs)

Unit – VI

Applications of Partial Differential Equations: Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables- One dimensional Wave and Heat equations. (8 hrs)

Text Books

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

Reference Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

CHEMISTRY
(Common to all Branches)

Subject Code:20BST107

L	T	P	C
3	0	0	3

Course Objectives:

The students will become familiar and understand about:

- Rationalise the importance of water for society and industrial needs.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- To become familiar in moulding methods of preparation of different types of plastic materials
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
- Rationalise reference electrodes and science of corrosion.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Course Outcomes:

The course will enable the student to:

1. Rationalise the importance of water for society and industrial needs.
2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
3. Differentiate different moulding techniques of plastic materials
4. Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions.
5. Rationalise the science of corrosion.
6. Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

Unit – I

Water Technology Hardness of Water – Temporary and Permanent Hardness - Units of Hardness - Estimation of Hardness by EDTA Method - Problems on Temporary and Permanent Hardness - Disadvantages of Hard Water – Softening Methods of Hard Water- Zeolite or Permutit Process - Ion Exchange Process - Methods of Treatment of Water for Domestic Purposes – Sedimentation, Coagulation, Filtration, Disinfection - Sterilization, Chlorination, Break Point chlorination, Ozonisation. ***(9 lectures)***

Unit – II

Spectroscopy Spectroscopy - Electronic Spectroscopy - Types of Electronic Transitions - Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts - Introduction to I.R. Spectroscopy – Fingerprint Region – Introduction to NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift- Splitting – Coupling Constant.***(8 lectures)***

Unit – III

Polymers and Plastics Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of Polymerization (Addition and Condensation Polymerizations) - Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of Plastics into Articles (Compression, Injection,

Transfer and Extrusion Moulding Methods) - Preparation, Properties and Engineering Uses of PVC and Bakelite.***(7 lectures)***

Unit – IV

Organic Reactions 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) – Rearrangement Reactions (Claisen, PinacolPinacolone Rearrangement).***(7 lectures)***

Unit – V

Corrosion and Its Control Definition of Corrosion – Theories of Corrosion (Chemical & Electrochemical) – Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Galvanic Series - Factors Influencing Corrosion – Corrosion Control Methods - Proper Designing, Modifying the Environment, Cathodic Protections – Sacrificial Anodic Protection and Impressed Current Cathodic Protection.Metallic (Anodic and Cathodic) Coatings – Methods of application on metals (Galvanizing and Tinning).***(9 lectures)***

Unit – VI

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.***(8 lectures)***

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

PROGRAMMING FOR PROBLEM SOLVING
(Common to all Branches)

Subject Code:20ESI102

L	T	P	C
3	0	3	4.5

Course Objective

The course is designed to provide complete knowledge ofC 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 toaccess 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 solvereal time problems and allocate memory using dynamic memorymanagement functions.
Co5 Create user defined data typesincluding structures and unions to solve problems.
Co6 Implement files operations in C programming for a given application and able to handle errors during program execution.

UNIT: 1

Introduction to Programming

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

Exercise Questions: 1

Ex 1: Write the C programs to calculate the following
a) Area of triangle when sides aregiven.
b) Program for Type Casting.
c) Interchanging values of twovariables.

Ex 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 conditionaloperator.
c) Calculate area and perimeter ofcircle.

UNIT: 2

Control Structures

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

Exercise Questions: 2

Ex 3: Write C programs for the following using decision making statements

a) Program to find roots of quadratic equation.
b) Find the Largest among 3values.
c) Calculate the grades of astudent.

Ex 4: Write C programs for the following using Iterative Statements

a) Arithmetical operations usingswitch-case.
b) Read a number and display inreverse.
c) Check for Armstrong number property

Ex 5:

a) Generate Fibonacciseries.
b) Generate Prime numbers between two numbers.
c) Write a program in C to display the pattern like right angle triangle using an asterisk

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UNIT: 3

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.

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

Exercise Questions: 3

Ex 6: Implement the following using arrays

a) Largest and smallest from a list ofelements.
b) Program for Linear Search.
c) Program for Bubble Sort.

Ex 7: Implement the following using arrays

a) Matrixaddition.
b) MatrixMultiplication.
c) Program using string handling functions

Ex 8: Implement the following using DMA Functions

a) Find the sum and average of list of elements using DMAFunctions
b) Implementation of call byreference and call by valve.

Ex 9:

a) Implement C Program using any numerical methods

UNIT: 4

Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions, functions and pointers, and Storage classes,

Exercise Questions: 4

Ex 10:

a) Factorial using recursion and nonrecursion.
b) GCD using recursion and nonrecursion.
c) To count the digits of a given number using recursion

UNIT: 5

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.

Exercise Questions: 5

Ex: 11

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

UNIT: 6

Files: Definition, Types of files, Opening modes, File IO Functions, Random access functions, Preprocessor directives.

Exercise Questions: 6

Ex 12:

a) Copy the contents of one file intoanother.
b) Count the number of characters, words and lines in afile.

Text Books

1. "The C – Programming Language", B. W Kernighan, Dennis M. Ritchie, 2nd Edition, PHI.

2. **"**A Structured Approach Using C" by Behrouz A. Forouzan,Richard F. Gilberg3rd Edition

3. "Problem solving Through 'C'- User Friendly Approach", Dr. G.S.N Murty, S Vishnu Murty, First Edition, MANTECH Publications Pvt.Ltd., 2020

References

1. "Let Us C", YashwantKantikar, 8th Ed., PBP Publications 2012.

2. "C Programming", E. Balagurusamy, Tata McGraw Hills,2011,New Delhi, India.

Web Links

1. https://www.tutorialspoint.com › Cprogramming › C – Home
2. https://www.programiz.com/c-programming

ENGINEERING GRAPHICS & DESIGN

Subject Code: 20ESL103

L	T	P	C
1	0	4	3

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Draw projection of points and straight lines in first angle projection.
CO 2. Project plane surfaces and simple solids inclined to one reference plane.
CO 3. Convert orthographic views into isometric projections and vice-versa.
CO 4. Draw basic lines and profiles with commonly used operations in drafting software.
CO 5. 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
(Common to all Branches)

Subject Code:20HSL101

L	T	P	C
0	0	3	1.5

Course Objectives

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To enhance the ability of students to speak spontaneously
- 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

1. Students will be able to recognize differences among various accents and speak with neutralized accent.
2. Students will be able to pronounce words accuratelywith the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
3. Students will be able to speak extemporaneously about anything in general.
4. Students will be able to generate dialogues for various situations.
5. Students will be able to present posters perceptively and concisely.
6. 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:JAM— Narration of an Event
Unit – IV: Situational Dialogues
Unit – V: Poster Presentation
Unit – VI: Interpretation of Data in Graphs and Tables

Text Books

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

CHEMISTRY LAB
(Common to all Branches)

Subject Code:20BSL102

L	T	P	C
0	0	3	1.5

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

Course Outcomes:

The students will learn to:

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

List of Experiments
(Choice of 10-12 experiments from the following)

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

14. Potentiometric Titration of a Chloride-Iodide Mixture.
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.

CONSTITUTION OF INDIA

L	T	P	C
2	0	0	0

Subject Code: 20MCT203

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

Course Outcomes:
By the end of this course the student will be able to:
CO 1: Realize the rigidness of our Indian Politics and Administrative aspects.
CO 2: A Student can understand our nation federalism.
CO 3: Can assess different types of risk involved in misadministration.
CO 4: Can create competitive advantage.
CO 5: Summarizes the legal and Administrative establishments.
CO 6: A student can infer financial aspects for betterment of the National Building.

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

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

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

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

Unit – V
PARLIMENTARY COMMITTEES:
Public Accounts Committee - Estimates Committee - Committee on Public. Undertakings. - Election commission of India (Article -324) - Comptrollar andAuditor General (CAG) of India (Article – 148 to 150)

Unit – VI

FINANCE COMMISSION:

Finance Commission(Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

Text Books:

1) Introduction to Indian Constitution by D.D Basu,Lexis Nexis Butterworth wadhwa Nagapur, 2008.
2) Poicits in India by Rajini Kothari, Orient LongMan, 2005.
3) The Indian Constitution by Madhav Khosla by Oxford University Press India, 2012.

COMPLEX VARIABLES AND STATISTICAL METHODS

Subject Code: 20BST203

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Test if a function is analytic, harmonic and then construct a harmonic conjugate function.
- Evaluate integrals using the Cauchy Integral theorem.
- Identify singular points of a function then calculate residues using Residue Theorem.
- Understand the concepts of discrete and continuous distributions.
- Understand the concept of sampling theory.
- Analyze the testing of hypothesis by t-test, z-test, Chi-square test.

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.
- Identify singular points of a function then calculate residues using Residue Theorem.
- Obtain probability of random variable.
- Execute Central limit theorem for Sampling Distributions.
- Perform the large and small sample tests.

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UNIT-I Complex Functions

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

UNIT-II Complex Integral

Cauchy's integral theorem (without proof)-Cauchy's integral formula (without proof)-Generalized Cauchy's integral formula (without proof).

UNIT-III Residues

Singular point –types of singularities- isolated, essential, removable –Pole of order m. Residue –Evaluation of residues – Residue theorem (without proof) and its applications.

UNIT-IV Random Variables and Distributions

Discrete and Continuous Random Variables –Properties. Distributions- Binomial – Possion's -Normal distribution.

UNIT-V Sampling Theory

Introduction to Sampling Theory -Population and Samples –Sampling distribution of means (σ known and σ unknown)- Central limit theorem- point estimation –Maximum error estimation-Interval estimation.

UNIT-VI Tests of Hypothesis

Hypothesis-null and alternative hypothesis – type-I and type-II error –level of significance – one tail and two tail test, z-test, Student's-t-test, F-test, Chi-square test.

Text Books:

1. Complex Analysis And Statistical Methods, Dr.B.Krishna Gandhi, Dr.T.K.V.Iyengar and S.Ranganatham and Dr.M.V.S.S.N.Prasad, S.Chand & Company.
2. Probability and Statistics for Engineers, Miller and Freund's, Prentice Hall of India.
3. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers.

Reference Books:

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

D.C MACHINES & TRANSFORMERS

Subject Code: 20EET202

L	T	P	C
2	1	0	3

Course objective

1. To analyze the performance of different types of DC machines & Transformers.
2. To appreciate the applications of DC machines & Transformers

Course outcomes

CO1: Identify and Define different types of dc generators.
CO2: Interpret the performance of DC generators under different load conditions.
CO3: Describe the construction and performance of various types of DC motors.
CO4: Determine the performance of DC machines by conducting different tests.
CO5: Distinguish between different types of transformers and compute their equivalent circuit parameters.
CO6: 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.

UNIT II:

Armature Reaction & Characteristics of D.C. generators: Armature Reaction, Commutation ,O.C.C, internal-external characteristics, losses-power flow, efficiency calculation, Applications of D.C Generators.

UNIT III:

DC Motors: Principle of operation of DC motors, Back EMF, Torque equation, Types of DC motors, Speed-Torque characteristics of DC motors, Applications.

UNIT IV:

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 V:

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, Applications.

UNIT VI:

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

TEXT BOOKS:

1. I.J. Nagrath&D.P.Kothari, " Electrical Machines", Tata McGrawHill, 5th edition.
2. P.S.Bimbhra, "Electrical Machinery", Khanna Publisher, 7th edition.

REFERENCE BOOKS:

1. Irving L.Kosow, "Electric Machine and Tranformers", Prentice Hall of India.
2. Husain Ashfaq , " Electrical Machines", DhanpatRai& Sons.
3. Electric Machinery. A.E. Fitzgerald, Charles Kingsley, JR., Stephen D. Umans 6th Edition.

ELECTRIC CIRCUIT THEORY

Subject Code: 20EET203

L	T	P	C
3	0	0	3

Course Objective:

- To impart knowledge on different network theorems.
- To impart knowledge on resonance.
- To impart knowledge on three phase networks.
- To impart knowledge on two port networks.
- To analyze D.C transient analysis &A.C transient analysis.
- To outline Causality, stability, Hurwitz and Routh's criterion& design Foster forms, Cauer forms.

Course Outcomes:

CO1: Able to understand different network theorems.
CO2: Able to explain resonance.
CO3: Able to describe three phase circuits.
CO4: Able to illustrate two port networks.
CO5: Able to analyze D.C transient analysis & A.C transient analysis.
CO6: Able to model network synthesis.

UNIT I:

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

UNIT II:

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

Resonance: Resonance-series, parallel circuits, concept of band width and Q factor.

UNIT-III:

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.

UNIT IV:

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 V:

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.

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 VI:

Synthesis: Introduction, Causality and stability, Hurwitz polynomial, Routh'scriterion,Positive real functions,Sturm'stheorem,Elementary synthesis procedures.L-C Immittance functions(Foster form-1,Fosterform-2 , First Cauer form, Second Cauer form).

TEXT BOOKS:

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

2. 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.

ELECTRICAL MEASUREMENTS

Subject Code: 20EET204

L	T	P	C
3	0	0	3

CourseObjectives:

- Electrical measurements course introduces the basic principles of all measuring instruments. It alsodeals with the measurement of RLC parameters voltage, current, power, power factor, energy andmagneticmeasurements.

CourseOutcomes:
Studentswill beableto

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 and operation and applications of potentio meter,flux meter and ballistic galvanometer.

CO6: Understand the principle, operation and applications of different types of electronic meters and Transducers

UNITI:
Measuring Instruments: Classification, deflecting, control and damping torques, Ammeters andVoltmeters, PMMC, moving iron type instruments, expression for the deflecting torque and controltorque,Errors andcompensations,extensionofrange usingshuntsandseriesresistance.

UNITII:
InstrumenttransformersMeasurementofPower:CTandPTRatioandphaseangleerrors, Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometerwattmeter,expressionfordeflectingandcontroltorques,Extensionofrangeofwattmeterusinginstrumenttransformers,Measurementof activeandreactivepowersinbalancedandunbalancedsystems, Basics ofhalleffectsensor.

UNITIII:
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 TypeofP.F.Meters, dynamometer and moving irontype,1-phand3-ph meters .

UNITIV:

D.C. Bridges: Wheatstone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring lowresistance,measurementofhighresistance,unbalancedKelvin'sbridgelossofchargemethod.

A.C. Bridges: Measurement of inductance, Quality Factor, Maxwell's bridge, Hay's bridge, Anderson'sbridge, Owen's bridge. Measurement of capacitance and loss angle Desautybridge.Wien's bridge –ScheringBridge**.**

UNITV:

Potentiometers&MagneticMeasurements: Principle and operation of D.C.Crompton's potentiometer standardization, Measurement of unknown resistance,current,voltage. A.C.Potentiometers:polarandcoordinatetypes,Drysdalepolarpotentiometer,Gall-Tinsley(co-ordinatetype)A.C.potentiometer,standardization,applications.Magneticmeasurements Ballistic galvanometer–equation of motion–flux meter constructional details, comparison with ballistic galvanometer. Analysis of B-H Loop and loss calculation.

UNITVI:

Electronic-meters &Transducer

Sweep generation, vertical amplifiers, Digital Frequency meter, Principle of operation of Digital multi-meter, Transistor Voltmeter, , Thermistors, Thermocouples, Linear Variable Differential Transformer, Peizo-Electric transducers, Strain Gauges, Optical Transducer, Electronic energy meter.

TEXTBOOKS:

1 Electrical&Electronic Measurement&InstrumentsbyA.K.SawhneyDhanpatRai&Co.Publications.
2 ElectricalMeasurementsandmeasuringInstruments– byE.W.GoldingandF.C.Widdis,fifthEdition,WheelerPublishing.

REFERENCEBOOKS:

1 ElectricalMeasurements:Fundamentals,Concepts,Applications– byReissland,M.U,NewAgeInternational(P)Limited,Publishers.
2 M.B.Stout,"BasicElectricalMeasurements",PHI,1981.
3 F.K.Harris, ElectricalMeasurements", WileyEasternPvt. Ltd., 1974

ELECTRICAL POWER GENERATION & DISTRIBUTION

Subject Code: 20EET205

L	T	P	C
3	0	0	3

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 &hydelpower 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
CO6: Students can understand the different tariff methods.

UNIT I:

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

UNIT II:

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

UNIT III:

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

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.

UNIT VI:

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, KHANNA PUBLISHERS; Fifteenth edition (1 January 1987).

REFERENCE BOOKS:

1. Generation,Distribution and Utilization of Electric Energy by C.L.Wadhawa New age 6^{th} edition 2018.
2. Power systems-I by S.Sivanagaraju, Pearson Education; 1st edition (1 January 2011)
3. Principles of Power System by V.K Mehta S Chand; 3rd edition (1 March 2005)

D.C MACHINES LAB

Subject Code: 20EEL202

L	T	P	C
0	0	3	1.5

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.
CO6: Understand losses of 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.

ELECTRICAL CIRCUITS LAB

Subject Code: 20EEL203

L	T	P	C
0	0	3	1.5

Course Objective:

- Able to understood and analyze the network theorems
- Able to understand other network concepts through the conduction of experiments
- Able to design series and parallel resonant circuit for a given resonant frequency
- Able to measure power in 3-Phase star and delta connected loads

Course Outcomes:

CO1: Understands different theorems and thereby able to measure the load currents.
CO2: Designs the Series & Parallel resonance circuit and hence calculates band widths for different values of Quality of factors.
CO3: Calculates the two port network parameters for a given network.
CO4: Measures the active power for 3-Phase Star & Delta connected loads.
CO5: Work effectively in groups by sharing responsibilities and analyzing on findings.
CO6: Understand measurement of three phase power.

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

ELECTRICAL MEASUREMENTS LAB

Subject Code: 20EEL204

L	T	P	C
0	0	3	1.5

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.
CO6: Determine the dielectric strength of transformer oil.

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 of 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.
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

In addition to the above ten experiments, at least any two of the experiments from the following list are required to be conducted:
11. Transformer turns ratio measurement using A.C Bridge.
12. A.C. Potentiometer – Polar form/Cartesian form – Calibration of AC Voltmeter, Parameters of Choke.
13. Measurement of % ratio error and phase angle error of given C.T. bycomparison.

PYTHON PROGRAMMING

L	T	P	C
3	0	3	4.5

Subject Code: 20ESI204

Course Objectives

This course will enable students to

1. Learn Syntax and Semantics and create Functions in Python
2. Handle Strings and Files in Python
3. Understand Lists, Dictionaries and Regular expressions in Python
4. Understand use of functions and file handling in python
5. Implement Object Oriented Programming concepts in Python
6. Introduction to Regular Expressions and matching in Python

Course Outcomes

By the end of this course the student will be able to

1. Examine Python syntax and semantics and be fluent in the use of Python flow control and functions
2. Demonstrate proficiency in handling Strings and File Systems
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions
4. Implement file handling functions and user defined functions in python
5. Interpret the concepts of Object-Oriented Programming as used in Python
6. Implement Regular Expressions and matching in Python

Unit – I

Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Control Structures: Conditional Statements, Loops

Exercise Questions: 1

Ex 1: Write the python programs to calculate the following

a) Find the factorial of given number
b) To print all the prime numbers below n. n value should be taken from the user at the time of execution

Ex 2: Write the python programs to perform the following

a) To check given number Armstrong or not.
b) To check Strong number.
c) To print Fibonacci series.

Unit – II

Data Types: Mutable vs immutable data type, Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules

Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Exercise Questions: 2

Ex 3: Write the python programs to calculate the following

a) Write a Python program to get a string from a given string where all occurrences of its first char have been changed to '$', except the first char itself.

b) Write a Python program to remove the characters which have odd index values of a given string.

c) To remove punctuations from the string

d) Write a Python program to count repeated characters in a string

e) Write a Python program to count Uppercase, Lowercase, special character and numeric values in a given string

Ex 4: Write the python programs to perform the following

a) Implement a STACK program by using PYTHON.
b) Implement a QUEUE program by using PYTHON.
c) Implement a Python Program for creating a dictionary and display its keys alphabetically.
d) Write a Python program to convert a list into a nested dictionary of keys.
e) Write a python program to remove duplicates from the list

Unit – III

Functions: Definitions, Declaration, Parameter passing, calling functions

File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Exercise Questions: 3

Ex 5: Write the python programs to calculate the following

a) To find HCF or GCD of two numbers

b) To find sum of natural numbers using recursive function

Ex 6: Write the python programs to perform the following

a) Read a file line by line into a list
b) Get filename, line count, file extension, file creation and modification date .
c) Reads and displays the content of the file
d) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.

Unit – IV

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

Exercise Questions: 4

Ex 7: Write the python programs to calculate the following

a) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.

b) Write a python program to define a module and import a specific function in that module to another program.

Unit – V

Classes in Python : Principles of Object Orientation , Creating Classes , Instance Methods , Special Methods ,class Variables and Inheritance, Data base connectivity .

Exercise Questions: 5

Ex 8: Write the python programs to calculate the following

a) Define a class, which have a class parameter and have a same instance parameter.

b) Define a class named 'Shape' and its subclass 'Square'. The Square class has an 'init' function which takes a given length as an argument. Both classes have an area function which can print the area of the shape, where Shape's area is 0 by default..

Unit-VI

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Exercise Questions: 6

Ex 9: Write the python programs to calculate the following

a) implement Re.findall, re.split, re.sub, re.subn, re.search and Match.group.

b) Write a Python program to check the validity of a password (input from users).

Validation :

- At least 1 letter between [a-z] and 1 letter between [A-Z].
- At least 1 number between [0-9].
- At least 1 character from [$#@].
- Minimum length 6 characters.
- Maximum length 12 characters.

Text Books

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, Prentice Hall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

References Books

1. Mark Lutz "Programming Python, 4th Edition" O'Reilly Media.
2. Think Python, Allen Downey, Green Tea Press

Web Links

https://docs.python.org/3/tutorial/index.html
https://pythonprogramminglanguage.com

ENGINEERING MECHANICS

Subject Code: 20EST203

L	T	P	C
3	0	0	3

COURSEOBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Determine the resultant of a planar force system using resolution of force and principle of moments.

CO 2. Draw free-body diagrams of given rigid bodies and compute unknown forces using equations of equilibrium of a planar force system by graphical and analytical methods.

CO 3. Comprehend the effect of friction on equilibrium of rigid bodies. Analyze the plane trusses by calculating axial forces in the members using method of joints.

CO 4. Calculate centroid and moment of inertia of plane figures of triangular, rectangular and circular cross sections.

CO 5. Predict the motion parameters of bodies under rectilinear, curve linear and general plane motion.

CO 6. Solve the problems involving dynamics of particles and rigid bodies

UNIT- I

System of forces: Fundamental concepts and principles of engineering mechanics – Laws of mechanics – Forces and components - Resultant of coplanar concurrent forces - Vector approach on addition, subtraction of forces.

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 - Equilibrium of rigid bodies - Principle of transmissibility

UNIT-II

Moment of a force: Introduction – Principle of moments – Equivalent system of forces – Reduction of system of forces into single force and couple - Resultant of planar force systems.

Moment Applications: Varignon's theorem – Moment of a force and its applications.

UNIT- III

Analysis of Trusses:Types of loads – Types of supports and their reactions – Analysis of plane trusses using method of joints.

Friction: Introduction – Limiting friction – Types of friction and laws of friction – Application of friction - Inclined plane –Ladder, wedge and screw friction.

UNIT- IV

Centroid and Centre of gravity: Centroid of lines and areas – Determination of centroid of regular laminas by integration method – Centroid of composite figures – Theorems of Pappus and Guldinus – Concept of center of gravity.

Area moment of inertia: Determination of moment of inertia of area by integration – Moment of Inertia by analytical method – Radius of gyration – Parallel and perpendicular axis theorems – Polar moment of inertia – 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 – Analysis of plane motion.

UNIT- VI

Kinetics: Kinetics of rigid bodies – Fixed axis rotation – rolling bodies - General plane motion –

Equilibrium of rigid bodies in plane motion – D'Alembert's Principle- Work Energy Principle- for rigid bodies in plane motion

TEXT BOOKS:

1. Engineering Mechanics, S.S. Bhavikatti, J.G. Rajasekharappa, New Age Publications,
2. Engineering Mechanics, A.K. Tayal, Umesh Publications, 13th Edition, 2008.
3. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.

REFERENCES BOOKS:

1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Ferdinand P. Beer, E. Russell Johnston (2010), Vector Mechanics for Engineers: Statics and Dynamics (9th Edition), Tata McGraw-Hill International Edition.
3. Russell C Hibbeler, (2009), Engineering Mechanics: Statics and Dynamics (12th Edition), Prentice Hall
4. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
5. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
6. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
7. Engg. Mechanics / S.S. Bhavikati& J.G. Rajasekharappa.

A.C MACHINES

Subject Code: 20EET206

L	T	P	C
2	1	0	3

Course objective:

- Ability to understand the principle of operation, construction and characteristics of both three phase and single 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
CO6: Analyze the working principle and different types of single-phase induction motors

UNIT I:

Three phase Induction Machine – I: Constructional features-Squirrel cage & Slip ring induction motors, 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, 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.

UNIT – VI

Single Phase Induction Motor:

Single phase induction motor: Principle of operation, Double field revolving theory, equivalent circuit analysis, split phase motor, construction, principle of operation, capacitor start motor, shaded pole motor, torque speed characteristics, Applications.

TEXT BOOKS:

1. P S Bimbra, ―Electrical Machines, Khanna Publishers, 2nd Edition, 2008.
2. I J Nagrath, D P Kothari, ―Electrical Machines, TMH publication, 3rd Edition, 2010.

REFERENCE BOOKS:

1. A. E Fitzgerald, Charles Kingsley JR., Stephen D Umans, ―Electric Machinery‖, McGraw Hill,6th Edition, 1985.
2. M G Say, ―Alternating Current Machines‖, Pitman Publishing Ltd, 4th Edition, 1976.
3. J B Gupta, ―Theory and Performance of Electrical Machines‖, S K Kataria& Sons Publication, 14thEdition, 2010

CONTROL SYSTEMS

Subject Code: 20EET207

L	T	P	C
3	0	0	3

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 understand frequency response analysis.
CO5: Able to Design controllers, compensators for improve the performance specifications.
CO6: 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.

UNIT VI:

State Space Analysis of Continuous Systems: Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix.

TEXT BOOKS:

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2nd edition.
2. Automatic Control Systems byFaridGolnaraghi, Benjamin C. KUO,Wileyindia Pvt. Ltd, Ninth Edition.

REFERENCE BOOKS:

1. Control Systems by A.Anand Kumar, PHI Publications,4th edition.
2. Control Systems Engineering by S.Palani,TataMcGraw Hill Publications.
3. Modern Control Engineering, Fifth edition, Kotsuhiko Ogata, Prentice Hall of India Pvt. Ltd.

NUMERICAL METHODS
(Interdisciplinary Elective – I)

Subject Code: 20IET212

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To Solve the algebraic and transcendental equations, using different numerical method.
- Calculate the value of dependent variable for a particular x by deducing the unknown function y=f(x) for an evenly or unevenly spaced points.
- To estimate the value of 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 .
- Estimate an equation of curve which fits a given data.

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 .
- Enables to fit a equation of curve to the given data.

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 – Central differences-Relation between different operators- Newton's Interpolation formulae –Gauss Interpolation Formulae- Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

Unit-III

Numerical Differentiation:

Numerical Differentiation– Differentiation using finite differences- Newton's Forward – Backward- Lagranges- Stirling's formula-Lagrange's interpolation formula.

UNIT-IV

Numerical Integration:

Numerical Integration – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.
Numerical double integration - 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(4^{th} order).

Unit-VI

Curve Fitting:

Curve fitting: Fitting a straight line-Second degree curve-Exponential curve-Power curve by method of least squares.

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi, 42^{nd} edition, 2012.
2. A Text Book on Mathematical Methods, Ravindranath, V. and Vijayalaxmi, A.,Himalaya Publishing House, Bombay, 2^{nd} edition, 2012.

Reference Books:

1. Engineering Mathematics Vol.2.-Mathematical Methods(JNTU Kakinada), Dr.T. K.V.Iyengar, Dr.M.V.S.S.N.Prasad, S.Ranganatham, Dr.B.Krishna Gandhi, , S. Chand Publications.
2. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill, New Delhi.

REMOTE SENSING
(Interdisciplinary Elective – I)

Course Code: 20IET215

L	T	P	C
3	0	0	3

Course Objectives

The objective of the course is to
1. To demonstrate the working principle of remote sensing
2. To differentiate the types platforms and orbits
3. To describethe various types of sensors and resolutions
4. To utilize different digital image processing and visual interpretation techniques to extract meaningful information from spatial data
5. To illustrate the image classification procedure
6. To explain the use of remote sensing in different applications.

Course Outcomes

On completion of the course, the students will be able to:
1. Demonstrate the working principle of remote sensing
2. Differentiate the types of platforms and orbits
3. Describe the types of sensors & resolutions
4. Utilize different digital image processing and visual interpretation techniques to extract meaningful information from spatial data
5. Illustrate the image classification procedure
6. Explain the use of remote sensing in different applications.

Unit – I

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

Unit – II

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

Unit – III

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

Unit – IV

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

Unit – V

Image classification: Introduction, Principles of Image classification, Process of image classification supervised classification, unsupervised classification

Unit – VI

Applications: Land use/Land cover, Agriculture, Forest, Water Resources and Urban Planning

Text Books

1. LRA Narayana, "Remote Sensing and its Applications" University Press, 1999.
2. M. Anji Reddy, "Remote Sensing and Geographical Information Systems", BS Publications, 4th edition,2014.
3.Basudeb Batta, "Remote Sensing and GIS", Oxford University Press, New Delhi, 2nd Edition, 2011

References Books

1. S.Kumar, "Basics of Remote Sensing and GIS", Laxmi Publications, 1st Edition, 2016.
2. Lillesand, Kiefer, Chipman, "Remote Sensing and Image Interpretation", Willy Publishers, 7th Edition, 2015
3. James B. Cambell, Rondolph H. Wynne, "Introduction to Remote Sensing", Guilford Press, London and Newyork, 5th Edition, 2011

MATHEMATICAL MODELING AND SIMULATION

(Interdisciplinary Elective – I)
(Except EEE)

Subject Code: 20IET216

L	T	P	C
3	0	0	3

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.
CO6: Understands about Scilab.

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

UNIT II
Data and Data Flow in Matlab
Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions.

UNIT III
Matlab Programming
Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

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

UNITV

Simulink-I

Introduction, Importance, Model Based Design, Tools, Mathematical Modeling,

UNITVI

Simulink-II

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 ,WenwuCao,Tae-SangChung,JohnMorris.

3.https://in.mathworks.com/products/simulink.html.

FUNDAMENTALS OF MATERIALS SCIENCE

(Interdisplinary Elective – I)

Subject Code: 20IET217

L	T	P	C
3	0	0	3

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. To acquire knowledge on material testing methods and its process

CO 6. Understand necessity of making components using powder metallurgy route

UNIT-I

Introduction: Introduction, classification of materials, crystal defects.

UNIT-II

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Impact toughness, Charpy V-Notch, fracture, ductile, brittle, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

Unit- VI

Powder Metallurgy: Definition, Methods of production of metal powders, Stages in powder metallurgical components preparation, Design considerations.

TEXT BOOKS:

1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

REFERENCE BOOKS:

1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.

INTRODUCTION TO ELECTRONIC MEASUREMENTS

(Interdisciplinary Elective-I)

Subject Code: 20IET218

L	T	P	C
3	0	0	3

Course Objectives:

- To provide knowledge of performance characteristics and classify static errors of different measuring instruments.
- To construct DC Ammeter, DC Voltmeter, Ohmmeters for measurement of unknown current, voltage and resistance.
- To introduce various Signal generators and Harmonic Distortion analyzers.
- To become familiar with the working of CRO and special Oscilloscopes for measurement of electronic parameters.
- To construct AC and DC bridges for measurement of unknown Resistance, Inductance and Capacitance.
- To understand working principles of transducers for the measurement of non-electrical quantities.

Course Outcomes:

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

CO 1. Define various performance characteristics and classify static errors of Instruments.
CO 2. Calculate the resistance values for construction of DC voltmeter, Ammeter and Ohmmeters.
CO 3. Explain the working of various signal generators and analyzers for distortion measurements.
CO 4. Describe the working and use of CRO and special oscilloscopes.
CO 5. Determine the value of unknown resistance, inductance, capacitance and frequency of excitation.
CO 6. Classify transducers and identify suitable transducer for measuring various non-electrical quantities.

Unit - I

Performance characteristics of instruments: Static characteristics - accuracy, resolution, precision, expected value, error and sensitivity, Error in measurement, Types of Static error, Dynamic characteristics - speed of response, fidelity, lag and dynamic error.

Unit - II

DC Meters: DC Ammeter Construction, Multirange ammeter, Universal Shunt and Extending Range. RF ammeter. DC Voltmeter – Construction, Multirange voltmeter, Extending Range. Ohmmeters - Series type and shunt type.

Unit - III

Signal Generators and Harmonic Distortion Analyzers:

Signal Generators - Standard signal generator, AF sine and square wave generator, Function Generator.

Harmonic Distortion Analyzers: Fundamental Suppression Type – Resonance Bridge, Wien's Bidge, Bridged T-Network.

Unit - IV

CRO and Special Oscilloscopes: CRT features, Block Diagram of oscilloscope, Dual Beam CRO, Dual trace oscilloscope, Storage oscilloscope.

Unit - V

DC and AC Bridges: DC Bridge – Measurement of Resistance – Wheatstone's Bridge. AC Bridges - Measurement of inductance - Maxwell's Bridge, Anderson's bridge. Measurement of capacitance – Schering's Bridge and Wien's Bridge

Unit - VI

Transducers: Classification**,** Resistive Transducer – Potentiometer type – Pressure Transducer and Position Transducer, unbonded and bonded strain gauges, Thermistor, Inductive Transducer- LVDT, Capacitive Transducer – Pressure Transducer, Temperature Transducer-Thermocouple.

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.

https://nptel.ac.in/courses/108/105/108105153/
http://nitttrc.edu.in/nptel/courses/video/108105153/108105153.html

UNIX UTILITIES
(Interdisciplinary Elective-I)

Subject Code: 20IET219

L	T	P	C
3	0	0	3

Course Objectives

- Know about UNIX operating system
- Understand important commands which are used in UNIX
- Learn shell programming
- Study UNIX file system
- Understand the process mechanism

Course Outcomes

1. Describe UNIX Architecture and Functions of OS
2. Demonstrate the basic set of commands and utilities in UNIX system
3. Design and Implement of UNIX file system
4. Familiar with various shell commands
5. Develop shell scripts to automate various tasks
6. Analyze the different types of processes in UNIX environment

Unit – I

Introduction to Unix-Brief History,What is Unix-Unix Components, 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

Using Unix-Commands, Unix-Some Basic Commands-. 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. 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 – III

The File system –The Basics of Files-What's in a File-Directories and File Names-Permissions-I Nodes-The Directory Hierarchy, File Attributes and Permissions-The File Command knowing the File Type-The Chmod Command Changing File Permissions-The Chown Command Changing the Owner of a File-The Chgrp Command Changing the Group of a File.

Unit – IV

Using the Shell-Command Line Structure-Met characters-Creating New Commands-Command Arguments and Parameters-Program Output as Arguments-Shell Variables- -More on I/O Redirection-Looping in Shell Programs.

Unit – V

Shell Programming-Shell Variables-The Export Command-The Profile File a Script Run During Starting-The First Shell Script-The read Command-Positional parameters-The $? Variable knowing the exit Status-More about the Set Command-The Exit Command-Branching Control Structures-Loop Control Structures-The Continue and Break Statement-The Expr Command: Performing Integer Arithmetic-Real Arithmetic in Shell Programs-The here Document(<<)-The Sleep Command-Debugging Scripts-The Script Command-The Eval Command-The Exec Command.

Unit – VI

The Process-The Meaning-Parent and Child Processes-Types of Processes-More about Foreground and Background processes-Internal and External Commands-Process Creation-The Trap Command-The Stty Command-The Kill Command-Job Control.

Text Books

1. Introduction to Unix Shell Programming by M.G.Venkateshmurthy, Parson.
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.

Reference Books

1. Unix and shell programmingby B.M. Harwani, OXFORD university press.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India

FUNDAMENTALS OF DATA STRUCTURES
(Interdisciplinary Elective-I)

Subject Code: 20IET21A

L	T	P	C
3	0	0	3

Course Outcomes:

On completion of this course, the student will be able to:

1. Compute the time and space complexities and calibrate the performance of a given algorithm.
2. Compare the performances of various Searching and Sorting techniques.
3. Illustrate the applications of Stacks and Queues.
4. Demonstrate the advantages of dynamic memory allocation via linked lists.
5. Implement the basic operations and Traversals on binary Trees.
6. Understand traversals and shortest path algorithms on a Graph.

Unit – I

Introduction: Basic Concepts of Data Structures and types of Data Structures; Performance Analysis of algorithms; Asymptotic Notations (O, Ω, θ)

Unit – II

Searching: Linear Search, Binary Search: Algorithm & Analysis; Sorting: Methodology & Performance Analysis of Sorting Algorithms: Selection, Bubble, Insertion, Quick, Merge sort.

Unit – III

Stacks: Definition, operations, Applications of Stacks: Conversion of infix to postfix expression

Queues: Definition, operations, Applications of Queues;

Unit – IV

Linked Lists: Comparison with Arrays; Operations on Singly linked list: Creation, Insertion, Deletion, Traversing; Operations on Doubly linked list; Operations on Implementation of Stack and Queue using Linked Lists.

UNIT-V

Trees: Basic Terminology of Trees; Binary Tree: Traversals; Binary Search Tree Operations: Insert, Delete;

UNIT-VI

Graph: Basic Terminologies and Representations of Graphs; Graph traversal algorithms: Breadth-FS & Depth-FS; Minimum spanning tree algorithms: Prim's and kruskal's algorithms

Text Books:

1. Mark Allen Weiss , "Data Structures and Algorithm Analysis", Fourth Edition , Pearson.
2. Ellis Horowitz, Sartaj Sahni, "Fundamentals of Data Structures", Illustrated Edition,Computer- Science Press.

Reference Books:

1. Michel T. Goodrich, Roberto Tamassia, David Mount, "Data Structures and Algorithm Analysis", 2nd Edition, John Wiley & Sons, Inc.
2. Adam. Drozdek , "Data Structure And Algorithms In C++", 4th edition, Ceng

COMPETITIVE PROGRAMMING-I

(Interdisciplinary Elective-I)

Subject Code: 20IET21C

L	T	P	C
3	0	0	3

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

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

1. Solve problems using programming
2. Design solution using OOP principles
3. Analyze time and space Complexity of a Solution.
4. Select appropriate container to organize data for problem solving.
5. Design a Relational Database schema for a subject of interest
6. Identify Redundancy in the Database using Normal Forms

UNIT-I

CPP Essentials:

Basics: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements and loops, pointers and Dynamic memory allocation, arrays ,vector , built in functions, user defined functions.

Problems to Practice: Missing Number ,Integer to English Words ,Integer to Roman, Roman to Integer, 2sum, 3sum,3sum closet,4sum,Remove duplicates in a list, Circular Array Loop,
Fruit Into Baskets,, K-diff Pairs in an Array, Move Zeroes, Rotate Array, Flipping an Image, circular Array Loop

UNIT-II

OOP Principles:

Implementation of OOP principles(Encapsulation , Abstraction, Inheritance ,polymorphism) in cpp and Exception Handling.

UNIT-III

Algorithm Analysis:

Characteristics of algorithm, Algorithm Analysis-operation count , step counts,. asymptotic complexity, recurrence equations

UNIT-IV

Standard Template Library: Containers, Container Classes,Vectors, Lists, Iterators, Maps, Set structures, Bit set, Stack, Queue, Deque, Priority queue.

Recursion: Recursion and its applications, Exhaustive search using Backtracking.

Problems to Practice: Permutations, Palindrome Partitioning, Beautiful Arrangement, N-Queens , Path with Maximum Gold

UNIT-V

Introduction to DBMS, ER Model, ER to Relation Model Conversion

SQL Part1: SQL Command, Data Types, Operators and Expressions, DDL statements, DML statements, Functions, Sorting Data, Grouping Data

UNIT-VI

SQL Part2: Cartesian Product and Inner Join, Self Join, Outer Join, Subquery, Independent Subquery, Correlated Subquery

Normalization: Functional Dependency and Normal Forms (1NF,2NF,3NF,BCNF)

Text Books:

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. Raghurama Krishnan, Johannes Gehrke: Database Management System, TATA McGrawHill 3rd Edition

Reference Books:

1. 2. J.Kleinberg & E. Tardos – Algorithm Design, Pearson Education, New Delhi, 2006.
2. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
3. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
4. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.

Resourses:

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

A.C MACHINES LAB

Subject Code: 20EEL205

L	T	P	C
0	0	3	1.5

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
CO6: Originate a professional experience on working in any practical field and to be ready for life-long involvement in the farther improvement of relevant technology

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. Regulation of a three-phase alternator by ZPF method.
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. Determination of Xd and Xq of a salient pole synchronous machine

CONTROL SYSTEMS LAB

Subject Code: 20EEL206

L	T	P	C
0	0	3	1.5

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.
CO6: Students can understand Characteristics of magnetic amplifiers

ANY TEN OF THE FOLLOWING EXPERIMENTS ARE TO BE CONDUCTED:

1. Time response of Second order system
2. Characteristics of Synchros
3. Effect of feedback on DC servo motor
4. Transfer function of DC motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. Transfer function of DC generator
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Root locus and bode plot from MATLAB
12. State space model for classical transfer function using MATLAB-verification.
13. Simulation of transfer function using operational amplifiers.

REFERENCE BOOKS:

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

INTRODUCTION TO ELECTRICAL VEHICLE TECHNOLOGY

(Honors/Minor Course)

Subject Code: 20EVT201

L	T	P	C
3	1	0	4

Course Objectives:

1. To describe the different types of electrical and hybrid vehicles
2. To discuss the basic components of Electric vehicle power train.
3. To discuss the basics of different Motor Principles
4. To describe the concepts of Hybrid Electric Drive Trains
5. To describe and analyze different types of batteries and energy storage systems
6. To describe different controllers and converters in Electric Vehicles

Course Outcomes:

At the end of the course the student will able to

1. Understand basics of Electric vehicle & Hybrid Electric Vehicle.
2. Understand about power train drives and control in Electric Vehicles.
3. Understand basics of different Motor Principles
4. Understand concepts in different Electrical Drive trains
5. Analyze different types of batteries and energy storage requirements.
6. Understand different controllers and converters in Electric Vehicles

Unit-I- Introduction to Electric vehicle

Comparison of Conventional Vehicle vs Electric Vehicle, Introduction to Electric Vehicles: Types of EVs, Hybrid Electric Vehicles, Introduction to EV Technology, History of Electric Vehicle, Benefits Of Electric Vehicles, Types of Electric vehicle and Hybrid Vehicles. Norms and Standards.

Unit-II- Power Train in Electric vehicle

Working of an Electric Vehicle, Major Components in an Electric Vehicle Power train, Energy Source of an EV, Transmission configuration, Components – Motor, gears, differential, clutch, brakes regenerative braking, Battery pack, Controller. Hybrid Electric Drive-train

Unit-III- Motor-Principles of Electrical Machines

Motor-Principles of Electrical Machines, EM Fundamentals**,** Classification of Motors, Selection of Motor, Motor Specifications Calculations, Gear ratio Calculations.

Unit-IV- Electrical Drive trains

Concept of Hybrid Electric Drive Trains, Electric Propulsion unit, Configuration and control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives, switched reluctance motor

Unit-V- Energy Storage systems

Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- Battery based energy , storage , Types of Batteries and Classification, different energy storage devices. Battery Selection Criteria, Major Components of a Battery pack, Applications

Unit-VI- Controllers & Converters

Controller & Converters, EV Controllers**,** DC-DC Converter**,** DC-AC Converter

Text Books:

1. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals", CRC Press, 2010
2. James Larminie, John Lowry, "Electric Vehicle Technology Explained", Wiley 2012.
3. Mehrdad Ehsani, Yimin Gao, Sebastien E. Gay, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles Fundamentals, Theory, and Design", CRC Press, 2004

References:

1. Mehrdad Ehsani, Yimin Gao, Ali Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals", CRC Press, 2010.
2. Sandeep Dhameja, "Electric Vehicle Battery Systems", Newnes, 2000 .http://nptel.ac.in/courses/108103009/

HUMAN VALUES
(Common to EEE, ME Branches)

Subject Code: 20MCT305

L	T	P	C
2	0	0	0

Course Objectives

- Toexplainthestudentshowtogoverntheprofessionalbehaviorintheircareer as employee.
- To interpret the culture when they are working in different organizations.
- To understand value of education and self- development.
- To anticipate good value sin students.
- To let the student know about the importance of character.
- To let the student understand the personality and behavior development.

Course Outcomes

By the end of this course the student will be able to

1. Analyze ethical behavior in the workplace
2. Adapt appropriate behavior in the family and society
3. Understand the challenging environment in workplace
4. Understand the Global culture in engineering problems
5. Identify the importance of Human values in real life
6. Assess over all personality of an individual

Unit–I

INTRODUCTION TO VALUES AND MORALS: Theory of Evolution – Ethics as a necessity for spiritual evolution-- Description of Human Values & Morals ---- Values --- Integrity, Honesty,Courage,Empathy,Personality,Character,SelfConfidence,RespectforOthers,7WaysofMisusing Truth – Work Culture, Social Responsibility, Responsibilities as a Citizen, Co operation and Commitment, Caring andSharingReligionvs.Spirituality,Philosophy,CustomsandPractices --- Impediments to Responsibility – Self-Interest, Fear, Self-Deception, Ignorance, Ego, Narrow Vision, Uncritical Acceptance of Authority, Group Thinking

Unit–II

MIND AND ITS MYSTERIES: What is Mind? Mind and Body, Mind and Food, Mental faculties, Theory of perception, Memory, Tendencies, Thought Creates the World-- Power of Thought, Thought Culture, Desires, Pleasure and Pain -- Cultivation of Virtues, Control of Senses and Mind--Discrimination, Dispassion, Sacrifice–Concentration, Meditation and Enlightenment

Unit–III

RISK, SAFETY AND ENVIRONMENT : Difficulties in Estimating Risk—Approach to Acceptable Risk, Regulator's Approach to Risk – Engineer's Liability, Changing Legal Rights of the Employees--OrganizationalDisobediencebyContraryAction,byNon-Participation,by

Protest – Environmental Laws and Judicial Intervention in Related Matters-Environmental Movements

Unit–IV

NON-ETHICAL PRACTICES IN VOGUE: Engineer's Responsibility for Rights - Respect for Authority – Conflict of Interests - Occupational crime -- Global Issues – How MultinationalCorporationsInfluenceGovernmentDecisions,RiskandPublicPolicy-EngineersasManagers,AdvisorsandExperts,Engineersas Moral Leaders Problem of Bribery, Extortion, Grease Payments, Nepotism exus between Politicians and Industrialists. Case Study–Chinese Minister Sentenced to Death for Corruption

Unit–V

VALUES AND SELF-DEVELOPMENT: Social values and individual attitudes. Work ethics, Indian vision of humanismMoralandnon-moralvaluationStandardsandprinciplesValuejudgments

Unit-VI

PERSONALITY AND BEHAVIOR DEVELOPMENT: Soul and Scientific attitude Positive Thinking. Integrity and discipline Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brother hood and religious to lerance true friendship, happiness Vs suffering, love for truth.Awareofself-destructivehabits,AssociationandCooperation,Doingbestforsavingnature

Text Books:

1. CharlesEHarris,MichealJRabins,"EngineeringEthics,CengageLearning (2009)
2. Mike Martin and Rol and Schinzinger, "Ethicsin Engineering"McGrawHill, (2005)
3. Mind, Its Mysteries and Control ,Swami Sivananda ,Divine Life Society Pub (1994)
4. Chakroborty,S.K."ValuesandEthicsfororganizationsTheoryandpractice",OxfordUniversityPress,NewDelhi (1998)
5. Dr SB. Nageswararao " Humour in Management " Walnut Publications, Bhubaneswar (2022)

ELECTRO MAGNETIC FIELD THEORY

Subject Code: 20EET308

L	T	P	C
3	0	0	3

Course Objectives:
This course deals with study of electric fields, magnetic field due to different configurations, application of Gauss' and Ampere's law to electric and magnetic fields respectively. Discuss behavior of conductors and dielectric fields in an external electric field, boundary conditions and Maxwell's equations for time varying electro-magnetic fields.

Course Outcomes:
CO1: Apply COULOMB's law and GAUSS's law to determine the electric field due to different charge configurations.
CO2: Understand behaviour of conductors and dielectrics in an external electric field.
CO3: Determine the capacitance of different charge configurations
CO4: Apply BIOT-SAVART's law and AMPERE's law to determine the magnetic field due to different current configurations.
CO5: Computes force on a charge, conductor and between two conductors and determines self-inductance of solenoid and toroid.
CO6: Understand the concepts displacement current, modification of Maxwell's equations for time-varying fields.

UNIT-I
Electrostatics: Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge, work done in moving a point charge in an electrostatic field, electric potential – potential gradient, Gauss's law, Applications of Gauss's law to line of charge, sheet of charge, and volume of charge.

UNIT-II
Conductors – Dielectrics: Electric dipole – dipole moment – potential and EFI due to an electric dipole, Torque on an Electric dipole in an electric field, behaviour of conductors in an electric field. Polarization, boundary conditions between conductor to dielectric, dielectric to dielectric and conductor to free space.

UNIT-III
Capacitance:Laplace& Poisson's equation, Laplace equation solution in one dimension, Capacitance of parallel plates, cylindrical and spherical configuration, current density, conduction and convection current densities, Ohm's law in point form – equation of continuity

UNIT-IV
Magneto statics, Ampere's Law and Force in magnetic fields: Biot-Savart's law and its applications viz. Straight current carrying filament, circular, square, rectangle and solenoid current carrying wire – Maxwell's second Equation, Ampere's circuital law and its applications viz. MFI due to an infinite sheet, long filament, solenoid, toroidal current carrying conductor, point form of Ampere's circuital law, Maxwell's third equation.

UNIT-V

Self and mutual inductance: Self and mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane

UNIT-VI

Time Varying Fields: Faraday's laws of electromagnetic induction – integral and point forms, Maxwell's fourth equation, statically and dynamically induced EMF – modification of Maxwell's equations for time varying fields, displacement current, Poynting theorem and Poynting vector.

Text Books:

1. "Principles of Electro Magnetics" by Sadiku, Oxford Publications, 6th edition, 2015.
2. "Engineering Electromagnetic" by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.

Reference Books:

1. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition
2. Electromagnetics by Joseph A. Edminister, Schaum's Outline,4th Edition,2014
3. Fundamentals of Engineering Electromagnetics by Sunil Bhooshan, Oxford University Press,2012.
4. "Electromagnetic Field Theory" by YaduvirSingh,Pearson.

ELECTRIC POWER TRANSMISSION

Subject Code: 20EET309

L	T	P	C
3	0	0	3

Course objective:

- To give the knowledge on modeling and design of electrical transmission line.
- To calculate the performance of transmission in terms of efficiency and regulation.
- To study the concepts of travelling waves on transmission lines.
- To learn the different types of insulators and grading of cables.
- To study the various factors effecting the transmission line performance.

Course outcomes:

CO1: Solve line parameters for different transmission line conductor configurations.
CO2: Analyze the performance of short and medium lines through efficiency and regulation.
CO3: Analyze the performance of long transmission lines through efficiency and regulation**.**
CO4: Explain theconcepts of travelling waves on transmission lines.
CO5: Classify the insulators and grading of cables for better features.
CO6: Explain the basics of corona, sag and other effects arise in transmission lines.

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:

Travelling Waves on Transmission Lines: Production of travelling waves, open circuited line, short Circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation Of travelling waves (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.

UNIT V:

Overhead Line Insulators: Types of Insulators, String efficiency and Methods for improvement, Numerical Problems – voltage distribution, calculation of string efficiency. Static Shielding.

Insulated Cables: Electrostatic stress in Single core cable, Grading of cables- Capacitance grading and Intersheath grading.

UNIT VI:

Corona: Introduction, disruptive critical voltage, corona loss, Factors affecting corona loss and Methods of reducing corona loss, Disadvantages of corona, interference between power and Communication lines.

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

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.

POWER ELECTRONICS

Subject Code: 20EET310

L	T	P	C
3	0	0	3

Course Objectives:
This course deals with characteristicsofsemiconductor 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 half controlled converters with different loads.
CO3: Evaluate the performance of single Phase fully controlled converters with different loads.
CO4: Describe the performance of three Phase controlled converters with different loads.
CO5: Explain the operation of AC voltage controllers and Cycle-converters.
CO6: Analyze and evaluate the operation of DC –DC Choppers and inverters.

UNIT – I
Power Semi-Conductor Devices:
Thyristors– Silicon Controlled Rectifiers (SCR's) - Power BJT – Power MOSFET – Power IGBT 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 half wave controlled 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 for discontinuous mode and continuous mode - Derivation of average load voltage, current and input power factor.
UNIT-III
Single Phase fully controlled converters:
Fully controlled converters- Midpoint and Bridge connections with Resistive, RL loads and RLE load for discontinuous mode and continuous mode- Derivation of average load voltage , current and input power factor – Line commutated inverters without and with Freewheeling Diode, Effect of source inductance – Derivation of average load voltage and current.

UNIT – IV
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 – V

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 – VI

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.

INSTRUMENTATION
(Professional Elective-I)

Subject Code: 20EEE311

L	T	P	C
3	0	0	3

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: Generalize representationof signals
CO3: Describe the representation of different signals.
CO4: Explain different types of transducers and digital meters.
CO5: Illustrate the operation of signal analyzers.
CO6: Estimate the process of measurement of non-electrical quantities.

UNIT I:
Characteristics of Signals: Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signal and their representation:

UNIT-II:
Signalrepresentation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation and pulse code modulation.

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

Subject Code: 20EEE312

L	T	P	C
3	0	0	3

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 multi vibrator
CO 5. Design monostable multi vibrator
CO 6. 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.

UNIT –II
Non – Linear Wave Shaping: Diode clippers, clipping at two independent levels, Transfer characteristics of clippers, 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.
Bistable Multivibrators: Principle of operation of Fixed bias Bistable Multivibrators, triggering in binary, Schmitt trigger.

UNIT –IV
Monostable Multivibrator: Principle of operation of monostable multivibrator triggering in monostable multi vibrator.

UNIT –V
Astable Multivibrator: Principle of operation of astable multivibrator using transistors, Astable multivibrator as voltage to time converter.

UNIT –VI

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.

Website References:

1. http://www.iitg.ac.in/apvajpeyi/ph218/Lec-18.pdf

SWITCHING THEORY AND LOGIC DESIGN

(Professional Elective-I)

Subject Code: 20EEE313

L	T	P	C
3	0	0	3

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
CO6: Develop different types of counters.

UNIT – I

Number systems: Review ofNumber systems (binary, hexa and octal), base conversion, complements of numbers- r's, r – 1's compliment, BCD, excess-3, self-complement codes, 2421, gray code.

UNIT – II

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

UNIT – III

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

UNIT – IV

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

UNIT – V

Sequential logic circuits: Introduction, flip-flops(D-Flip-flop,T-Flip-flop, SR-Flip-flop, JK-Flip-flops with truth tables and excitation tables.

UNIT – VI

Counters: 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.

FUNDAMENTALS OF FUZZY LOGIC
(Interdisciplinary Elective – II)

Subject Code: 20IET321

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Understand the concepts of fuzzy relations and their operations.
- Frame linguistic variables, analyze the fuzzy quantifiers and understand Fuzzy Inference.
- Understand the concept of constructing simple fuzzy sets.
- Understand the process of Fuzzification and Defuzzification by using different methods.
- Understand the concepts of Mamdani Approach **&** Takagi Sugeno's Approach with simple examples**.**

COURSE OUTCOMES

Student is able to

- Perform different fuzzy operations on fuzzy sets.
- Perform different fuzzy operations on fuzzy relations.
- Construct linguistic variables, estimate the fuzzy quantifiers as per the

Requirement, perform Fuzzy Inference.

- Construct a simple Fuzzy set.
- Perform the process of Fuzzification and Defuzzification by using different methods for simple Engineering problems.
- Apply Mamdani Fuzzy Model & Takagi Sugeno Model for simple Engineering problems.

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. ,

UNIT-II

Fuzzy Relations

Cardinality, operations, properties, fuzzy Cartesian product and composition, fuzzy tolerance and equivalence relations, forms of composition operation.

UNIT-III

Fuzzy Logic

Classic and fuzzy logic, approximate reasoning, Natural language, linguistic hedges, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference -fuzzy rule based systems, graphical technique of inference.

UNIT-IV

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-V

Fuzzy Expert System –Fuzzification & De-fuzzification

Fuzzy Controllers, Fuzzy Logic Control- Fuzzification- Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules. Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method.

UNIT-VI

Fuzzy Expert System

Mamdani Approach & Takagi Sugeno's Approach with simple 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.Vijayalakshmi Pai, Prentice-Hall of India Pvt Limited.

References

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

GEOGRAPHICAL INFORMATION SYSTEMS
(Interdisciplinary Elective – II)

Subject Code: 20IET322

L	T	P	C
3	0	0	3

Course Objectives:
- To interpret map projections
- To describe GIS components in GIS.
- To discuss data analysis operations in GIS
- To apply the concepts of DBMS in GIS
- To analyze spatial data and modeling in GIS
- To apply GIS in real time applications

Course Outcomes:
After the completion of this course, student will be able to
1. Interpret map projections
2. Describe GIS components.
3. Discuss data analysis operations in GIS
4. Apply the concepts of DBMS in GIS
5. Analyze spatial data and modeling in GIS
6. Apply GIS in real time applications

Unit – I
Fundamental Concepts of Map: Introduction; Classification of Maps; Scale of maps; Spatial referencing System; Map Projections- Classification; commonly used map projections and their comparisons- Grid systems.

Unit – II
Basic Concepts of Geographical Information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data.

Unit – III
GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.

Unit – IV
Data Base Management Systems: Introduction - Functions of DBMS; Components of DBMSGIS Data file Management- Simple List, Ordered Sequential Files; Data Base Models Hierarchical Database Models, Network Systems.

Unit – V
Spatial Data Modeling: Introduction; stages of GIS data modeling; Graphical representation of Raster data, Graphical representation of Vector data; Raster GIS Model, Vector GIS Model.

Unit – VI

Applications of GIS: Land use and Land cover, agriculture, forestry, geology, urban applications, flood zone delineation and mapping.

Text Books:

1. Peter A Burrough, Rachael A. Mc Donnell and Christopher D. Lloyd (2016), Principles of Geographical Information Systems, 3rd edition, Oxford University Press.
2. M.Anji Reddy(2012), Text Book of Remote Sensing and Geographical Information systems,4th edition, BS Publications/BSP Books

Reference Books:

1. Chor Pang Lo and Albert K.W. Yeung (2016), Concepts & Techniques of GIS, Pearson Education
2. Kang – tsung Chang (2017), GIS, 4th edition, McGraw-Hill Education

RENEWABLE ENERGY SOURCES

(Interdisciplinary Elective – II)
(Except EEE)

Subject Code: 20IET323

L	T	P	C
3	0	0	3

CourseObjective:

- To Outline the concept regarding solar radiation.
- 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.
- To Outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to

CO1: Define different kind of solar radiation.
CO2: Understand different methods of collection of solar energy and storage of solar energy.
CO3: Classify different types of wind mills.
CO4: Classify different types of biomass digesters and geothermal energy.
CO5: Classify different types of ocean energy extracting techniques.
CO6: 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, 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 energy:

Sources and potentials, block diagram, **Types**: horizontal and vertical axis windmills. Types of generators and its parts.

UNIT-IV

Biomass and Geothermal energy:

Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

UNIT-V

Ocean energy:

OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

UNIT-VI

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.

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

FUNDAMENTALS OF ROBOTICS
(Interdisciplinary Elective – II)

Subject Code: 20IET324

L	T	P	C
3	0	0	3

Course Objectives:

- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

Course Outcomes:

On completion of this course, students should be able to
- Discuss basic fundamentals and Describe commonly used robot configurations.
- Discuss end effectors, drives along with robotics applications.
- Describe working principles of various sensors commonly used in a robot.
- Solve basic transformation problems and rotation matrices.
- Discuss methods of programming and programming languages.
- Discuss robot manufacturing & non-manufacturing applications of robots.

UNIT-I Fundamentals of Robotics:
Introduction to Robotics & Overview –Robotics & Automation – Robotics – Classification of Robots based on Configuration & Control – Terminology - Components of Industrial Robots – DOF, Functions and Specifications of Robot System.

UNIT-II Robot Actuators:
Robotic Actuators – Classification of actuators – Difference between Electric, Pneumatic and Hydraulic actuators, Servo & Stepper Motors, Servo Amplifiers, Control of Robotic Joints, Closed and Open Loop Control System.

UNIT-III Sensing Systems:
Sensing systems – Overview of sensing – Functions of sensing – Types – Optical and Non – Optical Sensors, position sensors: potentiometer, resolvers, and encoders, velocity, proximity, accelerometers, tactile, range sensors, touch and slip sensors, force and torque sensors.

UNIT-IV Homogeneous transformations:
Mapping, mapping between rotated, translated and combined rotated and translated frames, description of objects in space, fundamental rotation matrices, homogeneous transformations, representations & properties – problems and differential motions of a frame.

UNIT-V Programming:
Introduction to robot programming – methods of programming – programming languages. generations of robot programming languages, robot control sequencing, AL, AML, RAIL, RPL, VAL Robot languages.

UNIT-VI Applications:
Introduction – Manufacturing & Non-manufacturing applications – Selection and need of robot for a particular application (Case study), Future applications.

TEXT BOOKS:
1. Industrial Robotics, M. P. Groover, Pearson Education Pub.
2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Pub.

REFERENCE BOOKS:
1. Robotics, K. S. Fu, Lee, McGraw Hill Pub.
2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Pub., London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall Pub.
4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Pub.
5. Introduction to Robotics, John J Craig, Pearson Education Pub.
6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley & Sons (ASIA) Pub.

PRINCIPLES OF COMMUNICATIONS
(Interdisciplinary Elective-II)

Subject Code: 20IET325

L	T	P	C
3	0	0	3

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.
- Understand the concept of channel capacity, information theory and Shannon's theorem.

Course Outcomes:

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

CO 1. Determine Modulation Index, Bandwidth and power of AM,DSB- and SSB for the given specifications and also compare various Demodulation techniques of AM.

CO 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.

CO 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.

CO 4. Analyze the PCM,DM and ADM techniques with respect to baud rate bit error rate and also construct the above said signals as per given conditions.

CO 5. Determine Modulation parameters of ASK,FSK,PSK, DPSK and QPSK for the given data and also construct the wave forms for the given specifications.

CO 6. Differentiate noises in communications systems and compute noise figure as per given specifications.

Unit - I

Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB , SSB , 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.

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.

Unit-V

Digital Modulation: ASK, FSK, PSK, DPSK, QPSK.

Unit-VI

Noise: External noise, Internal noise, noise calculations, noise figure and noise temperature.

Text books:

1. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition.
2. Digital Communications – Dr. Sanjay Sharma, S.K.Kataria and sons, New delhi, 2015

Reference Books:

1. Communication Systems Engineering – John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson, 2004.
2. Digital and Analog Communication Systems – Sam Shanmugam, John Wiley, 2005.

Website References:

1. https://youtube.com/playlist?list=PLq-Gm0yRYwTgX2FkPVcY6io003-tZd8Ru
2. https://youtube.com/playlist?list=PLmA4L9UCzuEMcZv9QxlBoUJHcNFM2LIpf

JAVA PROGRAMMING
(Interdisciplinary Elective-II)

Subject Code: 20IET326

L	T	P	C
3	0	0	3

Course Objectives

- The objective of the course is to teach the basic concepts and techniques which form the **Object Oriented Programming Paradigm.**
- Well equipped with Java SDK environment to create, debug and run simple Java programs

Course Outcomes

After completion of this course, the students 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. 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 applications
6. Develop efficient Java applets to provide interactive features to web applications.

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, Strings.

Unit – II

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java- Overloading Methods, Static Methods, Recursion, final keyword, this keyword, garbage collection, finalize() method.

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.

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.

Unit – V

Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, Terminating the Thread, Creating Multiple Threads, Thread Synchronization, Thread Priorities.

Unit – VI

Applets: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters.

Text books:

1. Herbert schildt (2010), The complete reference, 7th edition, Tata Mc graw Hill, New Delhi.

Reference Books

2. T. Budd (2009), An Introduction to Object Oriented Programming, 3rd edition, PearsonEducation, India.
3. J. Nino, F. A. Hosch (2002), An Introduction to programming and OO design using Java, John Wiley & sons, New Jersey.
4. Y. Daniel Liang (2010), Introduction to Java programming, 7th edition, Pearson education, India.

INTRODUCTION TO DBMS
(Interdisciplinary Elective - II)

Subject Code: 20IET327

L	T	P	C
3	0	0	3

Course Objectives:

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing and also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval.

Course Outcomes:

Students will be able to:

1. Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
2. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
3. Create /Modify the Structure and write optimized SQL Queries to extract and modify information from Tables or Views.
4. Apply and tell the concept of Triggers and PL/SQL.
5. Apply Normalization techniques and improve the database design by normalization.
6. Apply and tell the concept of transaction, concurrency control and file and page organization.

Unit-I

Database System Applications, History of Database Systems, Database Systems versus file Systems, View of Data: Data Abstraction, Instances, and Schemas, Data Models: The ER Model, Relational Model, Other Data Models, and Database System Structure.

Unit-II

Database Design and ER diagrams: Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Conceptual Design with the ER Model, Introduction to the Relational model.

Unit-III

Introduction to SQL, Data types in SQL, DDL commands, DML commands, DCL commands, TCL commands, Aggregative Operators, Views, Integrity constraints, Logical connectives AND, OR, and NOT.

Unit- IV

Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators, Joins, Triggers, PL/SQL introduction, and example programs on PL/SQL.

Unit- V

Schema refinement and Normal forms: Problems Caused by Redundancy, Decomposition, Properties of Decomposition, Functional Dependencies, Reasoning about FDS: Introduction to Normalization, First Normal form, Second Normal form, Third Normal form, and Fourth Normal form.

Unit- VI

Introduction to Transaction, Transaction States-Atomicity, Consistency, Isolation, and Durability properties, Schedule, Serializability, Concurrent Executions, File Organization, and Indexing.

Text Book:

1. Database System Concepts – Abraham Silberschatz, Korth, McGraw hill, 7th Edition, 2021
2. Fundamentals of Database Systems - Elmasri, Navrate, Pearson Education, 7th Edition,2017

Reference Books:

1. Database Management Systems - Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rd Edition, 2014.

Web links:

1. https://www.javatpoint.com/dbms-tutorial
2. bhttps://www.javatpoint.com/dbms-sql-introduction

COMPETITIVE PROGRAMMING-II

(Interdisciplinary Elective - II)

Subject Code: 20IET329

L	T	P	C
3	0	0	3

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

Course Outcomes:

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

1. Analyze the problem using Mathematics
2. Develop solution using Dynamic linear Data structures
3. Select appropriate Sorting /Searching technique to solve the Problem
4. Develop solutions using stack and queue
5. Develop solutions using Non-Linear Data Structures
6. Develop Solution to problems using Dynamic Programming.

Unit – I

Number Theory: Modular arithmetic, exponentiation ,Modular exponentiation, Greatest Common Divisor, Extended Euclidean algorithm, Modular multiplicative inverse, Prime Number, Sieve of Eratosthenes.

Problems to Practice: Factorial Trailing Zeroes, Happy Number, Ugly Number, Smallest Integer Divisible by K, Prime Arrangements, Poor Pigs, Check If It Is a Good Array, Rabbits in Forest

Unit – II

Linked List: Singly Linked List, Doubly Linked List and Circular Linked List and Josephus Circle problem

Problems to practice: Add Two Numbers, Swap Nodes in Pairs, Rotate List, Palindrome Linked List, Linked List Cycle, Remove Duplicates from Sorted List

Unit – III

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Merge Sort, Quicksort and Count Sort. **Searching:** Linear Search and Binary Search

Practice Problems: Find Peak Element, Guess Number Higher or Lower, Koko Eating Bananas, Find Minimum in Rotated Sorted Array, Sort Colors, Largest Number, Pancake Sorting, Valid Anagram.

Unit – IV

Stacks and Queues: Implementation in Array and Linked list and classic problems on Stacks and Queues.

Problems to practice : Min Stack, Valid Parentheses, Trapping Rain Water, Largest Rectangle in Histogram, Asteroid Collision, Simplify Path, Next Greater Element I, Online Stock Span, Implement Stack using Queues

Unit – V

Trees : Terminology of Tree concept, Types of Trees ,Tree traversal and Binary Search Tree.
Graphs: Terminology, Representation of Graph, Graph Traversal DFS and BFS
Problems to Practice: Word Ladder, Shortest Path in Binary Matrix, Rate In Maze.

Unit – VI

Dynamic Programming : Introduction, Bottom up DP, Top Down DP, Coin Change Problem, Road Cutting problem, Egg dropping problem, 0/1 Knapsack problem, Longest common Sub Sequence problem.

Text Book:

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
2. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
3. Silberschatz, Korth :Database System Concepts. McGraw hill,5th Edition.
4. Elmasri, Navrate:Fundamentals of Database Systems. Pearson Education,6th Edition

Reference Links :

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

PROFESSIONAL COMMUNICATION SKILLS LAB

Subject Code: 20HSL302

L	T	P	C
0	0	3	1.5

Course Objectives

- To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
- 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 state meanings, synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes for words in general.
- 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 impromptu speeches.
- Students will be able to prepare Job Application and Résumé / CV of their own, and face interviews confidently.

Course Syllabus

Unit I: Classified Vocabulary
Unit II: Power Point Presentation
Unit III: Project Reports on Social Issues
Unit IV: Group Discussion
Unit V: Debate
Unit VI: 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 Pushpa Lata. 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.

POWER ELECTRONICS LAB

Subject Code: 20EEL307

L	T	P	C
0	0	3	1.5

Course Objectives:

- To develop hands o experience about SCRs, MOSFETs & IGBTs.
- To verify the operation of phase-controlled rectifiers both for R & RL loads.
- To learn the operation of R, RC &UJT firing circuits.
- To verify the performance of AC voltage Controllers.
- To experience the behavior of DC-DC converters.

Course Outcomes:

Students will be able to

CO1: Analyze the working of SCRs, MOSFETs & IGBTs, with their characteristics.
CO2: Interpret the use of different types of firing circuits.
CO3: Understand the analysis of half controlled & full controlled rectifiers.
CO4: Understand the working of AC Voltage controllers.
CO5: Understand the analysis of PWM inverters.
CO6: Study and analyze the working of DC-DC converters.

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 step-down cyclo-converter with R &RL loads.
7. Single phase bridge inverter with R & RL loads.
8. Performance & speed control of 3 phase slip ring Induction motor by Static Rotor Resistance controller.
9. Study of DC-DC Buck Converter and DC-DC Boost Converter.
10. Performance & Operation of a four quadrant Chopper on D.C. Drive

Additional Experiments:

11. Study of forward and fly back converter.
12. Study of DC-DC Buck-Boost Converter

SPECIAL ELECTRICAL MACHINES
(Honors Course)

Subject Code: 20EVT302

L	T	P	C
4	0	0	4

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: Analyze the equivalent circuit of a permanent magnet motors
CO6: Describe the operation of motor drives to meet mechanical load requirements

UNIT I:
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. Applications

UNIT II:
Switched Reluctance Motor Principle of operation, Torque production, Power converter for switched reluctance motor, Control of switched reluctance motor.

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.

UNIT V:
Permanent Magnet Motors Construction – Principle of working – Torque equation and equivalent circuits, electrically commutated DC motor.

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
2. Special electrical machines, Simmi P Burman, S.K. Kataria& Sons private limited.

POWER SYSTEM ANALYSIS

Subject Code: 20EEI311

L	T	P	C
3	0	0	4.5

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 Gauss- Seidel method.

CO3: Calculate the load flows in a power system usingNewton-Raphson method and Fast decoupled Load Flow method and also understand merits and demerits of each method.

CO4: Compute $Z_{bus}$for a given power system network and analyze symmetrical fault calculation.

CO5: Solve an un-balanced three phase network by using symmetrical components and analyze a power system under fault conditions.

CO6: 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.

ExerciseQuestions:1

Ex 1: Obtain the Y-Bus of given power system.

UNIT II

Power flow studies-I:

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. Numerical problems.

ExerciseQuestions:2
Ex 2: Obtain the power flow solution by the Gauss-Seidel method for given power system.

UNIT III
Power flow studies-II:
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. Numerical problems.

ExerciseQuestions:3
Ex 3: Power flow solution of given power system network by Newton Raphson method.

Find the load flow solution using NR method.

Ex 4: Power flow solution of given power system network by Fast decoupled load flow (FDLF) method.

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

ExerciseQuestions:4
Ex 5: Obtain the Z-Bus of given power system.

UNIT V

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.

ExerciseQuestions:5

Ex 6: Analyze of various faults of given power system.

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

TEXT BOOKS:

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

REFERENCES:

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

MICROPROCESSORS AND MICROCONTROLLERS

Subject Code: 20EET312

L	T	P	C
3	0	0	3

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
- To study the fundamental features of 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. Describe the fundamental features of ARM Processor.
CO 6. 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, classification of interrupts, interrupt service routine and interrupt vector table, timing diagrams of 8086.

Unit-II

Assembly Language Programming of 8086: Instruction formats, Addressing modes, 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

Unit-V

ARM Processor: Introduction to ARM Processor, Features, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts, interrupt vector table, Applications of ARM Processor

Unit-VI

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 – Nagoor khani, RBA publications
2. The 8051 Microcontroller – Kenneth J. Ayala
3. Microprocessors and Interfacing – Douglas V Hall, McGraw-Hill.

Website References:

1. https://nptel.ac.in/courses/117104072
2. https://nptel.ac.in/courses/106108100
3. https://1lib.in/book/1082259/9bac0c
4. https://1lib.in/book/510467/d179b0

SWITCHGEAR AND PROTECTION

Subject Code: 20EET313

L	T	P	C
3	0	0	3

Course Objectives:
To Study the arc quenching phenomenon and various types of circuit breakers and relays, understand the principle of protective schemes for generators, transformers, feeders and bus bars. Protection against over voltages and grounding.

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: Identifythe suitable protection schemes for Generator & Transformer.
CO4: Describe the protection techniques for feeder and bus bar.
CO5: Describe the influence of over voltages and compare the operation of different arresters.
CO6: 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, Vacuumcircuit breakers and SF6 circuit breakers.

UNIT II:
Electromagnetic and Static Relays: Principle of Operation and Constructionof Attracted armature, Balanced Beam, Induction Disc and Induction Cup relays, Relays classification: Instantaneous, DMT and IDMT types, Application of relays: Over currentrelays, Directional relays, Differential Relays and Percentage Differential Relays, Universal torque equation, Distance relays: Impedance, Reactance and Mho relays, Characteristics of Distance Relays and Comparison, Introduction to Static Relays and itsadvantages over Electromagnetic Relays,Comparison of electromagnetic and static relays.

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

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

UNIT V:

Protection against over voltage: 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

UNIT VI:

Protection against grounding: Grounded and Ungrounded Neutral Systems. - Effects of UngroundedNeutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance and 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

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 microprocessor applications T.S MadhvaRaoTMHPublications.
5. Power system protection and switchgear- Bhuvanesh A Oza, N.K.C. Nair, R.P. Mehta and V.H.Makwana, Mcgraw hill education-2016

LINEAR DIGITAL INTEGRATED CIRCUITS
(Professional Elective-II)

Subject Code: 20EEE321

L	T	P	C
3	0	0	3

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
CO 6. Summarize the advantages of IC voltage regulators.

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 – 1^{st} order, 2^{nd} 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.

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

Unit-VI
Voltage Regulators: Introduction, IC voltage regulators-78XX, 79XX, 723 general purpose series regulators.

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

Website References:

https://nptel.ac.in/courses/108108111

ADVANCED CONTROL SYSTEMS
(Professional Elective-II)

Subject Code: 20EEE322

L	T	P	C
3	0	0	3

Course objective

1. Represent State space models by using Physical, Phase and Canonical variables
2. Solve state equation and test for controllability and observability
3. Design pole placement
4. Estimate stability for nonlinear systems
5. Understood Adaptive control functions
6. Understood different optimal control problems

Course outcomes

At the end of the course student can be able to:

CO1: Interpret the given system in state model using different variables
CO2: Compute solution of state equation and estimate the controllability and observability
CO3: Design the observers for pole placement
CO4: Apply liapunov theory and analyze the stability
CO5: Associate the functions of adaptive control with their applications
CO6: Distinguish the optimal control problems

UNIT I:

State Space Representation: State space representation using Physical variables, Phase variables and Canonical variables, Derivation of Transfer function of state model. Diagonalization: eigen values and eigen vectors, Generalized eigen vectors.

UNIT II:

State Space Analysis: State space representation, solution of state equation, state transition matrix and its properties, concepts of controllability and observability, test for controllability and observability by Gilberts and Kalman test

UNIT III:

Modern Control: Effect of state feedback on controllability and observability, Pole placementby state feedback, Full order observer and reduced order observer

UNIT IV:

Liapunov Stability Analysis: Stability of equilibrium state, asymptotic stability, graphical representation, Liapunov stability theorems, stability of linear and nonlinear systems, and construction of liapunov functions using krasovskii method, variable gradient method.

UNIT V:

Adaptive Control: Definition of adaptive control system, functions of adaptive control, gain scheduling, model reference, series and parallel schemes and their industrial applications.

UNIT VI:

Optimal Control: Formulation of optimal control problem, Minimum Time, Minimum energy, Minimum fuel problems, state regulator problem, output regulator problem, tracking problem.

TEXT BOOKS:

1. "Modern control system Theory", M.Gopal, Wiley eastern Ltd., New delhi,2014.
2. "Modern control Engineering", K. OGATA, 3ed.prentice Hall of India(p) Ltd., New delhi

REFERENCES:

1. "Modern Control Systems", Richard C.dorf and Robert H. Bishop, 11th Edition, Pearson Edu, India,2009
2. "Optimal Control Theory – an introduction", Kirk D.E., Prentice Hall, N.J. 1970
3. "Adaptive Control",Astry,S. and Bodson., Prentice Hall, 1989
4. "Adaptive Control and Optimization Techniques",Eveleigh, V.W.,McGraw-Hill,1967
5. "Linear Control System Analysis and Design Conventional and Modern", John J D'Azzo and C.H. Houpis, McGraw Hill Book Company,1988

FLEXIBLE AC TRANSMISSION SYSTEMS
(Professional Elective-II)

Subject Code: 20EEE323

L	T	P	C
3	0	0	3

Course objectives:
- To understand the need for FACTS.
- To learn shunt and series compensation techniques.
- To educate on static VAR compensators and their applications.
- To learn the concept of unified power flow controller.
- To provide knowledge on UPFC.

Course outcomes: Students will be able to
CO1: Understand the operations of different FACTS devices.
CO2: Summarize about Static VAR Compensators.
CO3: Analyze the different FACTS devices in different stability conditions.
CO4: Select an appropriate FACTS device for a particular application.
CO5: Analyze the Static series compensation.
CO6: Analyzecustom power devices.

UNIT-I
FLEXIBLE AC TRANSMISSION SYSTEM: Transmission inter connections, flow of power in ac systems, loading capability, dynamic stability considerations, basic types of FACTS controllers.

UNIT-II
STATIC SHUNT COMPENSATORS: Objectives of shunt compensation, static var compensators, STATCOM configuration, characteristics and control, comparison between STATCOM and SVC.

UNIT-III
STATIC SERIES COMPENSATION: Objectives of series compensation, Variable Impedance type series compensators, switching converter type series compensators, external control for series reactive compensators.

UNIT-IV
UPFC: Principle of operation and characteristics, independent active and reactive power flow control, comparison of UPFC with the series compensators and phase angle regulators.

UNIT-V
IPFC: Principle of operation and characteristics and control aspects.

UNIT-VI
CUSTOM POWER DEVICES:
Introduction to custom power devices, DSTATCOM and DVR operating principles, their applications In Distribution Systems

TEXT BOOKS

1. N.G. Hingorani, L. Gyugyi, "Understanding FACTS: Concepts and Technology of Flexible ACTransmission Systems", IEEE Press Book, Standard Publishers and Distributors, Delhi, 2001.
2. K R Padiyar, "FACTS Controllers in Power Transmission and Distribution", New Age InternationalPublishers, 2007.

REFERENCES

1.K.S.Sureshkumar ,S.Ashok , "FACTS Controllers & Applications", E-book edition, NalandaDigitalLibrary, NIT Calicut,2003
2. G T Heydt , Power Quality, McGraw-Hill Professional, 2007
3. T J E Miller, Static Reactive Power Compensation, John Wiley and Sons, Newyork, 1982
4. X P Zhang, C Rehtanz, B Pal, "Flexible AC Transmission Systems- Modeling and Control", SpringerVerlag, Berlin, 2006.

PRINCIPLES OF SIGNALS AND SYSTEMS

(Professional Elective-III)

Subject Code: 20EEE331

L	T	P	C
3	0	0	3

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 continuoustime (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, DTFS.

CO4.Represent CT and DT systems in the Frequency domain using Fourier analysis tools like CTFT, DTFT.

CO5.Compute the Laplace transforms of Continuous time signals and analyze continuous systems using Laplace transforms

CO6. 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.

UNIT-III

Fourier Analysis

Fourier theorem- Trigonometric form and exponential form of Fourier series – conditions of symmetry-line spectra and phase angle spectra– properties of Fourier series.

UNIT-IV

Fourier Transformes

Fourier Integrals and Fourier Transforms – properties of Fourier Transforms, applications to electrical circuits, limitations.Sampling and aliasing, impulse sampling, sampling theorem.

UNIT-V

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-VI

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. Simon Haykin and Barry Van Veen, "Signals & Systems", John Wiley and Sons Inc.New Delhi, 2008.
2.Signals and systems –by A.Anand Kumar, Third edition, PHI learning private Limited.

REFERENCE BOOKS:

1. Signals and systems –by Ramesh Babu and R.AnanadaNatarajan.
2. Ashok Ambardar, "Introduction to Analog and Digital Signal Processing", PWS Publishing Company, Newyork, 2002.
3. Rodger E Zaimer and William H Tranter, "Signals & Systems – Continuous and Discrete", McMillan Publishing Company, Bangalore ,2005
4.Alan V Oppenheim, Alan S Wilsky and Hamid Nawab S, "Signals & Systems", Prentice Hall, New Delhi, 2005.
5.Signals and Systems by K. Uma Rao, AndhePallavi, I.K International.

HIGH VOLTAGE DC TRANSMISSION
(Professional Elective-III)

Subject Code: 20EEE332

L	T	P	C
3	0	0	3

Course Objectives:

- This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters and MTDC systems and also design of AC filters.

Course Outcomes: Students will be able to

CO 1. Understand the basics of HVDC Transmission systems, Learning about advantages and Disadvantages of DC with AC Transmission. To have Knowledge about the Modern trends in HVDC Transmission.

CO 2. Analyze HVDC converters and characteristics of 6 and 12 pulse converters with and without overlapping.

CO 3. Understand the converter control characteristics, various controlling methods of converters such as firing angle, current and extinction angle control. Learn the converter faults and their protection schemes.

CO 4. Illustrate generation of harmonics, its adverse effects and also the design of filters for harmonic elimination. Learn about Multi terminal DC systems.

CO 5: Analyze harmonics in HVDC transmission system.

CO6: Understand the concept of Design of AC filters.

UNIT I:

Introduction to HVDC: Economics & Terminal equipment of HVDC transmission systems: Types of HVDC Links - Apparatus required for HVDC Systems - Comparison of AC &DC Transmission, Application of DC Transmission System - Planning & Modern trends in D.C.Transmission.

UNIT II:

Converter: Choice of Converter configuration - analysis of Graetz - characteristics of 6 Pulse & 12 Pulse converters - Cases of two 3 phase converters in star – star mode - their performance.

HVDC System Control: Principal of DC Link Control - Converters Control Characteristics - Firing angle control - Current and extinction angle control - Effect of source inductance on the system; Starting and stopping of DC link; Power Control.

UNIT III:

Reactive Power Control in HVDC: Reactive Power Requirements in steady state-Conventionalcontrol strategies-Alternate control strategies sources of reactive power - shunt capacitorssynchronouscondensers.

Modeling of DC Links-DC Network-DC Converter-Controller Equations-Solution of DC loadflow - P.U. System for d.c. quantities-solution of AC-DC Power flow-Simultaneous method-Sequential method.

UNIT IV:

Converter Fault & Protection: Converter faults - protection against over current and overvoltage in converter station - surge arresters - smoothing reactors - DC breakers - Audible noisespacecharge field-corona effects on DC lines-Radio interference.

UNIT V:

Harmonics : Generation of Harmonics-Characteristics harmonics, calculation of ACHarmonics, Non-Characteristics harmonics, adverse effects of harmonics - Calculation ofvoltage& Current harmonics - Effect of Pulse number on harmonics.

UNIT VI:

Filters: Types of AC filters, Design of Single and double tuned tuned filters –Design of High pass filters.

TEXT BOOKS:

1. Kamakshaiah, S and Kamaraju, V, 'HVDC Transmission', 1st Edition, Tata McGraw Hill Education (India), Newdelhi 2011.
2. Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., 2010.

REFERENCE BOOKS:

1. Arrilaga, J., 'High Voltage Direct Current Transmission', 2nd Edition, Institution of Engineering and Technology, London, 1998.
2. Kimbark, E.W., 'Direct Current Transmission-vol.1', Wiley Inter science, New York, 1971.

DIGITAL CONTROL SYSTEMS

(Professional Elective-III)

Subject Code: 20EEE333

L	T	P	C
3	0	0	3

Course objective

- Summarize the sampling techniques.
- Computing the Z- transforms and inverse Z transforms.
- Determination of pulse transfer function
- Determining stability of digital control systems.
- Understanding state equations.
- Testing controllability and observability in state space analysis.

Course outcomes

CO1: Students can understand the modeling of sampling process.
CO2: Students can operate the Z- transforms and inverse Z transforms.
CO3: Students can determine the pulse transfer function
CO4: Stability of digital control systems.
CO5: Students can understand state equations & their various state responses.
CO6: Students can test controllability and observability in state space analysis.

UNIT I:

Sampling: Advantages of sampling process in Control Systems, mathematical analysis of the sampling process – mathematical description of the ideal sampling process. The ideal sampler sampling theorem - S-plane properties. Reconstruction of sampled signals, zero-order hold - First – order hold

UNIT II:

Z transforms & Applications: Review of Z transforms, important properties and theorems of the Z-transform inverse Z-transform, Limitations of the Z-transform, Applications of Z transforms,

UNIT III:

Pulse-transfer function: Pulse-transfer function of open loop discrete systems, Pulse-transfer function of closed loop systems, Pulse transfer function of ZOH

UNIT IV:

Stability tests: Mapping between s-plane and z-plane, Definitions of stability**,** extension of Routh-Hurwitz criterion to Digital Control Systems, JURY's stability test.

UNIT V:

Discrete State equations –1: Discrete-Time State Space Equations, State space representation of discrete time systems,Solution of Discrete-Time State Space Equations, Z-Transfer from State Space Equations.

Unit VI:

Discrete State equations – 2: Computing the state transition matrix by the Z-transform method, Properties of STM, Relation between state equation and transfer function, Controllability and Observability.

TEXT BOOKS:

1. Discrete – time Control Systems, OGATA, PHI Publications, 2nd edition, 2015.
2. Digital Control Systems, Benjamin C.Kuo, Oxford HED Edition, 2012.

REFERENCE BOOKS:

1. Digital Control and State Variable Methods M.Gopal, Tata McGraw-Hill Publishing Co. Ltd., New Delhi (1997).
2. Digital Control Systems, C.H.Houpis and G.B.Lamount, McGraw-Hill Book Company(1985)

POWER SYSTEM POTECTION LAB

Subject Code: 20EEL308

L	T	P	C
0	0	3	1.5

Course Objective:

- To understand the various properties of Transmission lines to study the various concepts of protection in the Transmission lines.
- To analyze the performance of power system networks by conducting various experiments.
- To study the different power system protective equipment by conducting suitable experiments.
- To study the performance of transmission lines and relays
- To study the different types of short-circuit faults which occur in power systems

Course Outcomes:

Students will be able to

CO1: Detect the fault locations in underground cables**.**

CO2: Analyze performance characteristics of relays.

CO3: Analyze the performance characteristics of photo voltaic system and also analyze Performance characteristics of Fuse and miniature circuitbreaker**.**

CO4: Evaluate the parameters and performance of a long transmission lines and gain the Knowledge on Ferranti effect.

CO5: Describe the series and shunt compensation in transmission lines**.**

List of Experiments:

1. Identification of fault location in underground cable using Varley loop test.
2. Study of Characteristics of micro controller based over current relay.
3. Study of the (I-V) and (P-V) Characteristics curves of photo voltaic system.
4. Observation of the FERRANTI EFFECT using high voltage transmission line analyzer.
5. Determination of transmission line parameters (ABCD parameters) using high voltage Transmission line analyzer.
6. Study of Characteristics of normal FUSE and MCB.
7. Study of Shunt reactor and shunt capacitor compensation using high voltage transmission line analyzer.
8. Study of BUCHHOLZ RELAY for major and minor faults.
9. Study of over current relay, over voltage relay and under voltage relay for different load Conditions using high voltage transmission line analyzer.
10. Study of micro controller based biased 3-phase differential relay.

Additional Experiments:

11. Study of series reactor compensation using high voltage transmission line analyzer.
12. Determination of positive, negative and zero sequence impedance of an alternator

MICROPROCESSORS AND MICROCONTROLLERS LAB

Subject Code: 20EEL309

L	T	P	C
0	0	3	1.5

Course Objectives:

Learning the

- MASM (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 a MASM program by using Arthimatical instruction set.
CO 2. Develop a MASM program by using Logical instruction set.
CO 3. Develop a MASM program by using string manipulation instruction set.
CO 4. Develop a program to interface 8086 with DAC through 8255 to generate different analog signals like square, Triangular and sine signals.
CO 5. Develop a program to interface 8051 with stepper motor.
CO 6. Develop a program to interface 8051 with Traffic lights.

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.

SOFT SKILLS
(Common to ALL)

Subject Code: 20SSS301

L	T	P	C
1	0	2	2

Course Objectives:

- **CO1:** Develop communicative competence in students of engineering
- **CO2:** Enrich students' emotional intelligence and inter-personal skills
- **CO3:** Enable students to understand the importance of employing appropriate body language when communicating.
- **CO4:** Develop students' competence in written communication
- **CO5:** Train students in interview skills, group discussions and presentation skills to enhance their employability skills
- **CO6:** Bridge the gap between the current skill sets of students and the skills required by a potential employer through practice.
- **CO7**: Make students industry ready by grooming them for corporate life.

Outcomes: By the end of the course students should be able to:

- P01. Apply communication theory to solve workplace communication issues.
- P02. Demonstrate the communication required in the workplace: interpersonal and intrapersonal communication skills, listening skills along with barriers of communication
- P03. Interpret the role Non verbal communication, Cultural differences ,business etiquettes in communication,
- P04. Express and understand complex ideas accurately in written and spoken formats: resume writing ,E-mail writing and report writing
- P05.Express technical knowledge and expertise orally through presentations, group discussions and interviews to enhance employability competence
- P06. Preparing students for Campus to Corporate transition and improve employability

UNIT I: FUNDAMENTALS OF COMMUNICATION

Purpose and process of communication: Objectives of Communication-Process of Communication- Types of communication; noise, listening skills, Types of listening, essentials of good listening and tips.

UNIT II: INTERPERSONAL COMMUNICATION & EMOTIONAL INTELLIGENCE

Managing Interpersonal and Intrapersonal communication - Role of Emotion in Interpersonal Communication- Barriers to Interpersonal Communication- Exchange Theory- Gateways for Effective Interpersonal Communication.

UNIT III: NON VERBAL COMMUNICATION, ATTIRE & ETIQUETTES

Non-verbal communication and Body Language: Kinesics, Proxemics, Paralanguage, Haptics, handshakes, appropriate body language and mannerisms for interviews: business etiquettes- across different cultures.

UNIT IV: TECHNICAL COMMUNICATION & RÉSUMÉ WRITING

Written communication: mechanics of writing, report writing- business correspondence-business letter and E-Mail format - Meetings and managing meetings- Resume and **cover letter** writing -Formats.

UNIT V: PRESENTATION AND GROUP DISCUSSION

Presentation skills: prerequisites of effective presentation, format of presentation; Assertiveness –strategies of assertive behavior; Communication skills for group discussion and interviews, Interview Techniques.

UNIT VI: CAMPUS TO CORPORATE TRAINING

Goal setting- Establishing SMART Goals, Importance of Mission Statement, Formulation of Goals ; T**ime management** - Prioritization, Dealing with Difficult Tasks, Getting Organized; **conflict management**- Creating a Win-Win situation, Negotiation and Persuasion; Dealing with Aggressive Behavior SWOT analysis; **Team building skills**- Teambuilding Process and Techniques, Coordination in Teams

Text Books:

1) E. Suresh Kumar,P. Sreehari,J. Savithri "Communication Skills and Soft Skills : An Integrated Approach" Published by Dorling Kindersley (India) Pvt. Ltd, Pearson Education in South Asia.2011
2) Meenakshi Rama: "*Business Communication*", Oxford University Press, NewDelhi
3) C.S.G. Krishnamacharyulu and Dr. Lalitha Ramakrishnan, Business Communication, Himalaya Publishing House,Mumbai
4) Butterfield, Jeff. *Soft Skills for Everyone*. New Delhi: Cengage Learning. 2010
5) Nitin Bhatnager and Mamta Bhatnagar: Effective communication and soft skills: Strategies for Success, Pearson 2012

Reference Books:

1) Kelly M Quintanilla, Shawn T.Wahl:"Business and Professional Communication", SAGE, New Delhi,2012.
2) Chauhan, G.S. and Sangeeta Sharma. *Soft Skills*. New Delhi: Wiley. 2016
3) Thorpe, Edgar and Showick Thorpe. *Winning at Interviews*. Pearson Education. 2004.
4) Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi
5) Edoardo Rovida· Giulio Zafferri: The Importance of Soft Skills in Engineering and Engineering Education ,Springer 2022

BATTERY TECHNOLOGIES

(Honors/Minor Course)

Subject Code: 20EVT303

L	T	P	C
4	0	0	4

Course objectives:

To impart fundamental knowledge on electrochemical energy storage systems considering the operation and design of various battery technologies. To enable the students to understand the requirement of batteries for automotive application combined with environment policy considerations.

Course Outcomes:

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

1. Recognize the basic physical concepts of thermodynamics and kinetics involved in electrochemical reactions
2. Select the appropriate battery system with respect to application
3. Analyze the characterization methods of batteries and interpret concepts describing battery performance
4. Describe the recent developments battery systems
5. Understand the requirements of battery systems for automotive applications and understand the modelling of battery systems
6. Discuss the Life Cycle Analysis according to cost and environmental aspects; material and energy consumption, reuse, recycling

Unit-I: Introduction to Electrochemical energy storage

Introduction to battery technologiesElectromotive force- Reversible cells- Relation between electrical energy and energy content of a cell-Free energy changes and electromotive force in cell- Current challenges in Energy storage Technologies.

Unit-II: Major Battery Chemistries Development and testing:

Battery performance evaluation- Primary battery - Service time- Voltage data- Service life – ohmic load curve- Effect of operating temperature on service life. Secondary batteries- Discharge curvesTerminal voltages- Plateau voltage –Lead acid Batteries – Construction and application.

Unit-III: Recent Technologies-I:

Recent development of electrode materials in lithium ion batteries- Recent development of solid electrolytes and their application to solid state batteries.

Unit-IV: Recent Technologies-II:

Polymer solid electrolytes for lithium ion conduction– Thin Film solid state Batteries: Fundamentals, Constriction and application – Super Capacitors: Fundamental, Construction and application.

Unit-V: Batteries for Automotives – Future prospects:

Degrees of vehicle electrification - Battery size vs. application -USABC and DOE targets for vehicular energy storage systems - Analysis

Unit-VI: Modelling of Batteries for Automotives:
Simulation of batteries - Equivalent circuit and life modelling – Environmental concerns in battery production – recycling of batteries.

Text Books:
1. T.Minami, M.Tatsumisago,M.Wakihara,C. Iwakura,S. Kohijiya, Solid state ionics for batteries, Springer Publication, 2009
2. Sandeep Dhameja, Electric Vehicle Battery Systems, Newnes publication, 2001.

Reference Books :
1. Bard, Allen J., and Larry R. Faulkner. Electrochemical Methods: Fundamentals and Applications. 2nd ed.,Wiley– VCH, Verlag, GmbH, 2000.
2. MasatakaWakihara and Osamu Yamamoto, Lithium ion Batteries Fundamental and Performance,Wiley–VCH, Verlag GmbH, 1999.
3. Robert A.Huggins, Advanced Batteries – Materials science aspects,Springer, 2009

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE

Subject Code: 20HST403

L	T	P	C
3	0	0	3

Course Objectives:

- To understand Managerial Economics
- To understand Law of demand, Elasticity of demand and Demand forecasting techniques
- To understand theory of production cost analysis and its application in business
- To understand market structure different types of competition and pricing strategies
- To understand Principles of management. Leadership styles and social responsibility of an organisation
- To understand the concept of marketing and human resources management.

Course Outcomes:

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

CO 1. Recognize managerial Economics skills to the solution of engineering problems
CO 2. Explain the cost and production theories in engineering problems
CO 3. Explore and develop the management qualities
CO 4. Enhance the problem solving skills in various business areas
CO 5.Enhance the promotional skills in various Marketing situations
CO 6. Evaluate the future threats and application theories

Unit-I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Methods of Demand Forecasting viz. Survey methods, Statistical methods, Expert opinion method, Testmarketing, Controlled experiments, Judgmental approach to Demand Forecasting, GDP, National Income , Inflation and Business Cycles.

Unit-II

Theory of Production and Cost Analysis: Production Function in Isoquants and Isocosts, MRTS, Least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale.Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, Out of pocket costs & Imputed costs, Break-Even Analysis (BEA), Determination of Break- Even Point (simple problems), Managerial Significance and Limitations of BEA.

Unit-III

Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Oligopoly, Duopoly Price-Output Determination in Case of Perfect Competition and Monopoly.

Unit-IV

Introduction to Management : Concept of Management and Organization : Nature, Importance and Functions of Management, Taylor‘s Scientific Management Theory, Fayal‘s Principles of Management, Mayo‘s Hawthorne Experiments , Maslow‘s Theory of Human Needs, DouglasMcGregor‘s Theory X and Y, Hertzberg‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

Unit-V

Introduction to Marketing: Functions, Marketing Mix, Marketing Strategies based on Product Lifecycle, Pricing Methods and Policies,Channels of Distribution,Promotion Mix and Digital Marketing.

Unit-VI

Human Resources Management (HRM): Concept of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic Functions of HR Manager; Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating. E-HRM

Text Books:

1. Managerial Economics – Varshney and Maheswari, Sultan and Chand, New Delhi, 2003
2. Principles of Management – Ramaswamy,T, Himalaya Publishing House, Mumbai, 2008.
3. Marketing Management – Phillip Kotler and Kevin Lane Keller, PHI Learning Private Limited, 2006, 12/e.
4. Personnel and Human Resource Management: Text and Cases – P.Subba Rao, Himalaya Publishing Houses, Mumbai.

Reference Books:

1. Managerial Economics, Dwivedi, Vikas Publications, 2009, 6/e.
2. Principles of Management – Koonz, Weihrich and Aryasri, Tata McGraw Hill, 2004.
3. Marketing Management: Texts and Cases – Tapan K. Panda, Excel Books, 2008, 2/e.
4. Marketing Management – RajanSaxena, Tata McGraw Hill, 2009, 4/e.
5. Human Resource Management – Aswathappa, McGraw Hill, 2009.
6. Personnel Management – Edwin B.Flippo, McGraw Hill, 2000

UTILIZATION OF ELECTRICAL ENERGY

Subject Code: 20EET414

L	T	P	C
3	0	0	3

Course objectives:

- To study electric drive characteristics and understand various factors affecting the choice of motor.
- To study electrical heating and appreciate their merits over other methods.
- To study electrical welding and appreciate their merits over other methods.
- To learn the fundamentals of illumination and various illumination methods.
- To understand system of electrical traction and mechanics of train movement.
- To understand system of electrical traction and mechanics of train movement.

Course outcomes:

Upon successful completion of this course, students will:

CO1: Be able to select an appropriate motor for given application.
CO2: Gain insight into different electrical heating techniques.
CO3: Gain insight into different electrical welding techniques.
CO4: Be able to understand basic principles of light control and design lighting schemes.
CO5: Be able to differentiate existing electric traction system in India.
CO6: Acquire knowledge to calculate tractive effort, power, and specific energy consumption for given run.

UNIT I: Selection of Motors and Applications: Type of electric drives, choice of motor, starting and running characteristics, temperature rise, particular applications of electric drives, continuous, intermittent and variable loads, load equalization. Energy star rating of equipment.

UNIT II: Electric Heating: Advantages and methods of electric heating, resistance heating, induction heating and dielectric heating

UNIT III: Electric Welding: Electric welding, resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT IV: Illumination: Introduction, terms used in illumination, laws of illumination, Discharge lamps, MV and SV lamps – comparison between tungsten, filament lamps and fluorescent tubes, stroboscopic effect, Basic principles of light control, Types and design of lighting and flood lighting.

UNIT V: Introduction to Electric Traction: System of electric traction and track electrification. Review of existing electric traction systems in India, 25 kV AC traction system and its advantages, Special features of traction motor, Mechanics of train movement. Speed -time curves for different services – trapezoidal and quadrilateral speed time curves.

UNIT VI: Calculations of Electric Traction: Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight, braking retardation and coefficient of adhesion.

TEXT BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction - N. V. Suryanarayana, New Age International (P) Limited Publishers, 2017.
2. Art &Science of Utilization of electrical Energy – Partab, DhanpatRai& Sons, 2004.

REFERENCE BOOKS:

1. Utilization of Electrical Energy in SI Units - E. Openshaw Taylor, Orient Longman Pvt. Ltd.
2. Utilization of Electric Power and Electric Traction - J B Gupta, S K Kataria& Sons.
3. .Generation, distribution and utilization of electrical energy, C.L Wadhwa, Wiley Eastern Limited,1993
4. Electrical Power, S. L. Uppal, Khanna pulishers, 1988.

POWER SYSTEM OPERATION AND CONTROL

(Professional Elective-IV)

Subject Code: 20EEE441

L	T	P	C
3	0	0	3

Course objectives:

- Learn the characteristics of generation unit/output curves and study the optimal allocation of totalload among the generation units without and with transmission losses.
- To develop the mathematical modelling of long range hydro thermal scheduling and to study the Kirchmayers
- Learn how generating units are committed to meet load over the hours of a week using dynamicprogramming.
- It emphasizes on single area and two area load frequency control.
- To understand about reactive power control and the methods of compensation.

Course outcomes: Students will be able to

CO1: Explain how optimal allocation of total load among the generation units is done without transmission losses.

CO2: Explain how optimal allocation of total load among the generation units is done with and with transmission losses

CO3: Solve Unit Commitment problem using dynamic programming technique for a given power system.

CO4: Develop the block diagram for an isolated power system and also analyze the dynamic response of it with & without integrated control.

CO5: Develop the block diagram model for a two-area power system.

CO6: Explain Reactive power control and its compensation methods.

UNIT I:

Economic Operation of Power Systems without transmission losses: Optimal operation of Generators in thermal PowerStation, heat rate Curve, Cost Curve- Incremental fuel and Production costs, input- output characteristics, and optimum generation allocation with line losses neglected.

UNIT II:

Economic Operation of Power Systems with transmission losses: Optimum generation allocation including the effect of transmission line losses -Loss Coefficients-General transmission line loss formula-practice problems

UNIT III:

Hydrothermal Scheduling: Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems- Short term hydrothermal scheduling problem.

Unit commitment: Optimal unit commitment problem -Need for unit commitment -constraints in unit commitment solution methods dynamic programming.

UNIT IV:

Single Area Load Frequency control: Modelling of speed governing, steam turbine and generator-Necessity of keeping frequency constant-Definition of Control area- Block diagram representation of an isolated power system-Steady state analysis-Dynamic response Uncontrolled case. Proportional plus Integral control of single area and its block diagram representation.

UNIT V:

Two Area Load Frequency Control: Introduction-Block diagram representation of two area system with Load frequency control -Static and dynamic response -uncontrolled case

UNIT-VI

Reactive Power Control: Overview of Reactive Power control- Reactive Power compensation in transmission systems- advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation -objectives &Specifications of load compensator-Line compensation.

TEXT BOOKS:

1.J. DuncanGlover, M.S. Sarma& Thomas J. overbye, 'Power system analysis and design',5th Edition,2011.
2.DP Kothari, IJ Nagrath'Modern power system analysis',3rd Edition,2011.

REFERENCES:

1.Hadi Saadat,'Power System analysis', Tata McGraw-Hill Education,2nd Edition,2002
2.J.C. Das,'power system analysis', Short-Circuit load flow and Harmonics',1st Edition,2002.
3.Arthur R.Bergen,'Power system Analysis', Peterson Education India,2 nd Edition,2009.

HIGH VOLTAGE ENGINEERING
(Professional Elective-IV)

Subject Code: 20EEE442

L	T	P	C
3	0	0	3

Course objectives:
- To understand various numerical methods for field calculations.
- To develop knowledge on generation and measurement of high voltage DC, AC (power frequency and high frequency) voltages and currents.
- To understand thoroughly various high voltage testing techniques of power apparatus.

Course outcomes: Students will be able to
CO1: Describe the terms and numerical methods used in High Voltage engineering.
CO2: Discuss different breakdown mechanisms in dielectrics.
CO3: Analyze the concept of Generation and measurement of High Voltage, High Currents.
CO4: Outline the non-destructive test techniques in High Voltage Engineering.
CO5: Identify the industrial applications of high voltage engineering.
CO6: Describe the Industrial applications of High voltage Engineering.

UNIT I:
Introduction to High Voltage Technology: Electric Field Stresses, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control.

UNIT II:
Break down phenomenon:
Gaseous Gaseous insulating media, collision process, Ionization process, Townsend's criteria of breakdown in gases, Paschen's law.
Liquid Liquid as Insulator, pure and commercial liquids, breakdown in pure and commercial liquids. **Solid** Break down in solid dielectrics, intrinsic breakdown, electro mechanical breakdown, thermal breakdown.

UNIT III:
Generation of high voltages and High currents: Generation of High Direct Current Voltage, Generation of High alternating voltages and currents.

UNIT IV:
Measurement of High voltages and High currents:
Measurement of High Direct Current voltages, Measurement of High alternating Voltages and Currents.

UNIT V:
High voltage testing and Insulation Coordination: Measurement of D.C Resistivity, Measurements of Dielectric Constant and loss factor, Partial discharge measurements. Testing of Insulators and bushings, testing of circuit breakers, isolators, cables and Transformers, Insulation coordination.

UNIT-VI
Industrial Application of High Voltage Engineering: Electro Static applications- Electrostatic precipitator, Electro static separator, Electro static coating, Electro Static copying, pulsed power.

TEXT BOOKS:

1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH Publications, 5th Edition2017.
2. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition, 2000.

REFERENCES:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International(P) Limited, 1995.
3. High Voltage Engineering and Technology by Ryan, IET Publishers3rd edition 2013.
4. High Voltage Engineering fundamentals by Kuchler, Springer, 1st edition, 2018.

POWER QUALITY AND HARMONICS

(Professional Elective-IV)

Subject Code: 20EEE443

L	T	P	C
3	0	0	3

Course objective:
Introduction to custom power and study of factors governing power quality. Study of Power factor compensation techniques with power electronic devices and active Harmonic filtering. Introduction to measuring & solving power quality problems and particular standards relating to them**.**

Course outcomes: Students will be able to
CO1: Examine different power quality issues and prepared to take up prospective projects assignments
CO2: Describe power distribution protection techniques and its impact on voltage quality.
CO3: Plan to trained the work for improvement and betterment of power quality.
CO4: Distinguish basic harmonic phenomena.
CO5: Discuss theoretically and practically for monitoring of power quality.
CO6: Outline Custom Power Devices.

UNIT I:
Introduction To Electrical Power Quality: Definition of Power Quality, power quality terminology, Power Quality Issues, Power Quality v/s Equipment Immunity, Responsibility of supplier and users of electric power, Electric Power Quality Standards.

UNIT II:
Power Frequency Disturbances: Common Power Frequency Disturbances, Voltage Sag, cures of low frequency disturbances.

UNIT III:
Electrical Transients: Types and Causes of Transients-Atmospheric Causes, Switching Loads On or Off, Interruption of Fault Circuits, Capacitor Bank Switching, Power Factor Correction.

UNIT IV:
Harmonics: Definition of Harmonics Causes of Voltage and Current Harmonics. Individual and Total Harmonic Distortion. Effect of Harmonics on Power System Devices, Harmonic Current Mitigation, power factor.

UNIT V:
Measuring Power Quality Problems: Power Quality Measurement Devices, Harmonic Analyzers, Oscilloscopes, Data Loggers and Chart Recorders, True RMS Meters, Power Quality Measurements.

UNIT- VI:

CUSTOM POWER DEVICES:

Introduction to custom power devices, DSTATCOM and DVR operating principles, their applications In Distribution Systems

TEXT BOOKS:

1. R.C. Dugan, M.F. McGranaghan and H.W. Beaty, Electric Power Systems Quality, McGraw-Hill.3rd edition. .
2. J. Arrillaga, N. R. Watson, S. Chen, "Power System Quality Assessment", John Wiley & Sons, 2000.

REFERENCE BOOKS:

1. G.T. Heydt, Electric Power Quality. 2nd ed. West Lafayette, IN: Stars in a Circle, 1994.
2. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002.
3. D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley, 1985.
4. C.Sankaran, "Power Quality", First Indian reprint, CRC press, 2009.

ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING
(Professional Elective-V)

Subject Code: 20EEE451

L	T	P	C
3	0	0	3

Course Objectives

The student will be able to :

- Achieve basic knowledge of artificial intelligence.
- Analyzes different search strategies and understand their practical applications.
- Gain basic and practical knowledge of game playing and knowledge representation.
- Learn how to plan, design, and implement learning components.
- Learn basic machine learning algorithms.

Course Outcomes

By the end of the course, students will be

1. Familiar with the scope, problems and approaches to artificial intelligence and various search strategies.
2. Able to apply algorithm techniques for solving game playing and constraint satisfaction problems
3. Able to apply and analyze various knowledge representation techniques.
4. Familiar with the basic concepts of machine learning and various types of machine learning approaches
5. Able to implement decision tree learning algorithms for solving the problems
6. Recognize the feasibility of applying neural network methodology for a particular problem.

Unit-I

Introduction: Historical Perspective, Goals of AI, Applications of AI, Intelligent systems, types of intelligence,

Search Strategies: State-space problem, Problem Solving by Intelligent search: BFS, DFS, Iterative Deepening Search, Hill Climbing, Simulated Annealing, heuristic Search: A*, AO*,

UNIT– II

Game Playing: MIN-MAX Algorithm, Alpha-Beta pruning algorithm, Constraint Satisfaction Problems (Backtrack, 8-queens, coloring problem)

Logic, Inference and Predicate Calculus: Propositional Logic, Predicate calculus, First Order Logic, Inference in First Order Logic, Unification, Resolution, Conversion to Normal Form.

UNIT – III

Knowledge Representation and Reasoning: Rule-based Systems, Semantic Networks, Frame Systems, Ontologies, Knowledge Representation for the web - Semantic Web

UNIT-IV

Basic Concepts of Machine learning: Machine Learning, Machine Learning vs. Statistics, Applications of Machine Learning, Supervised Learning vs. Unsupervised Learning, Reinforcement Learning, Back Propagation learning

UNIT– V

Decision Tree Learning: Introduction to Decision Tree representation, Appropriate problems for Decision Tree Learning, basic decision tree learning algorithm, Inductive bias, Issues, Bayesian Learning

UNIT-VI

Neural Networks: Neural Network Representation, Problems, Perceptrons, Multilayer Networks, Back Propagation Networks, Feed Forward Neural Networks

Text Books

1. Elaine Rich and Kevin Knight, "Artificial Intelligence", 3rd Edition,TMH.
2. Ethem Alpaydın, **"**Introduction to Machine Learning ", Second Edition, The MIT Press Cambridge, Massachusetts London, England, 2010.

Reference Books

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", PHI.
2. Vinod Chandra SS, Anand Hareendran S, Artificial Intelligence and Machine Learning, 1st Edition, PHI
3. Stephen Marshland, "Machine Learning: An Algorithmic Perspective", Taylor & Francis

Reference Links

1. https://nptel.ac.in/courses/106102220
2. https://www.geeksforgeeks.org/machine-learning/

SMART GRID
(Professional Elective-V)

Subject Code: 20EEE452

L	T	P	C
3	0	0	3

Course objectives:

- To introduce the basic fundamentals of smart grid
- To provides overview of smart grid Technologies
- To provide knowledge on operation of Micro grids
- To provide knowledge on Power Quality Management
- To become familiar with Communication Technology
- To monitoring of grid systems

Course outcomes:

CO 1: Understand the features of Smart Grid.
CO 2: Summaries various aspects of the smart grid Components.
CO 3: Understand Micro grid and distributed generation as a part of modern hybrid power system with advantages and challenges in smart gird operations
CO 4: Identify Smart Grid technologies for system remote monitoring.
CO 5: Study and compare modern communication infrastructure and justify the feasibility of the smart grid applications.
CO 6: Use of Demand Side Energy Management in Pricing and Energy Consumption Scheduling in smart grid operations.

UNIT-I: Introduction to Smart Grid

Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid

UNIT-II: Smart Grid Technologies

Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading (AMR), Smart Sensors, Home Automation.

UNIT-III: Micro grids and Distributed Energy Resources

Concept of micro grid, need & applications of micro grid, formation of micro grid, Issues of interconnection, protection & control of micro grid.

UNIT-IV: Power Quality Management in Smart Grid

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid.

UNIT-V: Information and Communication Technology for Smart Grid

Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN)

UNIT-VI: Demand side management

Demand side management of Smart Grid, Demand response analysis of Smart Grid, Pricing and Energy Consumption Scheduling, Controllable Load Models, Dynamics and Challenges.

Text Books:

1. Ali Keyhani, Mohammad N. Marwali, Min Dai, "Integration of Green and Renewable Energy in Electric Power Systems", Wiley.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press.
3. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley.

References:

1. Smart Grid: Fundamentals of design and analysis, James Momoh John Wiley & sons Inc,IEEE press 2012.
2. Clark W. Gellings, "The Smart Grid: Enabling Energy Efficiency and Demand Response", CRC Press
3. Smart Grid: Technology and Applications,Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, John Wiley & sons inc, 2012.
4. Smart Grid: Integrating Renewable, Distributed & Efficient Energy, Fereidoon P. Sioshansi, Academic Press, 2012.
5. The smart grid: Enabling energy efficiency and demand response, Clark W.Gellings, Fairmont Press Inc, 2009.
6. https://www.energy.gov/oe/activities/technology-development/grid-modernization-and-smart-grid
7. https://www.nsgm.gov.in/en/smart-grid.
8. https://smartgrid.ieee.org/.
9. https://onlinecourses.nptel.ac.in/noc21_ee68/preview.
10. https://onlinecourses.nptel.ac.in/noc23_ee60/preview.
11. https://nptel.ac.in/courses/108107113.

NON CONVENTIONAL ENERGY SOURCES

(Professional Elective-V)

Subject Code: 20EEE453

L	T	P	C
3	0	0	3

Course Objectives:

- To Outline the concept regarding solar radiation.
- 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.
- To Outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion
- To Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to

CO1: Define different kind of solar radiation.
CO2: Understand different methods of collection of solar energy and storage of solar energy.
CO3: Distinguish different types of wind mills.
CO4: Describe different types of biomass digesters and geothermal energy.
CO5: Explain different types of ocean energy extracting techniques.
CO6: 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, 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 energy:

Sources and potentials, block diagram, **Types**: horizontal and vertical axis windmills. Types of generators and its parts.

UNIT-IV

Biomass and Geothermal energy:

Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

UNIT-V

Ocean energy:

OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

UNIT-VI

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.

TEXT BOOKS:

1. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers 1998.
2. Renewable Energy Technologies by R. Ramesh, K. Uday Kumar, M. Anandakrishnan, Narosa Publishing House, 1997.

REFERENCE BOOKS:

1. Solar Energy by by S P Sukhatme, J K Nayak , McGraw Hill Education; Fourth edition-2017.
2. Non-Conventional Energy Sources by B.H Khan, McGraw Hill Education; third edition-2017.
3. Renewable energy resources by Tiwari and Ghosal, Narosa. Narosa Publishing House 2004.
4.Non-Conventional Energy by Ashok V Desai, New Age International Private Limited; First edition 1990

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOR
(Open Elective)

Subject Code: 20OET411

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- CO1:To co-create a comprehensive view of Human Resource Development (HRD) through assessment of theories and practices of HRD
- CO2: To familiarize the students with the components of individual and group behavior in organizational setting
- CO3: To help them learn behavioral skills in managing people at work.
- CO4: To provide basic insight into select contemporary management practices and Strategic Management.
- CO5: To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
- CO6: To understand about organizations groups that affect the climate of an entire organizationthis helps employees in stress management.

COURSE OUTCOMES:

- CO1: To build an understanding and perspective of Human Resource Development as discipline appreciating learning.
- CO2: To learn the skills of developing a detailed plan for need and implementation of HRD program in the organization.
- CO3: To learn role of learning in action as an individual, group and an organization in order to develop creative strategies to organizational problems.
- CO4: To develop a perspective of HRD beyond organizational realities including national HRD
- CO5: To develop positive attitude through personality development and can equip with motivational theories.
- CO6: To attain the group performance and grievance handling in managing the organizational culture.

UNIT-I

HRD-Macro Perspective: HRD Concept, Origin and Need, HRD as a Total System; Approaches to HRD; Human Development and HRD; HRD at Macro and Micro Climate.

UNIT-II

HRD–Micro Perspective: Areas of HRD; HRD Interventions Performance Appraisal, Potential Appraisal, Feedback and Performance Coaching, Training, Career Planning, OD or Systems Development, Rewards

UNIT-III

Employee Welfare and Quality of Work Life and Human Resource Information; Staffing for HRD: Roles of HR Developer; Physical and Financial Resources for HRD; HR Accounting; HRD Audit, Strategic HRD

UNIT-IV

Human Resource Training and Development: Concept and Importance; Assessing Training Needs; Designing and Evaluating T&D Programmes; Role, Responsibilities and challenges to Training Managers

UNIT-V

Individual Behavior: Perception-Perceptual process- Impression management- Personality development – Socialization – Attitude- Process- Formation- Positive attitude- Change – Learning – Learning organizations- Reinforcement Motivation – Process- Motives – Theories of Motivation: Maslow's Theory of Human Needs, Douglas McGregor's Theory X and Theory Y, Herzberg's Two-Factor Theory of Motivation,

UNIT-VI

Group Dynamics: Types of Groups, Stages of Group Development, Group Behavior and Group Performance Factors, Organizational conflicts: Reasons for Conflicts, Consequences of Conflicts in Organization, Types of Conflicts, Strategies for Managing Conflicts, Organizational Climate and Culture, Stress, Causes and effects, coping strategies of stress.

TEXT BOOKS:

1. Nadler, Leonard :Corporat Human Resource Development, Van NostrandReinhold, ASTD, New York .
2. Rao, T.V and Pareek, Udai: Designing and Managing Human Resource Systems,Oxford IBH Pub. Pvt.Ltd., New Delhi , 2005.
3. Rao, T.V: Readings in HRD, Oxford IBH Pub. Pvt. Ltd., New Delhi , 2004.
4. Subba Rao P., Organizational Behaviour, Himalaya Publishing House.Mumbai.
5. Fred Luthans Organizational Behaviour, TMH, NewDelhi.
6. Robins, Stephen P., Fundamentals of Management, Pearson,India.

REFERENCE BOOKS

1. Viramani, B.R and Seth, Parmila: Evaluating Management Development, VisionBooks, New Delhi.
2. Werner &DeSimone (2006). Human Resource Development. Thomson Press, Network.
3. Mankin, David (2009). Human Resource Development. Delhi: Oxford University Press.
4. Hersey, Paul, Dewey E. Johnson & Kenneth H. Blanchard (2013). Management of Organisational Behaviour. PHI.

PROJECT MANAGEMENT
(Open Elective)

Subject Code: 20OET412

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To develop an understanding of Project Planning and formation.
2. To make students gaining the knowledge and skills related to Project Analysis.
3. To make student better understand on Selection Criteria and select the best Project.
4. To develop understanding the concepts of Project Financing and Contracts.
5. To familiarize the students with implementation and execution of the project.
6. To make students understanding complete and close the project.

COURSE OUTCOMES:

1. To understand the concept of Project Planning and formation.
2. To understand the key issues in Project Analysis.
3. To understand Selection Criteria and select the best Project.
4. To understand the concepts of Project Financing and Contracts.
5. To understand how to implement and execute the project.
6. To understand how to complete and close the project.

UNIT – I

Project Planning and Formation: Project meaning and concepts **–** Overview of total Project Management Cycle – Classification of Projects and Project Formation –Strategic Planning and Capital budgeting – Generation and Screening of Project Ideas – Generation of Ideas – Monitoring the Environment – Corporate Appraisal – Tools for Identify Investment opportunities – Scouting for Project Ideas – Preliminary Screening – Project Rating Index.

UNIT - II

Project analysis: Issues in Project Analysis - Market and Demand Analysis–conduct of Market Survey, Demand forecasting. Technical analysis – Manufacturing Process Technology, Material Inputs and Utilities, Plant Capacity, Location and Site –Machineries and Equipment, Structures and Civil Works, Environment Aspects. Financial Estimations and projections – Cost of Projects, Means of Finance – Estimates of sales and Productions, Working capital Requirement and its financing, Profitability Projections, Projected Cash flow Statement, Projected Balance Sheet –Time Value of Money

UNIT-III

Project Selection: Selection Criteria– Net Present Value, Benefit Cost Ratio, Internal Rate of return, Urgency, Payback Period, Accounting Rate of Return, Assessment of Various Methods, Investment Evaluation in Practice. Project Selection Under Risk – Risk Analysis in Practice, How Financial Institutions Analyse Risk. Social Cost Benefit Analysis, Rationale for SCBA – UNIDO Approach.

UNIT – IV

Project Financing and Contracts: Financing of Projects **–** Capital Structure, Working Capital**,** Financing Infrastructure Projects, Public Private Partnership, Venture Capital **-** Private Equity, Credit Risk Management. Contracts - Definitions of contract and Contractor. Elements of contracts, offer acceptance and consideration, Valid Contracts, Department execution of work – Master Roll Form 21 – Piece work

Agreement form – Work order. Types of Contracts – Lump sum Contract, Lump sum and Schedule contract, Item rate Contract, Sub Contracts, Joint ventures, Arbitration Disputes and claim Settlement.Tender -Contract system with tenders, Quotation, Earnest Money, Security Money – Tender Notice, Tender Form, Bidding – Procedure – Irregularities in Bidding – award

UNIT – V

Project Implementation: Forms of Project organization – Human Aspects – of project Management – Pre requisites for successful project implementation –Project Monitoring and Controlling – Parameters for monitoring and Control – Process of Monitoring –Network Techniques for Project Management– Development of Project Network -Time Estimation –Determination of Critical path– Scheduling when Resources are Limited - PERT Model – CPM Model – Network Cost System.

UNIT – VI

Project Completion: Completion of project and Managing Transition Period – Closure of Contracts – Completion of Assets of Projects – Post Project Evaluation and Completion Audit Report. Management – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personal Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

TEXT BOOKS:

1. Narendra Singh, Project management and Control, Himalaya Publishing House, Mumbai 5th Edition
2. Prasanna Chandra: Projects, TMH, New Delhi,2014, 8th Edition.
3. K.Nagarajan: Project Management, New Age International, New Delhi,2010
4. PERT and CPM – L.S Srikanth
5. PERT and CPM – Punmia
6. Construction Management and Planning – Guna and Sen Gupta, B.

REFERENCES:

1. Gray, Larson: Project Management-Tata McGraw Hill-2015
2. Jeffery K.Pinto: Project Management-Pearson Education-2015
3. Enzo Frigenti: Project Management-Kogan, 2015
4. R. Panneerselvam, P. Senthilkumar: Project Management, PHI, 2015
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute,USA.

ENTREPRENEURIAL DEVELOPMENT
(Open Elective)

Subject Code: 20OET413

L	T	P	C
3	0	0	3

OBJECTIVE:
The objective of this course is to expose the students to the subject of entrepreneurial development, so as to prepare them to establish a new enterprise and effectively manage the enterprise.

1. To co-create a comprehensive view of Human Resource Development (HRD) through assessment of theories and practices of HRD
2. To familiarize the students with the components of individual and group behavior in organizational setting
3. To help them learn behavioral skills in managing people at work.
4. To provide basic insight into select contemporary management practices and Strategic Management.
5. To learn theories of motivation and also deals with individual behavior, their personality and perception of individuals.
6. To understand about organizations groups that affect the climate of an entire organization this helps employees in stress management.

OUTCOME:

1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Create appropriate business model and develop well presented business plan that is feasible for the student.
4. Understanding how to manage effectively the selected business.
5. Understanding how to create e-Entrepreneurship.
6. Explain how various disciplines of the venture can be managed.

Unit I: Entrepreneur and Entrepreneurship:
Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship,, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

Unit II: Entrepreneurship Development in India:
Emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. Development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs, Designing Appropriate training programme for existing and new entrepreneurs. Institutions supporting for EDP

Unit III : Creating and starting the venture :
Steps to start an MSME. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection - meaning of project report (Business Plan) & Formulation of a project report, Preparation of sample project report of any one product and service.

Unit IV : Government and Institutional support to Entrepreneurs:
MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, EXIM Bank and commercial Banks, APSFC, AP Industrial policy (2020-23) - incentives and subsides, industrial estates, AP Skill Development Corporation.

Unit V: e-Entrepreneurship:
Concept of e-Entrepreneurship, Difference between Entrepreneurship and e-Entrepreneurship, Purpose of Creating e-Entrepreneur, Essence of e-Entrepreneurship, e-Business Ventures in different sectors, Role of information technology in MSME, Problems and prospectus of e-Entrepreneurs in INDIA.

Unit VI : Managing the venture:
Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:
1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

References:
1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd, 2009
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi,2012
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

DIGITAL MARKETING

(Open Elective)

Subject Code: 20OET414

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To develop an understanding on the digital marketing.
2. To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
3. To make student better understand on Social Media Optimization (SMO).
4. To develop understanding on SME (Search Engine Marketing) through AdWords.
5. To familiarize the students with the Lead Management & Digital Marketing.
6. To understand the contemporary concepts on digital innovation and trends.

COURSE OUTCOMES:

After completion of the course the student will be able to

1. Understand the concept on digital marketing.
2. Define the concept on search engine optimization (SEO).
3. Describe the concept on Social Media Optimization (SMO).
4. Explain the idea on SME (Search Engine Marketing) through AdWords.
5. Justify the concepts and developments on lead management & digital marketing.
6. Comprehend the contemporary concepts on digital innovation and trends.

UNIT -I:

Introduction to Digital Marketing: Digital Marketing- Importance -Digital Marketing Platforms- Difference between Traditional Marketing and digital Marketing- Advantages of Digital Marketing. Role and functions of a Digital Marketing Manager

UNIT - II:

Search Engine Optimisation: Definition, scope of SEO, on-page optimisation and Off Page Optimisation, Report Preparation- Keywords, Titles, Meta Tags

UNIT –III:

Social Media Optimization (SMO): Meaning and scope of SMO. Social Media Optimization of Facebook- Twitter- LinkedIn- Pinterest: Social media services optimization.

UNIT – IV:

Search Engine Marketing (SME): SME through AdWords, Keyword Selection, Create Text Ads- CPC Bidding- Navigate Ad Words- SEM Metrics & Optimization.

UNIT – V:

Lead Management & Digital Marketing: Web to lead forms- Web to case forms- Lead generation techniques- Social media and lead gen Inbuilt tools for Digital Marketing

UNIT – VI:

Digital Innovation and Trends: The contemporary digital revolution- Digital Transformation framework- Security and Privatization Issues with Digital Marketing- Trends in Digital Marketing

TEXT BOOKS:

1. Chaffey, D. (2019). Digital marketing. Pearson UK.
2. Chaffey, D., & Smith, P. R. (2017). Digital marketing excellence: planning, optimizing and integrating online marketing. Taylor & Francis.
3. Dodson, I. (2016). The art of digital marketing: the definitive guide to creating strategic, targeted, and measurable online campaigns. John Wiley & Sons.

REFERENCES:

1. Kaufman, I., & Horton, C. (2014). Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students. Routledge.
2. Stokes, R. (2011). E-Marketing: The essential guide to digital marketing. Quirk eMarketing.
3. Kamalesh K.Bajaj: Debjani Nag: E-commerce - The cutting edge of business, Tata Mc-Graw Hill.

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective)

Subject Code: 20OET415

L	T	P	C
3	0	0	3

Course Objectives:
This Course is intended to build the following objectives:
1. To understand basic concepts of EIA
2. To study different methodologies of EIA
3. To appreciate the significance of ecosystem and environmental protection
4. To prepare environmental audit reports
5. To understand the legal and regulatory compliance
6. To prepare EIA reports for different developmental and industrial establishments

Course Outcomes:
After studying the course, the student:
1. Determine and demonstrate the environment and developmental issues to the public effectively.
2. Assess and evaluate the key EIA methodologies and generate the data.
3. Assess and diagnose the impact of developmental activities on ecosystems.
4. Demonstrate environmental audit protocols to conduct on-site audit for the generation of reports.
5. Demonstrate the environmental and legal compliance suitable for the developmental activities.
6. Examine and generate comprehensive EIA reports to different developmental activities.

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

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

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

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

Unit-V
Environmental Legislations: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972.

Unit-VI

EIA Report Writing: Introduction - Case studies and preparation of Environmental Impact Assessment (EIA) statement report for coal mining activities – chemical industries – Thermal power plants.

Text Books:

1. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:

1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers (Recent addition).

ENERGY AUDIT CONSERVATION AND MANAGEMENT
(Open Elective)

Subject Code: 20OET416

L	T	P	C
3	0	0	3

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,
CO5: Illumination methods and demonstrate the operation of various energy instruments.
CO6: 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
Power factor – Need of power factor -methods of improvement of power factor, location of capacitors.

UNIT-V
Lighting and energy instruments
Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-VI

Economic aspects and analysis

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

OPTIMIZATION TECHNIQUES
(Open Elective)

Subject Code: 20OET417

L	T	P	C
3	0	0	3

COURSE OBJECTIVES
- Enumerate the fundamental knowledge of Linear Programming and Dynamic Programming problems.
- Learn classical optimization techniques and numerical methods of optimization.
- Explain Integer programming techniques and apply different optimization techniques to solve various models arising from engineering areas.

COURSE OUTCOMES
On completion of this course, students should be able to
CO 1 : Solve linear programming problems using simplex method and to use duality principle
CO 2 : Analyze the simplex solutions for the changes in cost coefficients constraint coefficients
CO 3 : Identify the queuing model and to solve them
CO 4 : Enumerate fundamentals of non-linear programming
CO 5 : Solve different dynamic programming problems
CO 6 : Solve problems of decision making under certainity, uncertainity and risk

UNIT I
Introduction to optimization techniques: Linear programming problem, simplex method, duality principle , Big-M method, Two phase simplex method.

UNIT II
Sensivity analysis: Change in the constraints, cost coefficients, coefficients of the constraints, addition and deletion of variable, constraints.

UNIT III
Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1:FCFS/∞/∞), (M/M/1:FCFS/N/∞), (M/M/C:FCFS/∞/∞) models.

UNIT IV
Introduction to Non linear programming: Single variable optimization with and without constraints, multi-variable optimization without constraints, multi-variable optimization with constraints, method of Lagrange multipliers, Kuhn-Tucker condition.

UNIT V
Dynamic Programming: Introduction, Terminology, Bellman‟s Principle of optimality, Applications of dynamic programming, shortest path problem, linear programming problem, Product allocation problem, Cargo load problem.

UNIT VI
Decision Theory: Introduction, Classification of decisions, decision making under certainty, decision making under risk, decision making under uncertainty.

TEXT BOOKS:

1. Operations Research by P. Rama Murthy, New Age Pub
2. Operations Research, S.D.Sharma, Kedarnath Ramanadh Publications.
3. Operations Research by D.S. Hira and Prem Kumar gupta, S.Chand.

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
3. Optimization theory & Applications / S.S .Rao / New Age International

BLOCKCHAIN TECHNOLOGIES

(Open Elective)

Subject Code: 20OET418

L	T	P	C
3	0	0	3

Course Objectives

To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of crypto currency eco-system, this course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes

After successful completion of the course, the students will be able to:

1. Understand block chain technology.
2. Understand Crypto currency
3. Understand Smart contract
4. Use Remix IDE
5. Develop block chain based solutions and write smart contract using Ethereum Framework.
6. Deploy Open source Hyper ledger Architecture.

Unit – I

Introduction: Overview of Block chain, History of Blockchain, Peer to Peer Network, Smart Contract, Wallet, Digital Currency, Ledgers, Types of Block chain Platform, Consensus algorithms and their scalability problems, digital cash etc.

Unit – II

Consensus Mechanism &Crypto primitives: Atomic Broad cast, Consensus, Permission Block chain, Permission less Block chain, Hash functions, digital signatures, public key crypto, verifiable random functions, Zero-knowledge systems.

Unit – III

Bitcoin basics: Bit coin block chain, Challenges and solutions, Different Consensus Mechanism- Proof of Work, Proof of Stake, Proof of Activity, Proof of Burn, Proof of Elapsed Time, Proof of Authority, Proof of Importance, alternatives to Bitcoin consensus, Bitcoin scripting language and their use.

Unit – IV

Crypto currency and Wallet: Types of Wallet, Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of crypto currency in metamask.

Unit – V

Contract and Ethereum: Overview of Ethereum, Writing Smart Contract in Solidity, Remix IDE , Different networks of ethereum, understanding blocks practically at blockhcain.com, how to compile and deploy smart contract in remix.

Unit – VI

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric-Architecture, Identities and Policies, Membership and Access Control, Channels, TransactionValidation, Writing smart contract using Hyperledger Fabric.

Text Books:

1. Blockchain: Blueprint for a New Economy by Melanie Swan
2. Narayanan, Bonneau, Felten, Millerand Goldfeder, "Bitcoin and Cryptocurrency Technologies-A Comprehensive Introduction", Princeton University Press.

Reference Books:

1. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popularBlockchain frameworks by Imran Bashier.
2. Mastering Ethereum: Building Smart Contracts and DApps by Andrews
3. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "*Blockchain Architecture Design And Use Cases*"[MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

Reference Links:

1. Dr.Mayank Agarwal, "*BlockChain*"[MOOC], NPTEL: https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

IT SYSTEMS MANAGEMENT
(Open Elective)

Subject Code: 20OET419

L	T	P	C
3	0	0	3

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 a 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.
6. Describe E-Commerce and Global System for Mobile Communication.

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.

Unit – V

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

Unit – VI

Emerging Trends in IT : Introduction, E-Commerce, Electronic Data Interchange , Global System for Mobile Communication.

Text Books:

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1,3,4,5).2009
2. Software Project Management , Walker Royce: pearson Education,2021.(Unit 2).

Reference Books:

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. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

API AND MICRO SERVICES
(Open Elective)

Subject Code: 20OET41A

L	T	P	C
3	0	0	3

Course Outcomes:
At the end of this course, the student will be able to
- Understand the Spring framework concepts.
- Develop the Spring boot application
- Develop a Spring Data JPA application with Spring Boot
- Implement query methods for querying the database using Spring Data JPA
- Write RESTful services using Spring REST that consumes and produces data indifferent formats
- Handle exceptions and errors in Spring REST endpoints

Unit I:
Spring 5 Basics : Why Spring, What is Spring Framework, Spring Framework - Modules, Configuring IoC container using Java-based configuration, Introduction To Dependency Injection, Constructor Injection, Setter Injection, What is AutoScanning

Unit II:
Spring Boot: Creating a Spring Boot Application, Spring Boot Application Annotation, What is Autowiring, Scope of a bean, Logger, Introduction to Spring AOP, Implementing AOP advices, Best Practices : Spring Boot Application

Unit III:
Spring Data JPA with Boot: Limitations of JDBC API, Why Spring Data JPA, Spring Data JPA with Spring Boot, Spring Data JPA Configuration, Pagination and Sorting,

Unit IV:
Query Approaches, Named Queries and Query, Why Spring Transaction, Spring Declarative Transaction, Update Operation in Spring Data JPA, Custom Repository Implementation, Best Practices - Spring Data JPA

Unit V:
Web Services: Why Web services, SOA - Service Oriented Architecture, What are Web Services, Types of Web Services, SOAP based Web Services, RESTful Web Services, Howto create RESTful Services

Unit VI:
Spring REST: Spring REST - An Introduction, Creating a Spring REST Controller, @RequestBody and ResponseEntity, Parameter Injection, Usage of @PathVariable, @RequestParam and @MatrixVariable, Exception Handling, Data Validation, Creating a REST Client, Versioning a Spring REST endpoint, Enabling CORS in Spring REST, Securing Spring REST endpoints.

Hardware and software configuration

- 4 or 8 GB RAM/126 GB ROM
- Swagger tool suite(opensource)
- OpenJDK 17 or Java 11,Maven 3.2 or above and MySQL 8.0 or above,Spring Toolsuite, Postman

Text Books:

1. Spring in action, 5th Edition, Author: Craig Walls, Ryan Breidenbach, Manning books

Web Links [Courses mapped to Infosys Springboard platform]:

Infosys Springboard courses:

1.https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_01296689056211763272_shared/overview [Spring 5 Basics with Spring Boot]

2.https://infyspringboard.onwingspan.com/en/app/toc/lex_4313461831752789500_shared/overview [Spring Data JPA with Boot]

3.https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_012731900963905536190_shared/overview [Spring REST]

ELECTRICAL SIMULATION LAB

Subject Code: 20EEL410

L	T	P	C
0	0	3	1.5

Course objective:
To enable the students gain sufficient knowledge on the programming and simulation in the area of electrical circuits, power electronics, control systems, power systems and electrical machines.

Course outcomes: Student will be able to
CO1 Correlate with the basic concepts and properties of electrical circuits and networks.
CO2 Practice computer skills (ORCAD PSPICE and Capture) for the analysis and design of circuits.
CO3 Demonstrate proficiency in the use of high-performance engineering modeling and analysis software (MATLAB and SIMULINK) for control system analysis and design in this course and for subsequent engineering practice.
CO4 Develop the simulation of power electronics circuits with different loads.
CO5 Observe several concepts and procedures learned in power system modeling and analysis and also electrical machines.
CO6 To impart knowledge on how these tools are used in Industries by solving some real time problems using these tools

List of experiments:

1) To plot three phase currents and neutral current of three phase circuit.
2) To obtain Transient Response of RLC Circuits for
   a) Pulse input, b) Step input, and c) Sinusoidal input.
3) Simulation of Single phase full converter using RL & E load without freewheeling diode.
4) Simulation of Three phase full converter using RL & E Load.
5) Simulation of single phase AC Voltage controller using RL load.
6) Modeling of transformer and simulation of transmission line.
7) Simulation of single phase inverter with sinusoidal pulse width modulation control using MATLAB/SIMULINK.
8) Development and Simulation of 3-phase PWM Inverter with sinusoidal pulse-width modulation using MATLAB/SIMULINK.
9) Simulation of Resonant pulse commutation circuit and buck chopper using MATLAB/SIMULINK.
10) Simulation of capacitor start-run single phase induction motor using MATLAB/SIMULINK.
11) Gauss-Seidel method of Power flow solution of given power system network using MATLAB.
12) Linear system analysis (Time domain analysis, Error analysis) using MATLAB.

INDUSTRIAL AUTOMATION LAB

Subject Code: 20EEL411

L	T	P	C
0	0	3	1.5

Course objective:
To enable the students to gain sufficient knowledge on the programmable logic controller & SCADA and their applications.

Course outcomes: Student will be able to

CO1: Develop the ladder logic diagram for Boolean logic gates.
CO2: Develop the ladder logic diagram for Boolean logic expressions.
CO3: Develop the ladder logic diagrams for timers, counters and their combinations.
CO4: Develop the ladder latching logic diagram for counters and timers.
CO5: Develop ladder logic for various practical applications using timers
CO6: Development of ladder logic for various practical applications using timers and counters.

1. Switch on light/off light for logic gates - AND, OR, NOT, NOR, NAND, XOR, XNOR by using Ladder Logic with PLC and SCADA monitoring.

2. Switch on light/off light for logic gates HALF ADDER, FULL ADDER by using Ladder Logic with PLC and SCADA monitoring.

3. Develop the ladder logic for the given Boolean logic function before and after simplification with PLC and SCADA monitoring.

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

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

6. Develop small ladder logic programs for traffic signal control with PLC and SCADA monitoring.

7. Develop a ladder logic program that will flash a light once every one second with PLC and SCADA monitoring

8. Develop ladder logic with for the motor which is controlled by two switches PLC and SCADA monitoring. (using Counters only)

9. Develop ladder logic for the motor which is controlled by two switches with PLC and Scada monitoring.(using Timers and counters)

10. Develop ladder logic for microwave oven operation using PLC and SCADA monitoring.

11. Develop ladder logic for conveyor run by switching on or off a motor with PLC and SCADA monitoring.

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

ELECTRIC VEHICLE ENGINEERING

Honors/Minor Course

Subject Code: 20EVI404

L	T	P	C
3	0	2	4

COURSE OBJECTIVES:

- To provide broad knowledge about the Electric Vehicle (EV) and hybrid electrical vehicles(HEV), and electrical drive-traine.
- To provide broad knowledge about of EV and EHV storage systems and various charge controllers.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe the components of EV and comparison with IC engines.
- Understand the concepts of electric vehicles, hybrid electric vehicles and their impact on environment.
- Analyze the drive-train topologies and advanced propulsion techniques.
- Analyze energy storage methodologies
- Analyze hybrid energy storage methodologies.
- Select suitable power converter topologies for motor control and hybrid energy storage.
- Analyze different fundamental charge controllers.

UNIT-I

ELECTRIC VEHICLE: Introduction, History, Components and Comparison with Internal combustion Engine -Technology, Benefits and Challenges.

Tractive Effort Modelling and Electric Vehicle Acceleration Modelling and their simulaton.

UNIT-II

Hybrid Electric Vehicles: Micro hybrid vehicles, mild hybrid vehicles, full hybrid vehicles, Parallel hybrid vehicles, series Hybrid Vehicles, Series-Parallel Hybrid vehicles, plug-in hybrid vehicles, power flow diagrams for various operating modes. Plug-in Hybrid Vehicles: Operating principle.

Hybrid vehicles modelling and simulation.

UNIT-III

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

The power flow of electric vehicle model and simulation.

UNIT-IV

Energy Storage devices and their analysis: Storage requirements for Electric Vehicles, Battery based energy storage, Fuel Cell based energy storage, and Super Capacitor based energy storage and their analysis.Energy management systems.

Developing Battery Management Systems with and their simulation.

UNIT-V

Converters for Hybrid Energy Storage Systems: Converter configurations for hybrid energy systems based on Battery and Ultra Capacitors-cascaded converter, multiple parallel connected converter and switched capacitor converter.

UNIT-VI

Fundamentals of Chargers: Charger classifications and standards, selection of AC charging systems, DC charging systems, Converter topologies for charging, wireless chargers.

Fast dc charge simulation for EV

TEXT BOOKS:

1. Advanced Electric Drive Vehicles, Ali Emadi, CRC Press, Taylor & Francis Group, 2015.
2. Electric and Hybrid Vehicles: Design Fundamentals (3rd ed, 2021) by Iqbal Husain (ISBN-13: 978-0367693930)
3. Automotive Mechanics Vol-I&II, Kripal Singh, Standard Pub.

REFERENCES BOOKS:

1. Electric and Hybrid Vehicles: Technologies, Modeling and Control (1st ed, 2014) by Khajepour, Fallah, and Goodarzi (ISBN-13: 978-1118341513)
2. Electric Vehicle Technology Explained, James Larminie, John Lowry, Wiley, 2003.