

श्रीचन्द्रशेखरेन्द्रसरस्वतीविश्वमहाविद्यालयः

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

Deemed to be University u/s 3 of UGC Act 1956 | Accredited with "A" grade by NAAC

Enathur, Kanchipuram - 631 561. Tamilnadu, India

www.kanchiuniv.ac.in

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E - EEE (FULL TIME)

CURRICULUM - 2024 ONWARDS

FOR CANDIDATES ADMITTED DURING THE YEAR 2024 ONWARDS

(CHOICE BASED CREDIT SYSTEM)



DEPARTMENT VISION AND MISSION

VISION

- To develop effective and efficient Electrical Engineers endowed with conceptual clarity, ethicality and a visionary zeal.

MISSION

- To provide quality teaching empowered with application skills.
- To mould leaders in Electrical Engineering with an all around personality.
- To encourage faulty members and students in research, capable of finding solutions for the problems in the society

PROGRAMME OBJECTIVES

- **PEO: I** To provide students with the knowledge of Basic Sciences in general and Electrical and electronics Engineering in particular so as to acquire the necessary skills for analysis and synthesis of problems in generation, transmission and distribution.
- **PEO 2**: Prepare students to meet the demands of contemporary industrial requirements and successfully engage them in appropriate careers.
- **PEO 3:** Connectivity in learning and professional improvement.
- **PEO 4**: Develop technical leadership qualities with ethicality.
- **PEO 5:** To induce students to design electrical, electronics, computing systems that are innovative and socially acceptable.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOS)

For a graduate study in EE engineering

- to work in research and development organizations
- for employment in electrical power industries
- to acquire job in electronic circuit design and fabrication industries
- to work in IT and ITES industries

PROGRAMME OUTCOMES/GRADUATE ATTRIBUTES

PO1: Engineering Knowledge: Apply the Knowledge of mathematics, science, Engineering fundamentals and an Engineering Specialization to the solution of complex engineering problems.

PO2: **Problem Analysis**: Identify formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.

PO3: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..

PO4: **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.

PO5: **Modern Tool usage:** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: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.

PO7: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.

PO8:Ethics: Apply ethical principle and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9:Individual and Team Work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO10: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.

PO11:Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work and member and leader in a team to manage projects and in multidisciplinary environments.

PO12: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.

N.B Graduate attributes have been assigned for all the courses

DEFINITION OF CREDIT

INDUCTION PROGRAM (details of induction program also available in the curriculum of mandatory courses)

Hr. Lecture (L) per week	1 credit
1 Hr. Tutorial (T) per week	1 credit
1 Hr. Practical (P) per week	0.5 credits
2 Hours Practical(Lab)/week	1 credit

Induction Program (Mandatory)	3 Weeks Duration
Induction Program for students to be offered right at the start of the first year	• Physical Activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to Local Areas • Familiarization to Dept/Branch & Innovations

B.O.S MEMBERS

SL. NO.	NAME OF THE MEMBER	DESIGNATION	ADDRESS	Feedback	SIGNATURE
1.	Dr.M.Rathinakumar	Representative for Hon'ble VC	Dean(E&T), SCSVMV		
2.	Dr.N.Ashokkumar	Chairman	Assistant Professor, Dept. of EEE,SCSVMV & HOD		
3.	Dr.S.Sentamilselvan	Internal Member	Associate Professor, Dept. of EEE, SCSVMV		
4.	Dr.R.Malathi	Internal Member	Associate Professor, Dept. of EEE,SCSVMV		
5.	Dr.R.Karthikeyan	Internal Member	Assistant Professor III, Dept. of EEE,SCSVMV		
6.	Dr.D.Vanitha	Internal Member	Assistant Professor II, Dept. of EEE,SCSVMV		
7.	Dr.A.Selvaraj	External Member	Professor & Faculty In charge of COE-EV,Dept of EEE,Rajalakshmi Engineering College		
8.	Dr.R.Sridhar	External Member	Professor and Head,Power Electronics in Renewable Energy Systems,EEE,SRM University,Kattankulathur		
9.	Mr.N.Ganesh	Co-opted Member	Mecwin Tech Pvt Ltd Bangalore,Karnataka		
10.	Mr.I.Saran	Co-opted Member	ZUMBACH Electronics Pvt Ltd Pune		

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

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Enathur, Kanchipuram – 631561

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM AND SYLLABUS FOR FULL TIME

B.E. (Electrical and Electronics Engineering)

(Applicable for students admitted from 2026-2027 onwards)

REGULATION AY 2026-2027

B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

These regulations are applicable to the students admitted from the AY 2026-27 Onwards.

CHOICE BASED CREDIT SYSTEM FOR B.E. (EEE) FULL-TIME PROGRAMME

CREDITS

Theory courses: Courses with 4/3 credits will be assigned 4/3 Lecture hours per week.

Practical courses: Courses with 2 credits will be assigned 4 hours of lab/practical work per week.

Each semester curriculum shall normally have a blend of theory and practical courses. In the first year the total number of credits will be around 20 for each Semester. For semester III to VII, the average credits per semester will be about 21–24 and for semester VIII, the credits will be about 9–16. For the award of the degree, a student has to earn a minimum of 160 credits.

DURATION OF THE PROGRAMME

A student is normally expected to complete the B.E (EEE) programme in four years and in any case, not more than seven years from the time of admission.

REGISTRATION FOR COURSES

A newly admitted student will automatically be registered for all the courses prescribed for the first year, without any option.

All other students shall submit a completed registration form indicating the list of courses intended to be credited during the next semester. This registration will be done a week before the last working day of the current semester. Late registration, with the approval of the Dean on the recommendation of the Head of the Department, along with a late fee will be done, up to the last working day.

Registration for the project work shall be done only for the final semester.

ASSESSMENT

The break-up of assessment and examination marks for theory subjects is as follows.

First Assessment Test : 15 Marks

Second Assessment Test : 15 Marks

Assignment & Attendance (seminars, group discussion) : 10 Marks

Total (Internal Marks) : 40 Marks

End semester Examination (External Marks) : 60 Marks

Total (Internal + External) : 100 Marks

The break-up of the assessment and examination marks for practical is as follows.

Observations : 15 Marks

Model Test : 15 Marks

Record book & Attendance : 10 Marks

Total (Internal Marks) : 40 Marks

End semester Examination (External Marks) : 60 Marks

Total (Internal + External) : 100 Marks

The project work will be assessed for 40 marks by a committee consisting of the Guide and the Head of the Department. The Head of the Department shall be the Chairman. 60 marks are allotted for the project viva voce examination at the end of the semester.

WITHDRAWAL FROM A COURSE

A student can withdraw from the course at any time before a date fixed by the Head of the Department prior to the second assessment, with the approval of the Dean on the recommendation of the Head of the Department.

TEMPORARY BREAK OF STUDY

A student can take a one-time temporary break of study covering the current year/semester and/or the next semester with the approval of the Dean on the recommendation of the Head of the Department, not later than seven days after the completion of the mid-semester test. However, the student must complete the entire program within the maximum period of seven years.

SUBSTITUTE ASSESSMENT

A student, who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the end semester examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the commencement of the end-semester examination.

A student who wishes to have a substitute assessment for a missed assessment must apply to the concerned faculty member within a week from the date of the missed assessment.

ATTENDANCE REQUIREMENTS

To be eligible to appear for the examination in a particular course, a student must put in a minimum of 80% of attendance in the course. However, if the attendance is 70% or above but less than 80% in any course, the authorities can permit the student to appear for the examination in the course on payment of the prescribed condonation fee.

A student who withdraws from or does not meet the minimum attendance requirement in the course must re-register for and repeat the course.

PASSING AND DECLARATION OF EXAMINATION RESULTS

All assessments of all the courses on the absolute mark basis will be considered and passed by the results passing board in accordance with the rules of the University. Thereafter, the Controller of Examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the grade point average & cumulative grade point average and prepare the grade cards.

90 to 100 marks - Grade 'S'

80 to 89 marks - Grade 'A'

70 to 79 marks - Grade 'B'

60 to 69 marks - Grade 'C'

55 to 59 marks - Grade 'D'

50 to 54 marks - Grade 'E'

less than 50 marks - Grade 'F'

Insufficient attendance - Grade 'I'

Withdrawn from the course - Grade 'W'

A student who obtains less than 50 marks out of 100 in the subject or less than 24 out of 60 in the External exam or is absent for the examination will be awarded Grade 'F'.

A student who earns a grade of S, A, B, C, D or E for a course is declared to have successfully completed that course and earned the credits for that course. Such a course cannot be repeated by the student.

A student who obtains letter grade F in a course has to reappear for the examination in that course.

The following grade points are associated with each letter grade for calculating the grade point average.

S – 10; A – 9; B – 8; C – 7; D – 6; E – 5; F – 0

A student can apply for revaluation of one or more of his/her examination answer papers within a week from the date of issue of Grade sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After results are declared, Grade cards will be issued to the students. The Grade card will contain the list of courses registered during the year/semester, the grades scored and the grade point average (GPA) for the year/semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the Year/Semester, divided by the sum of the number of credits for all courses taken in that year/semester. CGPA is similarly calculated considering all the courses taken from the time of admission.

After successful completion of the program, the Degree will be awarded with the following classification based on CGPA:

For First Class with Distinction, the student must earn the minimum required credits within four years from the time of admission, pass all the courses in the first attempt and obtain a CGPA of 8.25 or above.

For First Class, the student must earn the minimum required credits within four years from the time of admission and obtain a CGPA of 6.5 or above.

For Second Class, the student must earn the minimum required credits within seven years from the time of admission.

ELECTIVES

Apart from the various Core courses offered in the curriculum of the branch of specialization, a student can choose electives from a list of electives offered by the Department and from other Departments with the approval of the Head of the Department and the Head of the Department offering the course.

EXAMINATION PATTERN FOR MANDATORY COURSES

There will not be any External examination for Mandatory Courses. Performance of students will be assessed through tests and assignments conducted by the Department.

DEFINITION OF CREDIT

Sl.No	No. of hours per week	No. of credits
1	1 Hr. Lecture (L) per week	1 credit
2	1 Hr. Tutorial (T) per week	1 credit
3	1 Hr. Practical (P) per week	0.5 credit
4	2 Hrs. Practical (Lab) per week	1 credit

MAPPING OF PEOs, POs

DEPARTMENT VISION

To develop effective and efficient Electrical Engineers endowed with conceptual clarity, ethicality and a visionary zeal.

DEPARTMENT MISSION

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- To encourage faulty members and students in research, capable of finding solutions for the problems in the society

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. I To provide students with the knowledge of Basic Sciences in general and Electrical and electronics Engineering in particular so as to acquire the necessary skills for analysis and synthesis of problems in generation, transmission and distribution.

2. Prepare students to meet the demands of contemporary industrial requirements and successfully engage them in appropriate careers.

3. Connectivity in learning and professional improvement.

4. Develop technical leadership qualities with ethicality.

5. To induce students to design electrical, electronics, computing systems that are innovative and socially acceptable.

PROGRAM OUTCOME(S) (POs) for B.E (EEE)

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, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science 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 modelling to complex engineering activities with an understanding of the limitations.

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

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11. Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work and 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.

Note: Programme Specific Outcomes (PSOs) for the department, as referenced in the course-level CO–PO/PSO mapping tables, are to be consolidated and formally notified by the Board of Studies; they are not restated here as a standalone list in the source curriculum document.

CREDIT DISTRIBUTION

Sl.No	Category	Credits
1	Humanities and Social Science Including Management Courses (HSMC)	12
2	Basic Science Courses (BSC)	21
3	Engineering Science Courses (ESC)	13
4	Professional Core Courses (PCC)	73
5	Professional Elective Course (PEC)	21
6	Open Elective Courses (OEC)	6
7	Mandatory Courses (MC)	5
8	Project / Internship Work (PROJ / INT.)	9

	Total Credits	160

(Computed from the category tags used against each course in the semester-wise curriculum; to be verified and formally approved by the Board of Studies.)

COURSE CODE AND DEFINITION

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
IA / CIA	Internal Assessment
EA / SEE	External Assessment
TM	Total Marks
HSMC	Humanities and Social Science Including Management Courses
BSC	Basic Science Courses
ESC	Engineering Science Courses
PCC	Professional Core Courses
PEC	Professional Elective Course
OEC	Open Elective Courses
MC	Mandatory Courses
PROJ / INT.	Project Work / Industrial Training & Practice

SUMMARY OF CREDITS

Sem	HSMC	BSC	ESC	PCC	PEC	OEC	MC	PROJ	Total
I	4	11	2	-	-	-	-	-	17
II	5	7	9	-	-	-	1	-	22
III	1	3	1	14	-	-	1	-	20
IV	1	-	1	22	-	-	-	-	24
V	1	-	-	16	3	-	3	-	23
VI	-	-	-	13	6	3	-	-	22
VII	-	-	-	8	9	3	-	3	23
VIII	-	-	-	-	3	-	-	6	9
Total	12	21	13	73	21	6	5	9	160

CURRICULUM OF B.E. (EEE)

SEMESTER – I

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	English	AEC - I	2	0	0	2	40	60	100
2	Mathematics –I	BSC	3	1	0	4	40	60	100
3	Universal Human Values	VAC - I	2	1	0	2	40	60	100
4	Engg Physics	BSC	2	0	1	3	40	60	100
5	Environmental Science and Engineering	MC*	2	0	0	0	40	60	100
	Laboratory								
6	IDEA Lab	BSC	0	0	2	2	40	60	100
7	Design Thinking Lab	ESC	0	0	2	2	40	60	100
8	Engg Physics Lab	BSC	0	0	2	2	40	60	100

SEMESTER – II

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Mathematics – II	BSC	3	1	0	4	40	60	100
2	Engineering Chemistry	HSMC	2	0	1	3	40	60	100
3	Basic Electrical and Electronics Engineering	ESC	2	1	0	3	40	60	100
4	Programming for Problem solving	ESC	2	0	0	2	40	60	100
5	Engineering Graphics and design.	BSC	2	0	1	3	40	60	100
	Laboratory								
6	Basic Electrical and Electronics Engineering Lab	ESC	0	0	2	2	40	60	100
7	Engineering Chemistry Lab	HSMC	0	0	2	2	40	60	100
8	Problem Solving Programming Lab	ESC	0	0	2	2	40	60	100
9	Soft Skills	MC	2	0	0	1			100
10	Industrial Visit/Seminar	MC	0	0	2	0			100
11	NSS/Green Cell/Club Activity	MC	0	0	1	0			100

SEMESTER – III

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Mathematics –III (Probability and Statistics)	BSC	3	1	0	3	40	60	100
2	Electromagnetic Theory	PCC	2	0	1	3	40	60	100
3	Digital System Design	PCC	2	1	0	3	40	60	100
4	Electric Circuit Theory	PCC	2	1	0	3	40	60	100
5	Object Oriented Programming	PCC	2	0	1	2	40	60	100
6	Sanskrit and Indian Culture and IKS	MC*	1	0	0	1*	-	-	100

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
7	Ability Enhancement Course1	AEC	0	0	2	1	-	-	100
8	Internship with Project	PCC	0	0	2	1	-	-	100
9	Vocational skill Development Course1	VSDC	0	0	2	1	-	-	100
	Laboratory								
10	Electric Circuit Theory Lab	PCC	0	0	2	2	40	60	100
11	Object Oriented Programming Lab	PCC	2	0	1	0	0	0	0

SEMESTER – IV

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Measurement and Instrumentation	PCC	3	0	0	3	40	60	100
2	D.C Machines and Transformers	PCC	2	0	1	3	40	60	100
3	Analog Electronics	PCC	3	0	0	3	40	60	100
4	Generation, Transmission and Distribution	PCC	3	0	0	3	40	60	100
5	Data Structures and Algorithms	PCC	2	0	1	3	40	60	100
6	Microprocessor and Microcontroller	PCC	2	0	1	3	40	60	100
7	Ability Enhancement Course 2	AEC	0	0	2	1	-	-	100
8	Vocational skill Development Course 2	VSDC	0	0	2	1	-	-	100
	Laboratory								
9	Analog and Digital Electronics Lab	PCC	0	0	2	2	40	60	100
10	DC Machines and Transformer Lab	PCC	0	0	2	2	40	60	100

SEMESTER – V

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Entrepreneurship & Start up	HSSM	2	0	0	1			100
2	Induction and Synchronous Machines(T&P	PCC	2	0	1	3	40	60	100
3	Power Systems - I [Modelling and Components	PCC	2	1	0	3	40	60	100
4	Control Systems(T&P	PCC	2	0	1	3	40	60	100
5	Professional Elective Course 1	PEC	2	1	0	3	40	60	100
6	DSP and its Applications(T&P)	MC*	2	0	1	3	40	60	100
7	Data base Management [T&P]	PCC	2	0	1	3	40	60	100
	Laboratory								
8	Control Systems and Instrumentation Lab	PCC	0	0	2	2	40	60	100
9	AC Machines Lab	PCC	0	0	2	2	40	60	100

SEMESTER – VI

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Power Electronics	PCC	2	1	0	3	40	60	100
2	Embedded Systems	PCC	2	0	0	3	40	60	100
3	Power Plant Engineering.	PCC	2	1	0	3	40	60	100
4	Professional Elective Course2	PEC	2	1	0	3	40	60	100
5	Professional Elective Course3	PEC	2	1	0	3	40	60	100
6	Open Elective Course 1	OEC	2	0	0	3	40	60	100
7	Automotive Electronics								
	Laboratory								
8	Power System Protection and Testing Lab	PCC	0	0	2	2	40	60	100
9	DSP and Microcontroller Lab	PCC	0	0	2	2	40	60	100

SEMESTER – VII

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Protection and Switchgear	PCC	2	1	0	3	40	60	100
2	Professional Elective Course 4	PEC	2	1	0	3	40	60	100
3	Professional Elective Course 5	PEC	2	1	0	3	40	60	100
4	Open Elective Course 2	OEC	2	0	0	3	40	60	100
5	Professional Elective Course 6	PEC	2	1	0	3	40	60	100
6	Electrical Energy Conservation ,Utilisation and Auditing	PCC	2	1	0	3	40	60	100
	Laboratory								
7	Embedded System Design Lab	PCC	0	0	2	2	40	60	100
8	Major Project Work [Phase1]	P II	0	0	4	2	40	60	100
9	Internship	PII	-	-	-	1	40	60	100

SEMESTER – VIII

Sl.No	Course Title	Category	L	T	P	C	IA	EA	TM
1	Professional Elective Course 7 Can be Taken in any Online Mode(NPTEL/MOOCS/ANY ONLINE PLATFORM)	PEC	2	1	0	3	40	60	100
	Laboratory								
2	Major Project Work - Phase 2	P II	0	0	6	6	40	60	100

Humanities and Social Science Including Management Courses (HSMC)

Sl.No	Course Title	L	T	P	C
1	English	2	0	0	2
2	Universal Human Values	2	1	0	2
3	Engineering Chemistry	2	0	1	3
4	Engineering Chemistry Lab	0	0	2	2
5	Ability Enhancement Course1	0	0	2	1
6	Ability Enhancement Course 2	0	0	2	1
7	Entrepreneurship & Start up	2	0	0	1

Basic Science Courses (BSC)

Sl.No	Course Title	L	T	P	C
1	Mathematics –I	3	1	0	4
2	Engg Physics	2	0	1	3
3	IDEA Lab	0	0	2	2
4	Engg Physics Lab	0	0	2	2
5	Mathematics – II	3	1	0	4
6	Engineering Graphics and design.	2	0	1	3
7	Mathematics –III (Probability and Statistics)	3	1	0	3

Engineering Science Courses (ESC)

Sl.No	Course Title	L	T	P	C
1	Design Thinking Lab	0	0	2	2
2	Basic Electrical and Electronics Engineering	2	1	0	3
3	Programming for Problem solving	2	0	0	2
4	Basic Electrical and Electronics Engineering Lab	0	0	2	2
5	Problem Solving Programming Lab	0	0	2	2
6	Vocational skill Development Course1	0	0	2	1
7	Vocational skill Development Course 2	0	0	2	1

Professional Core Courses (PCC)

Sl.No	Course Title	L	T	P	C
1	Electromagnetic Theory	2	0	1	3
2	Digital System Design	2	1	0	3
3	Electric Circuit Theory	2	1	0	3
4	Object Oriented Programming	2	0	1	2
5	Internship with Project	0	0	2	1
6	Electric Circuit Theory Lab	0	0	2	2

Sl.No	Course Title	L	T	P	C
7	Object Oriented Programming Lab	2	0	1	0
8	Measurement and Instrumentation	3	0	0	3
9	D.C Machines and Transformers	2	0	1	3
10	Analog Electronics	3	0	0	3
11	Generation, Transmission and Distribution	3	0	0	3
12	Data Structures and Algorithms	2	0	1	3
13	Microprocessor and Microcontroller	2	0	1	3
14	Analog and Digital Electronics Lab	0	0	2	2
15	DC Machines and Transformer Lab	0	0	2	2
16	Induction and Synchronous Machines(T&P	2	0	1	3
17	Power Systems - I [Modelling and Components	2	1	0	3
18	Control Systems(T&P	2	0	1	3
19	Data base Management [T&P]	2	0	1	3
20	Control Systems and Instrumentation Lab	0	0	2	2
21	AC Machines Lab	0	0	2	2
22	Power Electronics	2	1	0	3
23	Embedded Systems	2	0	0	3
24	Power Plant Engineering.	2	1	0	3
25	Power System Protection and Testing Lab	0	0	2	2
26	DSP and Microcontroller Lab	0	0	2	2
27	Protection and Switchgear	2	1	0	3
28	Electrical Energy Conservation ,Utilisation and Auditing	2	1	0	3
29	Embedded System Design Lab	0	0	2	2

Professional Elective Course (PEC)

Sl.No	Course Title	L	T	P	C
1	Professional Elective Course 1	2	1	0	3
2	Professional Elective Course2	2	1	0	3
3	Professional Elective Course3	2	1	0	3
4	Professional Elective Course 4	2	1	0	3
5	Professional Elective Course 5	2	1	0	3
6	Professional Elective Course 6	2	1	0	3
7	Professional Elective Course 7 Can be Taken in any Online Mode(NPTEL/MOOCS/ANY ONLINE PLATFORM)	2	1	0	3

Open Elective Courses (OEC)

Sl.No	Course Title	L	T	P	C

Sl.No	Course Title	L	T	P	C
1	Open Elective Course 1	2	0	0	3
2	Open Elective Course 2	2	0	0	3

Mandatory Courses (MC)

Sl.No	Course Title	L	T	P	C
1	Environmental Science and Engineering	2	0	0	0
2	Soft Skills	2	0	0	1
3	Industrial Visit/Seminar	0	0	2	0
4	NSS/Green Cell/Club Activity	0	0	1	0
5	Sanskrit and Indian Culture and IKS	1	0	0	1*
6	DSP and its Applications(T&P)	2	0	1	3

Project / Internship Work (PROJ / INT.)

Sl.No	Course Title	L	T	P	C
1	Major Project Work [Phase1]	0	0	4	2
2	Internship	-	-	-	1
3	Major Project Work - Phase 2	0	0	6	6

PROFESSIONAL ELECTIVES [PEC]

1. Computer Architecture.
2. Java Programming and Applications
3. Cloud Computing Fundamentals.
4. Fundamentals of big Data Analysis.
5. Electrical Machine Design
6. Special Electrical Machines
7. Control and Maintenance of Electrical Equipments
8. Embedded Control for Drives Applications
9. Smart grid
10. Design and layout of power apparatus.
11. High voltage Engineering
12. High voltage DC Transmission.
13. Power System Analysis and Control
14. Automotive Electronics
15. Digital Image Processing
16. Virtual Instrumentation
17. Bio Medical Engineering
18. Principles of Communication Engineering
19. Smart Sensors For Engineering Applications
20. Electrical Safety Management
21. Maintenance and Safety Engineering
22. Environmental Safety
23. Industrial Safety, Health And Environment Acts
24. Advanced power Electronics And Drives
25. Electric Vehicles and Hybrid Vehicle.
26. Advanced Power Electronics Lab.
27. Power Quality
28. Electric Vehicle Architecture
29. Electric Vehicle Design, Mechanics and Control
30. Design of Electric Vehicle Charging System
31. Hybrid Electric Vehicle.
32. Embedded C programming
33. Embedded Control for Electric Drives
34. Smart System Automation
35. Embedded System for Automotive Applications
36. VLSI Design Architecture
37. Robotics and Automation

OPEN ELECTIVES [OEC]

1. Solar PV Systems, Design (NSDC)
2. Maintenance of Power Transformer, DG Sets, Industrial Power Distribution(NSDC)
3. Wind Energy, System Design, Control and Maintenance.(NSDC)
4. FPGA Design Lab -System Design (NSDC)
5. Internet of Things (IOT)
6. Fundamentals of Big Data Analysis
7. Bio Information
8. Web development using Python
9. Drone Technology

Course Code		L	T	P	C
Course Title	ENGLISH	2	1	0	3

Course Category: HSMC

OBJECTIVES

- To enhance students' proficiency in English language skills.
- To develop students' ability to think analytically, speculatively, and imaginatively.
- To help students see themselves as professionals, as part of a discipline with skills and abilities valuable in business, teaching, publishing, etc.

COURSE OUTCOMES

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

CO1. To enhance vocabulary building

CO2. Techniques for basic writing skills

CO3. Identifying common errors in writing

CO4. Ability to nature and style of sensible writing

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	M	L	L	L	M	M	L	M
CO2	-	-	-	-	M	L	L	L	L	L	L	M
CO3	-	-	-	-	L	L	L	L	L	L	L	L
CO4	-	-	-	-	L	L	L	L	L	L	L	L

SYLLABUS

UNIT I VOCABULARY BUILDING
The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance with prefixes and suffixes from foreign languages in English to form Derivatives - Synonyms, antonyms, and standard abbreviations.
UNIT II BASIC WRITING SKILLS
Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence - Organizing principles of paragraphs in documents - Techniques for writing precisely.
UNIT III IDENTIFYING COMMON ERRORS IN WRITING
Subject-verb agreement - Noun pronoun agreement - Misplaced modifiers - Articles - Prepositions - Redundancies - Cliches.
UNIT IV NATURE AND STYLE OF SENSIBLE WRITING
Describing - Defining - Classifying - Providing examples or evidence -Writing introduction and conclusion.
UNIT V WRITING PRACTICES
Comprehension - Précis Writing - Essay Writing.

UNIT VI ORAL COMMUNICATION
(This unit involves interactive practice sessions in Language Lab)Listening Comprehension - Pronunciation, Intonation, Stress and Rhythm - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations.

TEXT BOOKS

1. Practical English Usage. Michael Swan. OUP. 4th edition.

2. Remedial English Grammar. F.T. Wood. Macmillan.Jan 2014

3. On Writing Well. William Zinsser. Harper Resource Book. 9th May 2006.

REFERENCES

1. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2nd edition 31st Jan 2007.

2. Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2nd Edition 2015.

WEB / ONLINE RESOURCES

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Dept. of EEE

Course Code		L	T	P	C
Course Title	MATHEMATICS - I (Calculus and Differential Equations)	3	1	0	4

Course Category: BSC

OBJECTIVES

- The objective of this course is to familiarize the prospective engineers with techniques in calculus, differential equations and sequence and series. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics.

COURSE OUTCOMES

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

CO1. The objective of this course is to familiarize the prospective engineers with techniques in basic calculus, analysis and numerical computations.

CO2. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

CO3. The concept of convergence and divergence and their testing that is fundamental to application of analysis to Engineering probes.

CO4. The effective mathematical tools for the solutions of differential equations that model physical processes.

CO5. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

CO6. The mathematical tools needed in evaluating multiple integrals and their usage. To deal with functions of several variables that are essential in most branches of engineering.

CO7. To improve the ability of numerical computations to find the solutions of a given polynomial and transcendental equations along knowing the process of inter and extrapolations that improves the ability of solving helps to perform computational engineering problems.

CO8. Solve problems involving eigenvalues, eigenvectors, and reduce matrices and quadratic forms to canonical forms.

CO9. Apply numerical methods to find approximate solutions of algebraic and transcendental equations.

CO10. Use interpolation techniques and numerical integration/differentiation for estimating values from data.

CO11. Evaluate double and triple integrals, and apply Beta and Gamma functions in engineering contexts.

CO12. Compute gradient, divergence, and curl, and apply vector integral theorems in physical applications.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	-	M	-	-	M	M	M
CO2	S	S	S	S	S	-	-	-	M	M	L	M
CO3	S	S	S	S	S	-	M	-	L	M	L	M
CO4	S	S	S	S	S	-	M	L	M	M	M	M
CO5	S	S	S	S	S	-	L	-	L	M	L	M

SYLLABUS

UNIT I MATRICES
Eigen Value and Eigen Vectors – Properties of Eigen Values – Cayley-Hamilton Theorem – Reduction to Diagonal Form – Reduction of Quadratic Form to Canonical Form – Nature of Quadratic Forms.
UNIT II NUMERICAL SOLUTIONS TO ALGEBRAIC EQUATIONS
Introduction – Solution of Algebraic and Transcendental Equations – Bisection Method, Method of False Position, Newton's Method – Solution of Linear Simultaneous Equations – Direct Methods of Solution – Gauss Elimination, Gauss-Jordan Method – Indirect Methods of Solution –Jacobi's Method, Gauss-Seidel Method.
UNIT III INTERPOLATION, NUMERICAL DIFFERENTIATION AND INTEGRATION
Finite Differences – Newton's Interpolation Formula – Interpolation with Unequal Intervals – Lagrange's Formula – Divided Differences – Newton's Divided Difference Formula. Numerical Differentiation – Formulae for Derivatives – Numerical Integration – Newton-Cote's Quadrature Formula – Trapezoidal Rule – Simpson's 1/3rd Rule – Simpson's 3/8th Rule.
UNIT IV MULTIPLE INTEGRALS AND BETA-GAMMA FUNCTIONS
Double Integrals – Change of Order of Integration – Double Integrals in Polar Coordinates – Area enclosed by Plane Curves – Triple Integrals – Volume of Solids – Beta Function – Gamma Function – Relation between Beta Function and Gamma Function.
UNIT V VECTOR CALCULUS
Scalar and Vector Point Functions-Vector Operator del. – Del applied to Scalar Point Functions-Gradient – Del applied to Vector Point Functions-Divergence and Curl – Del applied twice to Point Functions – Del applied to Product of Point Functions – Integration of Vectors – Line Integrals-Circulation-Work – Surface Integral-Flux – Green's Theorem in the Plane – Stoke's Theorem – Volume Integral – Divergence Theorem – Irrotational and Solenoidal Fields.(statement only for theorems)

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.

2. B.S. Grewal, "Higher Engineering Mathematics", Khanna Publishers,43rd Edition Jan 2010.

REFERENCES

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition.

2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, Pearson, 9th Edition Jan 2010.

3. T. Veerarajan, Engineering Mathematics, McGraw-Hill, New Delhi, 3rd Edition 2011.

4. B. V. Ramana, Higher Engineering Mathematics, McGraw Hill, New Delhi, 2010.

5. N.P. Bali and M. Goyal, A text book of Engineering Mathematics, Laxmi Publications,9th Edition 2016.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	**Engineering PHYSICS**	3	1	0	3

Course Category: BSC

OBJECTIVES

- Theory of Interference- Newton's rings, Michelson Interferometer, Fresnel and Fraunhoffer diffraction, Diffraction due to "n" slits – Plane Transmission grating.
- Energy distribution in black body-Planck's law, De Broglie matter waves – dual nature and expression, Schrodinger Time Independent and Dependent, wave equation, Expression for particle in 1-D box and applications.
- Laser-Principles and Properties, Einstein's theory, Types of lasers – Nd:YAG and CO2 laser Applications of lasers – IR Thermograph, Optical fibers- Types of optical fibers, Acceptance angle and numerical aperture, Fiber losses, Applications in engineering and medicine.
- PN Junction diode and Zener diode - V-I characteristics, BJT, SCR, FET, D-MOSFET, E-MOSFET Characteristics, Characteristics of CMOS, Logic Gates and Universal Building Blocks.
- Fundamentals of dielectric materials, Internal field and Clausius-Mossotti relation, Superconductors – properties and types - BCS theory, Nanomaterials – Synthesis, Ball milling and PVD method. Principle and properties of SMA and Biomaterials.

COURSE OUTCOMES

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

CO1. The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

CO2. To develop an understanding of the principles of optics.

CO3. Experience the diverse applications of the wave equation. Learn the mathematical tools needed to solve quantum mechanics problems.

CO4. To provide adequate knowledge on laser fundamentals types and applications and to expose the basics of signal propagation through fiber optics

CO5. Understand the principles and concepts of semiconductor Physics. Understand and utilize the mathematical models of semiconductor junctions and MOS transistors for circuits and systems

CO6. Acquire basic knowledge on various newly developed smart materials

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	L	M	L	M	M	L	L
CO2	S	S	S	S	S	M	M	L	M	M	L	L
CO3	S	S	S	S	S	M	M	M	M	S	S	S
CO4	S	S	S	S	S	L	L	L	M	M	M	M
CO5	M	M	M	M	M	S	S	M	M	M	M	M

SYLLABUS

UNIT I WAVE OPTICS
Huygens' principle, superposition of waves –Theory of interference of light -Young's double slit experiment. Thin films- Newton's rings, Michelson interferometer-Anti reflection coating. Fresnel and Fraunhofer diffraction– diffraction due to 'n' slits- plane transmission grating. Rayleigh criterion for limit of resolution - resolving power of grating
UNIT II QUANTUM PHYSICS
Black body radiation-Planck's law – Energy distribution function, Wave – particle duality-de Broglie matter waves – Concept of wave function and its physical significance – Heisenberg's Uncertainty Principle – Schrodinger's wave equation – Time independent and Time dependent equations – Particle in a one dimensional rigid box – tunnelling (Qualitative) – Scanning tunnelling microscope.
UNIT III PHOTONICS
Einstein's theory of matter radiation interaction and A and B coefficients; Properties of laser- spontaneous and stimulated emission, amplification of light by population inversion, different types of lasers: solid-state laser(Neodymium), gas lasers (CO_2), applications –IR Thermography. Optical fibre- principle [TIR]-types-material, mode, refractive index-Fibre loss-Expression for acceptance angle and numerical aperture. Application-Communication.
UNIT IV SEMICONDUCTOR DEVICES AND APPLICATIONS
Introduction to P-N junction Diode and V-I characteristics, Zener diode and its characteristics, Introduction to BJT, its input-output and transfer characteristics, SCR characteristics, FET, MOSFET and CMOS characteristics. Basic logic gates - NAND, NOR as Universal building block.
UNIT V NEW ENGINEERING MATERIALS
Dielectric materials: Definition – Dielectric Breakdown – Dielectric loss – Internal field – Claussius Mossotti relation. Superconducting materials: Introduction – Properties- Meissner effect – Type I & Type II superconductors – BCS theory-Applications. Nanomaterials: Introduction – Synthesis of nano materials – Top down and Bottom up approach- Ball milling- PVD method- Applications. Smart materials: Shape memory alloys-Biomaterials (properties and applications)

TEXT BOOKS

1. Optics by Subramaniam N& BrijLal, SChand& Co.Pvt .Ltd.,New Delhi, 2006 Dec 1st.
2. Modern Physics by R Murugeshan, Kiruthiga, Sivaprasath S Chand 2016.
3. QuantumMechanicsbySathyaprakash,PragatiPrakashan,Meerut.2007.
4. AppliedEngineeringPhysics–Rajendran&Marikani(TataMcGrawHill) 2016.
5. EngineeringPhysics–Bhattacharya,Bhaskaran–OxfordPublications[unit2,3,5] 2017.
6. EngineeringPhysicsI&II–G.Senthilkumar,VRBpublications[unit2,3] 2017.
7. AppliedPhysicsforEngineers–K.Venkatramanan,R.Raja,M.Sundarrajan(Scitech)[3,5]2014.
8. PrinciplesofElectronicsbyV.K.Mehta,(S.Chand) 11th edition 2008.

REFERENCES

1. FundamentalsofOpticsbyJenkinsAFrancisandWhiteEHarvey,McGRawHillInc.,NewDelhi,4th Edition july 2017.
2. Quantum Mechanics by V.Devanathan, Narosa, Chennai. 2011.
3. Engineering Physics by M.N.Avadhanulu, S.Chand&CompanyLtd.5th Edition 2016.
4. Concepts of Modern Physics by Arthur Beisser, McGraw Hill, 7thedition 2015.
5. Optics by R.Agarwal, S.Chandpublishers.2017.

6. Basic Electronics by B.L.Theraja, S.Chandpublishers. 2005.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	ENGINEERINGPHYSICS LABORATORY	0	0	2	2

Course Category: BSC

OBJECTIVES

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

COURSE OUTCOMES

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

CO1. The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications

CO2. Demonstratethe procedural preparationskilltoconductthe experiment

CO3. Abilityto performtheexperiment andtabulatetheobservations made.

CO4. Skill to obtainanexpected experimental out-comes by differenttechniques and impart practical knowledge in real time solution.

CO5. Interpretationof experimental results andconclusions.

CO6. Understand principle, concept, working and applications of new theory and articulation oftherelevanttheory.

CO7. CO: 1. They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.

CO8. CO: 2. They would have better critical ability.

CO9. CO: 3. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).

CO10. CO: 4. It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	L	L	L	-	M	M	M	L
CO2	S	S	S	S	S	L	L	-	M	M	M	L
CO3	S	S	S	S	S	L	L	-	M	M	M	L
CO4	S	S	S	S	S	M	M	-	L	L	L	-
CO5	S	S	S	S	L	L	L	-	L	L	L	L

SYLLABUS

UNIT 1 INTRODUCTION TO VALUE EDUCATION
Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education) Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Happiness and Prosperity – Current Scenario, Method to

Fulfill the Basic Human Aspirations
UNIT 2 HARMONY IN THE HUMAN BEING
Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to ensure self-regulation and Health
UNIT 3 HARMONY IN THE FAMILY AND SOCIETY
Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Other Feelings, Justice in Human-toHuman Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order
UNIT 4 HARMONY IN THE NATURE/EXISTENCE
Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence
UNIT 5 IMPLICATIONS OF THE HOLISTIC UNDERSTANDING – A LOOK AT PROFESSIONAL ETHICS
Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession

LIST OF EXPERIMENTS

1. 1. Determinationof radius of curvature of convex lens by Newton’s rings experiment.
2. 2. Determinationofthewavelengthofspectrallinesusingplane diffractiongratingbyminimumdeviationmethod.
3. 3. Determinationofnumericalapertureandacceptanceangleof anopticalfiber.
4. 4. Determinationofthenumber of lines in grating.
5. 5. Verificationof truth tables of Basic Logic Gates.
6. 6. Verify NAND as Universal Building Block.
7. 7. Verify NOR as Universal Building Block.
8. 8. To study the V-I characteristics of Zener diode.

TEXT BOOKS

1. [1].The Textbook A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 97893-87034- 47-1

2. [2].The Teacher‟s Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G

REFERENCES

1. Practical Physics - Ouseph and Rangarajan.
2. Engineering Practical Physics-K. Srinivasan. 2013.
3. Engineering Practical Physics - M.N. Avadhanulu.1stEdition April 2015.
4. Experimental Physics – K.Venkatramanan, R.Raja, M.Sundarrajan (Scitech)
5. [1].Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.

6. [2]. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

7. [3]. The Story of Stuff (Book).

8. [4]. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

9. [5]. Small is Beautiful - E. F Schumacher.

10. [6]. Slow is Beautiful - Cecile Andrews

11. [7]. Economy of Permanence - J C Kumarappa

12. [8]. Bharat Mein Angreji Raj – Pandit Sunderlal

13. [9]. Rediscovering India - by Dharampal

14. [10]. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

15. [11]. India Wins Freedom - Maulana Abdul Kalam Azad

16. [12]. Vivekananda - Romain Rolland (English)

17. [13]. Gandhi - Romain Rolland (English)

18. [14]. Sussan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991 [15]. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth – Club of Rome's report, Universe Books.

19. [16]. A Nagraj, 1998, JeevanVidya EkParichay, Divya Path Sansthan, Amarkantak.

20. [17]. P L Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

21. [18]. A N Tripathy, 2003, Human Values, New Age International Publishers.

22. [19]. Subhas Palekar, 2000, How to practice Natural Farming, Pracheen (Vaidik) KrishiTantra Shodh, Amravati.

23. [20]. E G Seebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists &Engineers , Oxford University Press

24. [21]. M Govindrajran, S Natrajan & V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

25. [22]. B P Banerjee, 2005, Foundations of Ethics and Management, Excel Books.

26. [23]. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

27. Web links and Video Lectures (e-Resources):

28. Value Education websites,

29. https://www.uhv.org.in/uhv-ii,

30. http://uhv.ac.in,

31. http://www.uptu.ac.in

32. Story of Stuff,

33. http://www.storyofstuff.com

34. Al Gore, An Inconvenient Truth, Paramount Classics, USA

35. Charlie Chaplin, Modern Times, United Artists, USA

36. IIT Delhi, Modern Technology – the Untold Story

37. Gandhi A., Right Here Right Now, Cyclewala Productions

38. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw

39. https://fdp-si.aicte-india.org/8dayUHV_download.php

40. https://www.youtube.com/watch?v=8ovkLRYXIjE
41. https://www.youtube.com/watch?v=OgdNx0X923I
42. https://www.youtube.com/watch?v=nGRcbRpvGoU
43. https://www.youtube.com/watch?v=sDxGXOgYEKM
44. MAPPING CO – PO

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Course Code		L	T	P	C
Course Title	ENVIRONMENTAL SCIENCE	2	0	0	2

*Course Category: MC**

OBJECTIVES

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.

COURSE OUTCOMES

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

CO1. Public awareness of environmental is at infant stage.

CO2. Ignorance and incomplete knowledge has lead to misconceptions

CO3. Development and improvement in std. of living has lead to serious environmental disasters.

CO4. Nature of environment and reasons for environmental problems

CO5. Ecosystem – structure ,functions, simplified ecosystem models

CO6. Natural resources, reasons for over exploitation of resources

CO7. the interrelationship between living organism and environment

CO8. Public awareness of environmental is at infant stage.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	-	M	M	S	M	M	M	L
CO2	M	M	M	M	L	M	M	S	M	M	M	L
CO3	-	-	-	-	M	M	M	S	M	M	M	L
CO4	L	L	L	L	M	M	M	S	M	M	M	L
CO5	L	L	L	L	M	M	M	S	M	M	M	L

SYLLABUS

UNIT I INTRODUCTION TO ENVIRONMENT AND ENVIRONMENTAL STUDIES
1.1. Introduction to environment – components – nature of environment - need of awareness – reasons for environmental problems – anthropocentric and eco centric views. 1.2. Environmental studies - multidisciplinary nature – scope and aim – sustainable development principles – RRR concept-Indian environmental movements – environmental calendar.
UNIT II ECOSYSTEM AND BIODIVERSITY
2.1. Ecosystem – structure – functions – simplified ecosystem models (food chain and food webs and their types, energy flow) - forest – grassland – pond –ecosystems – ecological succession - ecological pyramids – Bio-geochemical cycles of water – oxygen-carbon-phosphorous and sulphur. 2.2. Biodiversity – definition – types – species – genetic and ecosystem diversities-values of biodiversity – threats to biodiversity –

conservation of biodiversity – endemism – biodiversity hotspots – Indian biodiversity– endemic species of India – IUCN lists -red-green and blue data books.
UNIT III NATURAL RESOURCES
3.1 Natural resources – definition – types – forest resources – uses –deforestation- reasons - effects – water resources – dams – effects of dams - food resources – modern agriculture– ill effects -energy resources- types – hydel –nuclear – solar –wind and biomass energy - world scenario – Indian scenario. 3.2 Population and environment – reasons for over exploitation of resources – population – demography – population curves – population explosion – effects – consumerism – effects – urbanization – reasons and effects- role of an individual.
UNIT IV ENVIRONMENTAL POLLUTION
4.1 Pollution – definition – types – air pollution – causes and effects – effects of CO2 – CO – NOx –SOx – particulates – control of air pollution – water pollution – causes – effects – remedies – soil pollution – solid waste management – e waste – ill effects of e-waste – proper recycling- Noise pollution – reasons – effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies. 4.2 Legal provisions for protecting environment – article 48 A – 51 A (g) – Environment act 1986 – Air act 1981 – Water act 1974 – wild life protection act – Forest act 1980- problems in implementation–reasons.
UNIT V SOCIAL ISSUES AND ENVIRONMENTAL ETHICS
5.1 Present environmental scenario – green house effect – climate change – The Kyoto Protocol– ozone layer depletion-The Montreal Protocol - acid rain – causes – effects - disparity among the nations – The Copenhagen UNFCCC summit – carbon currency- virtual water- genetically modified organisms, Disaster management. 5.2 Environmental ethics – introduction – people getting affected - resettlement and rehabilitation – issues involved –SardharSarovar project – TawaMatsya sang - Melting icebergs of Arctic.

TEXT BOOKS

1. AnubhaKaushik and C.P. Kaushik, ”Prospects of Environmental Science”, New Age International publishers,2019.

REFERENCES

1. Environmental Studies, N. Nandini, N. Sunitha and SucharitaTandon, Sapna Book House, 2019.

2. Text book of Environmental Science, RagavanNambiar, Scitech Publications, 2010.

3. Text book of Environmental Chemistry and Pollution Control, S.S.Dara, S.Chand and Co.,7thEdition 2004.

4. Environmental Chemistry, Colin Baird, W.H.Freeman and company, New York,4thEdition 2008.

5. Environmental Chemistry, Gary W. VanLoon and Stephen J.Duffy, Oxford University Press, 9thEdition 2017.

6. New Trends in Green Chemistry, V.K. Ahluwalia and M. Kidwai, Anamaya Publishers, 1stEdition 2012.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	IDEA Lab Workshop	0	0	2	2

OBJECTIVES

- To learn all the skills associated with the tools and inventory associated with the IDEA Lab.
- Learn useful mechanical and electrical and electronic fabrication processes.
- Learn necessary skills to build useful and standalone system/ project with enclosures.
- Learn necessary skills to create print and electronic documentation for the system/project

SYLLABUS

UNIT 1 MECHANICAL TOOLS
Introduction to basic hand tools - Tape measure, combination square, Vernier caliper, hammers, fasteners, wrenches, pliers, saws, tube cutter, chisels, vice and clamps, tapping and threading. Adhesives Introduction to Power tools: Power saws, band saw, jigsaw, angle grinder, belt sander, bench grinder, rotary tools. Various types of drill bits. 3D printing and prototyping technology – 3D printing using FDM, SLS and SLA. Basics of 3D scanning, point cloud data generation for reverse engineering.
UNIT 2 ELECTRICAL AND ELECTRONIC TOOLS
Familiarization and use of basic measurement instruments - DSO including various triggering modes, DSO probes, DMM, LCR bridge, Signal and function generator. Logic analyzer and MSO. Bench power supply (with 4-wire output) . Electrical Measurements. – use of multimeters- tong testers- continuity testing-use of contactors-push button switches-relays—fuses - electrical cabling tools-optical cable connectors. Electronic component familiarization, Understanding electronic system design flow.Schematic design and PCB layout and Gerber creation using EagleCAD.Documentation using Doxygen, Google Docs, Overleaf. Version control tools - GIT and GitHub. \ Basic 2D and 3D designing using CAD tools such as FreeCAD, Sketchup, Prusa Slicer, FlatCAM, Inkspace, OpenBSP and VeriCUT. Electronic circuit building blocks including common sensors. Arduino and Raspberry Pi programming and use. Digital Input and output. Measuring time and events.PWM.Serial communication.Analog input.Interrupts programming. Power Supply design (Linear and Switching types), Wireless power supply, USB PD, Solar panels, Battery types and charging

LIST OF EXPERIMENTS

1. Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit
2. Machining of 3D geometry on soft material such as soft wood or modelling wax
3. Familiarity and use of welding equipment.
4. Familiarity and use of normal and wood lathe
5. Embedded programming using Arduino and/or Raspberry Pi.
6. Design and implementation of a capstone project involving embedded hardware,
7. software and machined or 3D printed enclosure
8. Discussion and implementation of a mini project.

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	Design Thinking	0	0	2	2

OBJECTIVES

- The objective of this Course is to provide the new ways of creative thinking and
- Learn the innovation cycle of Design Thinking process for developing innovative products which useful for a student in preparing for an engineering career.

COURSE OUTCOMES

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

CO1. Compare and classify the various learning styles and memory techniques and Apply them in their engineering education

CO2. Analyze emotional experience and Inspect emotional expressions to better understand users while designing innovative products

CO3. Develop new ways of creative thinking and Learn the innovation cycle of Design Thinking process for developing innovative products

CO4. Propose real-time innovative engineering product designs and Choose appropriate frameworks, strategies, techniques during prototype development

CO5. Perceive individual differences and its impact on everyday decisions and further Create a better customer experience

SYLLABUS

UNIT 1 AN INSIGHT TO LEARNING UNDERSTANDING THE LEARNING PROCESS, KOLB'S LEARNING STYLES, ASSESSING AND INTERPRETING
UNIT 2 REMEMBERING MEMORY UNDERSTANDING THE MEMORY PROCESS, PROBLEMS IN RETENTION, MEMORY ENHANCEMENT TECHNIQUES
UNIT 3 EMOTIONS: EXPERIENCE & EXPRESSION UNDERSTANDING EMOTIONS: EXPERIENCE & EXPRESSION, ASSESSING EMPATHY, APPLICATION WITH PEERS
UNIT 4 BASICS OF DESIGN THINKING DEFINITION OF DESIGN THINKING, NEED FOR DESIGN THINKING, OBJECTIVE OF DESIGN THINKING, CONCEPTS & BRAINSTORMING, STAGES OF DESIGN THINKING PROCESS (EXPLAIN WITH EXAMPLES) – EMPATHIZE, DEFINE, IDEATE, PROTOTYPE, TEST
UNIT 5 BEING INGENIOUS & FIXING PROBLEM UNDERSTANDING CREATIVE THINKING PROCESS, UNDERSTANDING PROBLEM SOLVING, TESTING CREATIVE PROBLEM SOLVING
UNIT 6 PROCESS OF PRODUCT DESIGN PROCESS OF ENGINEERING PRODUCT DESIGN, DESIGN THINKING APPROACH, STAGES OF PRODUCT DESIGN, EXAMPLES OF BEST PRODUCT DESIGNS AND FUNCTIONS, ASSIGNMENT – ENGINEERING PRODUCT DESIGN
UNIT 7 PROTOTYPING & TESTING WHAT IS PROTOTYPE? WHY PROTOTYPE? RAPID PROTOTYPE DEVELOPMENT PROCESS, TESTING, SAMPLE EXAMPLE, TEST GROUP MARKETING
UNIT 8 CELEBRATING THE DIFFERENCE UNDERSTANDING INDIVIDUAL DIFFERENCES & UNIQUENESS, GROUP DISCUSSION AND ACTIVITIES TO ENCOURAGE THE UNDERSTANDING, ACCEPTANCE AND APPRECIATION OF INDIVIDUAL DIFFERENCES

UNIT 9 DESIGN THINKING & CUSTOMER CENTRICITY PRACTICAL EXAMPLES OF CUSTOMER CHALLENGES, USE OF DESIGN THINKING TO ENHANCE CUSTOMER EXPERIENCE, PARAMETERS OF PRODUCT EXPERIENCE, ALIGNMENT OF CUSTOMER EXPECTATIONS WITH PRODUCT DESIGN
UNIT 10 FEEDBACK, RE-DESIGN & RE-CREATE FEEDBACK LOOP, FOCUS ON USER EXPERIENCE, ADDRESS "ERGONOMIC CHALLENGES, USER FOCUSED DESIGN, RAPID PROTOTYPING & TESTING, FINAL PRODUCT, FINAL PRESENTATION – "SOLVING PRACTICAL ENGINEERING PROBLEM THROUGH INNOVATIVE PRODUCT DESIGN & CREATIVE SOLUTION".

TEXT BOOKS

1. 1. E Balaguruswamy (2022), Developing Thinking Skills (The way to Success), Khanna Book Publishing Company.

2. SECONDSEMESTER

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	MATHEMATICS – II (Linear Algebra, Transform Calculus and Numerical Methods)	3	1	0	4

Course Category: BSC

OBJECTIVES

- This course aims at familiarising the prospective engineers with techniques in Linear Algebra, Transform Calculus and Numerical Methods. To understand the fundamental concepts in the above said topics. To develop the ability to evaluate the problems in transform calculus and its application in varies areas.

COURSE OUTCOMES

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

CO1. Determine consistency of liner system of equations, Rank, eigen values and eigen vectors of the given square matrix also compute power , inverse of the matrix using cayley Hamilton theorem.

CO2. Work numerically on the ordinary differential equations and partial differential equations using different methods through the theory of finite differences

CO3. Apply Laplace transform and its inverse to solve initial value and other related problems.

CO4. Use Fourier transforms and its inverse in practical applications of electronics engineering.

CO5. Solving finite difference equation in z-transforms

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	-	M	M	M	L
CO2	S	S	S	S	S	M	M	-	M	M	M	L
CO3	S	S	S	S	S	M	M	-	M	M	M	L
CO4	S	S	S	S	S	M	M	-	M	M	M	L
CO5	S	S	S	S	S	M	M	-	M	M	M	L

SYLLABUS

UNIT I DIFFERENTIAL EQUATIONS
Method of variation of parameters - Equations reducible to linear equations with constant coefficients: Cauchy's homogeneous linear equation.- solving of Ordinary differential equations using Numerical methods: Taylor's series, Runge-Kutta method of fourth order for solving first order equations - Milne's predicator corrector methods.
UNIT II PARTIAL DIFFERENTIAL EQUATIONS
Formation of partial differential equations – Solution of a partial differential equation – Equations solvable by direct integration – Linear equations of first order – Non linear equations of the first order – Charpit's method - Homogeneous linear equations with constant coefficients –Rules for finding complementary functions – Rules for finding particular integral – Solution of homogeneous linear equation of any order.
UNIT III FOURIER SERIES
Introduction- Euler's Formulae- Conditions for a Fourier expansion - Functions having points of discontinuity

- Change of interval - Odd and even function-Expansions of odd or even periodic functions - Half-range series - Typical wave-forms - Parseval's formula.
UNIT IV LAPLACE TRANSFORMS
Definition, Properties of Laplace transforms: Linearity Property, First shifting property, Change of scale property – Transforms of derivatives - Transforms of integrals - Multiplication by tn - Division by t - Evaluation of integrals by Laplace transform - Inverse transforms: Method of partial fractions – Other methods of finding inverse - Convolution theorem (without proof) Application to differential equations
UNIT V FOURIER TRANSFORMS
Fourier integral theorem (without proof) - Fourier Sine and Cosine integrals – Complex form of Fourier integral - Fourier transform – Fourier sine and Cosine transforms – Properties of Fourier Transforms: Linear property, Change of scale property, Shifting property -Parseval's identity for Fourier transforms (without proof)

TEXT BOOKS

1. B.S. Grewal, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.

2. Grewal B.S, Higher Engineering Mathematics, 41st Edition, Khanna Publishers, New Delhi, 43rdEdition 2011.

REFERENCES

1. Coddington, E. A, An Introduction to Ordinary Differential Equations. United Kingdom: Dover Publication. (2012).

2. Simmons, G. F. Differential Equations: With Applications and Historical Notes. India: Tata McGraw-Hill. (2003)

3. John, F. Partial Differential Equations. Germany: Springer New York(2013)

4. Evans, L. C. Partial Differential Equations. United States: American Mathematical Society(2022)

5. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press.Jun 2001.

6. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons. Dec 2015.

7. Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company.7thEdition 2006.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ENGINEERING CHEMISTRY	3	0	0	3

Course Category: BSC

OBJECTIVES

- To learn the basics of atomic structure, bonding, analytical methods and varioustypes of reactions in organic chemistry.

COURSE OUTCOMES

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

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

CO2. Rationalize bulk properties and processes using thermodynamic considerations

CO3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO4. Rationalize periodic properties.

CO5. List major chemical reactions that are used in the synthesis of various organic molecules

CO6. Principle and concepts of atomic Structure and configuration of atoms

CO7. Microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.

CO8. Concepts of electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques

CO9. chemical reactions that are used in the synthesis of various organic molecules

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	L	M	M	-	M	M	M	M
CO2	S	S	M	M	L	M	M	-	M	M	M	M
CO3	S	S	M	M	M	M	M	-	M	M	M	M
CO4	S	S	M	M	M	M	M	-	M	M	M	M

SYLLABUS

UNIT I ATOMIC STRUCTURE
Comparison between Rutherford's model of atom and Bohr's model - Bohr-Somerfield model (Concepts only)-its limitations - de Broglie theory-Heisenberg's uncertainty principle - Schrodinger's wave equation (derivation not needed)-significance of Ψ and Ψ2 – shapes of different orbital's –Aufbau principle-Pauli Exclusion Principle- Hund's rule. Electronic configuration of atoms- Mosley's law – Modern periodic table - periodic properties: atomic size-ionization energies- electron affinity- electro negativity.
UNIT II CHEMICAL BONDING
Types of bonds – ionic - covalent – coordinate bond - Molecular Orbital Theory –types of molecular orbitals-energy level diagrams- e-ns filling in MO – bond order – MO diagrams of H2, He2, N2, O2, CO and HF molecules- Metallic bond – band theory of solids (primitive treatment only) and the role of doping on band

structures - Hybridization – definition - geometry of the molecules- CH4, C2H4, C2H2 - Molecular forces- Ionic, dipolar, vanderwaals interactions.
UNIT III THERMAL AND ELECTROCHEMICAL EQUILIBRIA
Thermodynamic functions: State functions, Path functions, Internal energy, enthalpy, entropy and free energy-Gibbs Helmholtz equation and its applications. Feasibility of reaction - Ellingham diagrams. Types of electrodes- Standard electrodes-Standard hydrogen electrode, standard calomel electrode, Single electrode potential , electrochemical series - galvanic cell - emf - Nernst equation and its applications - Glass electrode, Potentiometric acid base titrations and Solubility equilibria-Corrosion-types- Chemical corrosion-electrochemical corrosion-factors influencing and control measures.
UNIT IV SPECTROSCOPIC TECHNIQUES AND APPLICATIONS
Electromagnetic radiations – wavelength – frequency – energy of a radiation –electromagnetic spectrum – changes brought about by the radiations– components of a spectrometer – rotational spectra of diatomic molecules – rigid and non-rigid rotor models (energy expressions only)- selection rule– schematic instrumentation – types of vibrations in molecules (CO2, H2O) – vibrational spectra (primitive treatment) – selection rule-instrumentation and applications – electronic transitions – electronic spectra — Beer-Lambert's law- instrumentation and applications – NMR – principle – chemical shift - instrumentation – NMR spectra of CH4 – CH3OH – xylene isomers – MRI (Introduction only).
UNIT V STEREOCHEMISTRY & ORGANIC REACTIONS
Stereochemistry - Representation of 3D structures - Fisher projection, Newman andSawhorse projection formulae – Ethane, 3-bromo-2-butanol Conformation of Ethane, Butane & Ethylene glycol, , Symmetry and Chirality - Stereo isomers, Enantiomers, Diastereomers. Configuration - R-S system. Optical activity - Lactic acid, Tartaric acid- Geometrical isomerism cis-trans& E-Z notations. Organic Reactions – Substitution - SN1& SN2(simple examples, mechanism notexpected) –electrophilic substitutions – Friedel Crafts alkylations - Additions – 1,2-addition – types- addition of HX - Elimination – E1& E2 (Examples only, mechanism not expected) - Oxidations – cis-hydroxylation with OsO4, Reductions – Clemmensen&wolff-Kishner reductions, Cyclization – Diels Alder, Ring-Opening – Nylon-6 from caprolactum. Synthesis of most commonly used drugs – Aspirin, Paracetamol.

TEXT BOOKS

1. Textbook of Inorganic Chemistry, P.L.Soni, Sultan Chand & Sons, Delhi, 2013.

2. Principles of Physical Chemistry, B.R. Puri, L.R. Sharma and Madan S. Pathania, ShobanLalNagin Chand & Co., Jalandhar, 2000.

3. Advanced Organic Chemistry, B. S. Bahl and ArunBahl, S.Chand, Delhi, 5thEdition Jan 2012.

REFERENCES

1. Engineering Chemistry, P.C. Jain and Monika Jain, DhanpatRai Publishing Co Pvt. Ltd., New Delhi, 6thEdition 2013.

2. Applied Chemistry, K. Sivakumar, Anuradha Publications, Chennai,

3. Textbook of Engineering Chemistry, S.S.Dara& S.S. Umare,S.Chand, Delhi,3rdEdition July 2004

4. Fundamentals of Molecular Spectroscopy, C.N.Banwell and Elaine.M.McCash, 4th Edition July 2017, McGraw Hill Education,

5. Physical Chemistry, P. W. Atkins and Julio De Paula, Oxford University Press, 11thEdition Dec 2017.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	PROGRAMMING FOR PROBLEM SOLVING	2	0	0	2

Course Category: ESC

OBJECTIVES

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

COURSE OUTCOMES

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

CO1. Design C Programs for problems.

CO2. Write and execute C programs for simple applications

CO3. Design problem solutions using Object Oriented techniques

CO4. Develop algorithms for solving simple mathematical and engineering problems and examine the suitability of appropriate repetition and/or selection structures for given problems

CO5. Solve matrix problems, merging, searching, sorting and string manipulation problems using iteration, modularization or recursion as applicable.

CO6. Organize files to perform text operations like editing, pattern searching using structures

CO7. Implement the algorithms for matrix problems, merging, searching, sorting, and string manipulation and file problems and debug and test using any procedural programming language

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	L	L	M	M	-	M
CO2	S	S	S	S	S	M	L	L	M	M	-	M
CO3	S	S	M	M	S	M	L	L	M	M	-	M
CO4	S	S	S	S	S	M	L	L	S	S	-	S

SYLLABUS

UNIT I
Introduction to components of computer system-Generation of programming languages-Types of Computers-Organization of Computers-Types of memory, Number systems-Idea of Algorithm-Pseudo code- Flow Chart with examples.
UNIT II
Introduction to C-Character set, Constants, Variables, Data Types-Operators – Arithmetic expressions and precedence-Decision Making statement - Looping statements.
UNIT III
Arrays and its types-Functions –Parameter passing in functions-call by value- call by reference – Passing

array to functions-Recursive function.
UNIT IV
Structures and array of structures –Union, Basic searching –Linear and Binary, Basic sorting, String operations.
UNIT V
Introduction to Pointer, Pointer arithmetic-notion of linked list (no implementation) - File handling.

TEXT BOOKS

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.4th Edition july 2018.

2. Balagurusamy. E, "Programming in ANSI C", Tata McGraw Hill, Third edition, 2008

3. Fundamentals of Computing and Programming- V.Ramesh Babu, R.Samyuktha, M.Muniratham by VRB Publishers Sep 2018 edition.

REFERENCES

1. Let Us 'C' - Yashawant Kanetkar, (Unit 2 to 5), BPB publications, 16thEdition, 2017.

2. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2011.

3. Venugopal. K and Kavichithra.C, "Computer Programming", New Age International Publishers, 2nd Edition,Jan 2008.

4. Kernighan B.W and Ritchie,D.M , The C programming language: second edition, Pearson education, 2015.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ENGINEERING GRAPHICS & DESIGN(T&P)	2	0	2	4

Course Category: BSC

OBJECTIVES

- To develop in students, graphic skills for communication of concepts, ideas and design of engineering products.
- To expose them to existing national standards related to technical drawings.

COURSE OUTCOMES

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

CO1. Introduction to engineering design and its place in society

CO2. Exposure to the visual aspects of engineering design

CO3. Exposure to engineering graphics standards

CO4. Exposure to solid modelling

CO5. Exposure to computer-aided geometric design

CO6. Exposure to creating working drawings

CO7. Exposure to engineering communication

CO8. Draw orthographic projections of lines, planes and solids

CO9. Draw projections of solids including cylinder, prism and pyramid.

CO10. Draw section of solids including cylinder, prisms and pyramids.

CO11. Draw the development of surfaces including cylinder, pyramid and prism

CO12. Draw projection of lines, planes, solids, orthographic projection, Isometric projection, and section of solids including cylinder, cone, prism, pyramid and building drawing using Auto CAD.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	-	M	M	M	L
CO2	S	S	S	S	S	M	M	-	M	M	M	L
CO3	S	S	S	S	S	M	M	-	M	L	M	L
CO4	S	S	S	S	S	M	M	-	M	M	M	L
CO5	S	S	S	S	S	L	M	-	M	L	M	L

SYLLABUS

UNIT I
Introduction to Engineering Drawing: Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;
UNIT II

Orthographic Projections: Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;
UNIT III
Projections of Regular Solids: Inclined to HP & VP - Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc
UNIT IV
Sections and Sectional Views of Right Angular Solids: Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)
UNIT V ISOMETRIC PROJECTIONS
Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;
UNIT VI OVERVIEW OF COMPUTER GRAPHICS-THEORY OF CAD SOFTWARE-DRAWING AREA, DIALOG BOXES AND WINDOWS- DIFFERENT METHODS OF ZOOM AS USED IN CAD-ISOMETRIC VIEWS OF LINES, PLANES, SIMPLE AND COMPOUND SOLIDS-CUSTOMISATION & CAD DRAWING-ISO AND ANSI STANDARDS FOR COORDINATE DIMENSIONING AND TOLERANCING; DIMENSIONS TO OBJECTS-VARIOUS WAYS OF DRAWING CIRCLES, ANNOTATIONS, LAYERING & OTHER FUNCTIONS-SETTING UP AND USE OF LAYERS, LAYERS TO CREATE DRAWINGS-COLOR CODING ACCORDING TO BUILDING DRAWING PRACTICE; DRAWING SECTIONAL ELEVATION SHOWING FOUNDATION TO CEILING-INTRODUCTION TO BUILDING INFORMATION MODELLING (BIM)

TEXT BOOKS

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.53rd Edition 2014.

2. Shah, M.B. & Rana B.C. (2010), Engineering Drawing and Computer Graphics, Pearson Education. 2nd Edition 2009.

REFERENCES

1. Agrawal B. & Agrawal C. M. (2017), Engineering Graphics, TMH Publishers. July 2017.

2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers.

3. AUTO CAD User Manual.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	BASIC ELECTRICAL ENGINEERING	3	0	0	3

Course Category: ESC

OBJECTIVES

- This course equips students to have basic knowledge and understanding in solving algebraic, transcendental equation numerically.
- To make the student knowledgeable in the area of matrix theory so that he/ she will be familiar in Matlab applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.

COURSE OUTCOMES

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

CO1. To understand and analyze basic electric and magnetic circuits

CO2. To study the working principles of electrical machines and power converters. To introduce the components of low voltage electrical installations

CO3. Explain the basic electrical quantities and laws.

CO4. Explain the construction, types and applications of electrical machines.

CO5. Study the working principles of power converters.

CO6. Show the tariff for a given load and energy consumption.

CO7. Introduce the components of low voltage electrical installations and its applications.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	L	L	M	M	M	-	S	M	-	S
CO2	S	S	M	M	M	S	M	L	S	M	L	M
CO3	S	S	M	M	S	M	M	-	M	M	-	M
CO4	S	S	S	S	S	M	M	M	M	M	L	M
CO5	S	S	M	S	M	M	L	L	S	M	L	M

SYLLABUS

UNIT I DC CIRCUITS
Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.
UNIT II AC CIRCUITS
Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current

relations in star and delta connections.
UNIT III TRANSFORMERS
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections.
UNIT IV ELECTRICAL MACHINES
Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.
UNIT V POWER CONVERTERS AND ELECTRICAL INSTALLATIONS
DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energyconsumption, power factor improvement and battery backup.

TEXT BOOKS

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.

2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 1stEdition July 2017.

REFERENCES

1. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.

2. E. Hughes, “Electrical and Electronics Technology”, Pearson, 10thEdition 2010.

3. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 2ndEdition 1989.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ENGINEERING CHEMISTRY LAB	0	0	3	2

Course Category: BSC

OBJECTIVES

- To learn the basics and perform experiments involving volumetric analysis,colligative properties, simple synthesis and other instrumental techniques.

COURSE OUTCOMES

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

CO1. Estimate rate constants of reactions from concentration of reactants/products as a function of time .

CO2. Measure molecular/system properties such as surface tension, viscosity, Conductance of solutions, redox potentials, chloride content of water.

CO3. Synthesize a small drug molecule.

CO4. Analyze a salt sample.

CO5. Determinationsurface tension, viscosity, Conductance of solutions, chloride content of water.

CO6. Conductometry- redox potentials

CO7. Analyze a salt sample

CO8. Estimate rate constants of reactions from concentration of reactants/products as a function of time

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	-	M	M	M	M
CO2	S	S	S	S	M	M	M	-	M	M	M	-
CO3	M	M	M	S	M	M	M	-	M	M	M	-
CO4	S	S	S	S	S	M	M	-	M	M	M	-

LIST OF EXPERIMENTS

1. Any ten experiments of the following
2. Determination of surface tension and viscosity of a liquid or a solution
3. Thin layer chromatography / Paper chromatography for separation of a mixture.
4. Ion exchange column for removal of hardness of water
5. Determination of chloride content of water by volumetry.
6. Determination of M.wt of a non-volatile solute by Rast's method.
7. Determination of the rate constant of the reaction between K2S2O8 and KI – Clock reaction method.
8. Conductometry -Verification of Debye-Huckel-Onsager equation for a strong electrolyte.
9. Potentiometry - Determination of formal redox potential of Fe3+/Fe2+ couple
10. Synthesis of Nylon 66 by interfacial polymerization method.

11. Determination of Saponification/acid value of oil.
12. Systematic qualitative analysis of a salt
13. Lattice structures and packing of spheres
14. Models of potential energy surfaces – computational experiment.
15. Chemical oscillations- Potentiometric study of the oscillations of Belousov-Zhabotinsky reaction
16. Determination of the partition coefficient of I2 between water and CCl4
17. Verification of Freundlich isotherm for adsorption of acetic acid / oxalic acid by charcoal.
18. Determination of isoelectric point of Gelatin sols by using capillary viscosmeter.

TEXT BOOKS

1. Advanced Practical Physical Chemistry, J.B.Yadhav, Krishna Prakasan Media, 2016.
2. Experiments in Applied Chemistry, Sunita Rattan, S.K. Kataria& Sons, 2012.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	PROBLEM SOLVING PROGRAMMING LABORATORY	0	0	3	2

Course Category: ESC

OBJECTIVES

- To get a clear understanding of C Concepts.

COURSE OUTCOMES

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

CO1. Toformulatethealgorithmsforsimpleproblems.

CO2. Totranslategivenalgorithmstoaworkingandcorrectprogram.

CO3. Tobeabletocorrectsyntaxerrorsasreportedbythecompilers.

CO4. Tobeabletoidentifyandcorrectlogicalerrorsencounteredatruntime.

CO5. Tobeabletowriteiterativeaswellasrecursiveprograms.

CO6. Tobeabletorepresentdatainarrays,strings and structures and manipulate them through aprogram.

CO7. Tobeabletodeclarepointersofdifferenttypesandusethem in defining selfreferential structures.

CO8. Tobeabletocreate,readandwritetoandfromsimpletextfiles.

CO9. Develop algorithms for solving simple mathematical and engineering problems and examine the suitability of appropriate repetition and/or selection structures for given problems

CO10. Solve matrix problems, merging, searching, sorting and string manipulation problems using iteration, modularization or recursion as applicable.

CO11. Organize files to perform text operations like editing, pattern searching using structures

CO12. Implement the algorithms for matrix problems, merging, searching, sorting, and string manipulation and file problems and debug and test using any procedural programming language

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	L	L	M	M	-	M
CO2	S	S	S	S	S	M	L	L	M	M	-	M
CO3	S	S	M	M	S	M	L	L	M	M	-	M
CO4	S	S	S	S	S	M	L	L	S	S	-	S

LIST OF EXPERIMENTS

1. Basic programs in data types.

2. Evaluate Expressions using library Function.

3. πr2

4. (A+B+(2C/3A)+2A+2B)

5. √S(S-A) (S-B) (S-C)

6. LOG (x3+y3+z3)

7. Problems in Decision making statements.
8. Find the Biggest among 3 numbers.
9. Find Even or odd
10. Arithmetic operations using Switch - Case Statements.
11. Problems in looping statements.
12. Find the Sum of digits using (a) For loop (b) While loop.
13. Generate the Fibonacci series
14. Check whether the number is prime or not.
15. Find the Linear Search.
16. General sorting.
17. Matrix Manipulation-Addition, Subtraction and Multiplication.
18. String operations-string copy, string reverse, string concatenate.
19. Swapping of numbers using call by value, call by reference.
20. Find factorial using recursive functions.
21. Numerical methods-Quadratic Equation.
22. Display the student information & marks using Structure & Unions.
23. Demonstrate array of structures.
24. Pointer Arithmetic and Array access using Pointers.
25. Basic File Operations.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	BASIC ELECTRICAL ENGINEERING LAB	0	0	3	2

Course Category: ESC

OBJECTIVES

- This course equips students to have basic knowledge and understanding in solving algebraic, transcendental equation numerically.
- To make the student knowledgeable in the area of matrix theory so that he/ she will be familiar in Matlab applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.

COURSE OUTCOMES

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

CO1. To understand and analyze basic electric and magnetic circuits

CO2. To study the working principles of electrical machines and power converters. To introduce the components of low voltage electrical installations

CO3. Obtain load characteristics of Single Phase Induction Motor, Three Phase Induction Motor, Single Phase Transformer and Three Phase Alternator

CO4. Obtain Speed Control of DC Motor, Three Phase Induction Motor (Pole Changing Method)

CO5. To demonstrate the working of Multi meter, CRO and LCR Meter and Measurement of Voltage, Current and Power.

CO6. To Verify experimentally Kirchoff's Law and Thevenin's Theorem

CO7. Obtain the B•H Curve of a Magnetic Material

CO8. Analysis of RLC circuit

CO9. Analysis of Converter circuit

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	M	-	-	S	M	-	L
CO2	S	S	M	M	S	M	L	-	S	S	-	M
CO3	S	S	M	M	S	M	L	-	S	M	L	M
CO4	S	S	S	S	M	M	L	L	M	M	-	S
CO5	M	M	M	S	M	M	L	-	M	M	-	M
CO6	S	S	M	M	M	M	-	-	M	M	-	M
CO7	S	S	M	M	M	M	-	-	M	M	-	M

LIST OF EXPERIMENTS

1. Study of Electric Motors (AC & DC Motors)

2. Load Test on Single Phase Induction Motor

3. Load Test on Three Phase Induction Motor
4. Load Test on Single Phase Transformer
5. Load Test on Three Phase Alternator
6. Speed Control of DC Motor
7. Speed Control of Three Phase Induction Motor (Pole Changing Method)
8. Study of Multi meter, CRO and LCR Meter
9. Measurement of Voltage, Current and Power.
10. Verification of Kirchoff's Law
11. Verification of Thevenin's Theorem
12. B•H Curve of a Magnetic Material
13. Rectifier Circuit Analysis (AC – DC)
14. Inverter Circuit Analysis (DC – AC)
15. Chopper Circuit Analysis (DC – DC)
16. Series and Parallel RLC Circuit Analysis

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	MATHEMATICS III (Probability and Statistics)	3	1	0	4

Course Category: BSC

OBJECTIVES

- The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

COURSE OUTCOMES

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

CO1. Students who successfully complete this course should be able to demonstrate and understanding of:

CO2. Basic probability axioms and rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous random variables.

CO3. How to derive the probability function of transformations of random variables and use these techniques to generate data from various distributions.

CO4. How to calculate and apply measures of location and measures of dispersion in grouped and ungrouped data cases.

CO5. Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

CO6. How to translate real-world problems into probability models. Also how to collect data, analyze and deduce information from a real time survey without any unwilling bias

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	-	M	M	M	M
CO2	S	S	S	S	M	M	M	-	M	M	M	M
CO3	S	S	S	S	M	M	M	-	M	M	M	L
CO4	S	S	S	S	M	M	M	-	M	M	M	L
CO5	S	S	S	S	M	M	M	-	M	M	M	L

SYLLABUS

UNIT I PROBABILITY
Introduction to Probability,Probability spaces, conditional probability, Bayes' Theorem, Discrete and Continuous one dimensional random variables - Expectations, Moments, Variance of a sum, Moment generating function, Tchebyshev's Inequality.
UNIT II PROBABILITY DISTRIBUTIONS
Discrete Distributions – Binomial, Poisson and Negative Binomial distributions, Continuous Distributions - Normal, Exponential and Gamma distributions.
UNIT III STATISTICS

Measures of Central tendency, Measures of dispersion, co efficient of variation, Moments, Skewness and Kurtosis, Correlation, Rank Correlation and Regression (Bivariate)
UNIT IV TESTING OF HYPOTHESIS-I
Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.
UNIT V TESTING OF HYPOTHESIS-II
Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

TEXT BOOKS

1. T. Veerarajan, Probability, Statistics and Random Processes, Third edition, Tata McGraw- Hill, New Delhi, 2010.

2. S.P. Gupta, Statistical Methods, 31st edition, Sultan chand and sons, New Delhi, 2002.

REFERENCES

1. Loeve, M. (2012). Probability Theory I. United States: Springer New York.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTROMAGNETIC THEORY [T &P]	2	0	1	3

Course Category: PCC

OBJECTIVES

- To introduce the basic mathematical concepts related to electromagnetic vector fields
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density andtheir applications, Faraday's law, induced Emf and Maxwell's equations
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vectorpotential electromagnetic waves and Pointing vector and its applications.

COURSE OUTCOMES

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

CO1. Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.

CO2. To differentiate different types of coordinate systems.

CO3. To use different coordinate systems for solving the problems of electromagnetic field theory.

CO4. To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.

CO5. To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory.

CO6. To describe time varying fields, propagation of electromagnetic waves in different media, pointing theorem.

CO7. To know the sources & effects of electromagnetic fields and to apply the theory of electromagnetic waves in practical problems.

CO8. To apply concepts of Wave reflection and refraction in practical field.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-		-	-	L
CO2	S	S	M	L	M	-	-	-	L	-	-	M
CO3	S	S	S	M	M	-	-	-	M	-	-	S
CO4	S	S	M	M	M	-	-	-	L	-	-	M
CO5	S	S	M	L	M	-	-	-	-	-	-	M
CO6	S	S	M	S	S	L	M	M	S	-	-	M
CO7	S	S	S	L	M	M	M	L	S	-	-	M

SYLLABUS

UNIT I ELECTROSTATICS
The field concept – Sources of electromagnetic fields.-Charges – Columb's Law – electric field

intensity – Electric flux – Gauss's law – Potential – Boundary value problems – Laplace and Poissons equations – Electrostatic energy – Dielectrics – Capacitance.
UNIT II MAGNETOSTATICS
Current density– Magnetic field – Magnetic flux – Biot – Savart's – Ampere's law –Torque – Force – Vector potential – Boundary value problem.
UNIT III ELECROMAGNETIC FIELDS
Faraday's Law –Lenz's law –Maxwell's equations – Displacement current – Eddy current – Relation between field theory and circuit theory.
UNIT IV ELECTROMAGNETIC WAVES
Generation–Propagationofwavesindielectrics–ConductorsandTransmissionlines–Pointing vector– Skin effect.
UNIT V FIELDMODELLINGANDCOMPUTATION
Problem formulation –Boundary conditions – Solutions – Analytical methods – Variables Separable methods – Conformal transformation– Method of images – Numerical methods – Finite difference method– Finite element method –Charge Simulation Method.

TEXT BOOKS

1. JohnDKraus,"Electromagnetics",McGraw-HillBookCo.,NewYork,ThirdEdition,1989.

2. JosephAEdminister,"TheoryandProblemsofElectromagnetics",McGraw-HillbookcompanyNewYork,2ndEdition.

3. WilliamH.Hayt,"EngineeringElectromagnetics",TataMcGraw-HillEdition, NewDelhi,8thEdition July 2017.

REFERENCES

1. DavidJGriffith,"IntroductiontoElectrodynamics",Prentice HallofIndiaPvt. Ltd,NewDelhi, 4thEdition 2015.

2. Richard E. Dubroff, S.V.Marshall, G.G.Skitek, "Electromagnetic Concepts and Applications", FourthEdition,PrenticeHallofIndiaPvt.Ltd.,NewDelhi,1996.

3. Kraus andFleish,"Electromagnetics with Applications",McGraw-HillInternationalEditions5th Edition 2017.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

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Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTRIC CIRCUIT THEORY	2	1	0	3

Course Category: PCC

OBJECTIVES

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- Thecourseshould enablethestudents
- Tounderstandtheconcept of OOP aswell asthepurposeandusageprinciplesof Inheritance, polymorphism, encapsulation and method overloading.
- Toidentifyclasses,objects,membersofaclassandtherelationshipsamongthemneeded foraspecificproblem.

COURSE OUTCOMES

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

CO1. Ability to analyze electric circuits

CO2. Ability to apply circuit theorems

CO3. Ability to analyze AC and DC Circuits

CO4. Concepts, Nodal, Mesh methods

CO5. Sinusoidal Analysis, Resonance, three phase circuits

CO6. Network Theorem and Application

CO7. Circuit Response RLC, DC & AC Excitation

CO8. Two Port Networks, synthesis Networks

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	L	-	-	M	L	-	S
CO2	S	S	S	S	M	-	-	-	M	L	-	M
CO3	S	S	M	M	M	M	-	-	M	L	-	S
CO4	S	M	S	M	M	M	-	-	L	L	-	M
CO5	S	S	S	S	M	L	-	-	L	L	-	S

SYLLABUS

UNIT I CIRCUIT CONCEPTS AND MESH & NODAL METHODS:
Lumped circuits – Kirchhoff's Laws – Voltage - Current relationships of R, L and C – Independent sources Dependent sources – Simple resistive circuits – Network reduction – Voltage division – Current division –Source transformation. Formation of matrix equations and analysis of AC and DC circuits using mesh-current and nodal-voltage. Methods – Mutual inductance – Coefficient of coupling – Ideal transformer.
UNIT II SINUSOIDAL STEADY STATE ANALYSIS:

Phasor – Sinusoidal steady state response – concepts of impedance and admittance- analysis of simple circuits – Power and Power factor – series resonance and parallel resonance – Bandwidth and Q factor Solution of three-phase balanced and unbalanced circuits.

UNIT III NETWORK THEOREMS AND APPLICATIONS:

Superposition theorem – Reciprocity theorem – Compensation theorem – Substitution theorem – Maximum Power transfer theorem – Thevenin's theorem – Norton's theorem and Millman's theorem with applications.

UNIT IV TRANSIENT ANALYSIS:

Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

UNIT V TWO PORT NETWORKS AND SYNTHESIS:

Characterization of two port networks in terms of Z,Y,H and T parameters – networks equivalents – relations between network parameters – Analysis of T, Ladder ,Bridged – T and lattice networks – Characteristics Ideal filter - low pass and high pass filter. Reliability of one port network – Hurwitz polynomials and properties – P. R. functions and properties – synthesis of RL, RC and LC one port networks.

UNIT I MINIMIZATIONTECHNIQUESANDLOGICGATES 9HOURS

Minimization Techniques: Boolean postulates and laws – De-Morgan's Theorem - Principle of Duality - Boolean expression - Minimization of Boolean expressions — Minterm – Maxterm -Sum of Products (SOP) – Product of Sums (POS) – Karnaugh map Minimization – Don't care conditions –Quine- McCluskey method of minimization. Logic Gates: AND, OR, NOT, NAND, NOR, Exclusive–OR and Exclusive–NORImplementationsofLogic Functionsusing gates,NAND –NOR implementations – Multilevelgate implementations-Multioutputgateimplementations.TTLandCMOSLogicandtheir characteristics–Tristate gates.

UNIT II COMBINATIONAL CIRCUITS 9 HOURS

Designprocedure–Halfadder–FullAdder–Halfsubtractor–Fullsubtractor– Parallel binary adder, parallel binary Subtractor – Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/ Demultiplexer-decoder-encoder–paritychecker–paritygenerators–codeconverters-MagnitudeComparator.

UNIT III SEQUENTIALCIRCUITS 9HOURS

Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation – Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops – serial adder/subtractor Asynchronous Ripple or serial counter – Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Programmable counters – Design of Synchronous counters: state diagram- State table –State minimization –State assignment -Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shiftregisters-Universalshiftregisters–Shiftregistercounters–Ringcounter–Shiftcounters-Sequencegenerators.

UNIT IV MEMORYDEVICES 9HOURS

Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM – EAPROM, RAM – RAM organization – Write operation – Read operation – Memory cycle - Timingwave forms – Memory decoding – memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell– ProgrammableLogicDevices– Programmable Logic Array (PLA)- Programmable Array Logic (PAL) – FieldProgrammableGateArrays(FPGA)-Implementationofcombinationallogiccircuitsusing ROM,PLA,PAL

UNIT 10 UNIT-VSYNCHRONOUSANDASYNCHRONOUSSEQUENTIALCIRCUITS9HOURS

SynchronousSequentialCircuits:GeneralModel–Classification–Design–Useof Algorithmic State Machine – Analysis of Synchronous Sequential CircuitsAsynchronousSequentialCircuits:Designoffundamentalmodeandpulsemodecircuits– IncompletelyspecifiedStateMachines–ProblemsinAsynchronousCircuits– DesignofHazardFreeSwitchingcircuits.DesignofCombinationalandSequentialcircuitsusingVERILOG TotalHours 45Hours TextBook(s) 1. M.MorrisMano,"DigitalDesign",4e,PrenticeHallofIndiaPvt.Ltd.,2008/ PearsonEducation(Singapore)Pvt.Ltd.,NewDelhi,2003. ReferenceBook(s) 1. JohnF.Wakerly,"DigitalDesign",FourthEdition,Pearson/PHI,2008. 2. JohnYarbrough, "DigitalLogicApplicationsandDesign", ThomsonLearning, 2006. 3.

CharlesH.Roth."FundamentalsofLogicDesign", 6thEdition, ThomsonLearning, 2013. 4. DonaldP.LeachandAlbertPaulMalvino,"DigitalPrinciplesandApplications",6th Edition,
UNIT 11 TMH,2006.
5. ThomasL.Floyd,"DigitalFundamentals",10thEdition,PearsonEducationInc,2011. 6. DonaldD.Givone,"DigitalPrinciplesandDesign", TMH,2003. 7. A.AnandaKumar,Fundamentalsofdigitalcircuits,secondedition,PHIlearningprivate limited,2009.
UNIT I NEEDFOROBJECTORIENTEDPROGRAMMING 9HOURS
Characteristicsof objectorientedlanguage-objects,classes,Inheritance,Reusability,creatingnew datatypes,Polymorphismandoverloading.C++programmingbasis–Datatypes,Manipulators, Cin,Cout,Typeconversion,arithmeticoperators,Loopsanddecisions.
UNIT II CLASSANDOBJECTS 9HOURS
Asimpleclass,C++ObjectsasphysicalObjects,C++ObjectsasDataTypes,Constructors, destructors,objectsasfunctionarguments,overloadedconstructors,memberfunctionsdefinedoutsidetheclass,inlinefunctions,andReturningobjectsfromFunctions.
UNIT III ARRAYS 9HOURS
Defining & accessing Array elements, arrays as class member data, array of Objects. Operator Overloading: Overloading Unary Operators, Operator Arguments, Return Values, nameless Temporary objects, postfix notations. Overloading Binary Operators - Arithmetic operators, ConcatenatingStrings,MultipleoverloadingComparisonoperators,ArithmeticAssignmentOperators.
UNIT IV INHERITANCE-DERIVEDCLASSANDBASECLASS 9HOURS
Derived class constructors, overriding member functions, Class Hierarchies, Abstract base class, Publicand private inheritance,Levels of inheritance, Multipleinheritance.Memory management – newanddeleteoperator,astringclassusingnew,PointerstoObjects– ReferringtoMembers,anotherApproachtonew,AnarrayofpointerstoObjects.
UNIT V VIRTUALFUNCTIONS 9HRS
Virtual function, Late Binding, Abstract Classes, Pure virtual functions, Friend Functions–, Friends for functional Notation. Friend Classes -Static Functions, investigating destructors. Assignmentandcopy–initialization-overloadingtheassignmentoperator,thecopyconstructor,thispointer.Templates,functiontemplate,class template. TotalHours :45 Hours TextBook(s) ObjectOrientedProgramminginMicrosoftC++-RobertLafore,GalgotiaPublications1998 LetusC++-YaswantKanitkar,2000. ReferenceBook(s) ObjectOrientedProgramminginC++-C.Balagurusamy,TataMcGrawHill,2002. CorrelationbetweenCourseOutcomes(COs)andProgramOutcomes(POs):

TEXT BOOKS

1. Hyatt W.H. and Kemmerly, "Engineering Circuits Analysis", McGraw- Hill International 8thEdition 2011.

2. Kuo F.F., "Network Analysis and Synthesis", Wiley International Edition, 2ndEdition 2006.

3. ParanjothiS.R.,"Electric Circuit Analysis", New Age International Ltd., Delhi, 2nd Edition. 2008.

REFERENCES

1. Edminister J.A., "Theory and Problems of Electric Circuits", Schaum's outline series McGraw HillBook Company, 4thEdition 2003.

2. Sudhakar A and Shyam Mohan S.P., "Circuits and Network Analysis and Synthesis", Tata McGraw- Hill Publishing Ltd., New Delhi5th Edition 2015.

3. Van Valkenburg M.E., “Network Analysis”, Prentice – Hall of India Private Ltd., New Delhi, Third Edition,1974.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTRIC CIRCUITS LAB	0	0	3	2

Course Category: PCC

OBJECTIVES

- To provide practical experience with simulation of electrical circuits and verifying circuit theorems.

COURSE OUTCOMES

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

CO1. Ability to understand and apply circuit theorems and concepts in engineering applications.

CO2. Verification of theorems

CO3. Measurement by two wattmeter method

CO4. Series and Parallel resonance in RLC Circuits

CO5. Circuit Transients by Digital simulation

CO6. Obtain the B-H Curve of a magnetic material

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	L	L	-	M	M	-	S
CO2	S	S	S	S	S	L	L	-	M	M	-	S
CO3	S	S	S	S	M	L	L	-	L	L	-	M
CO4	S	S	S	S	S	M	L	-	M	M	-	M
CO5	S	S	M	M	M	M	L	-	M	M	-	M

LIST OF EXPERIMENTS

1. LIST OF THE EXPERIMENTS:
2. Verification of Kirchhoff's laws
3. Verification of Superposition theorem.
4. Verification of Thevenin's Theorem.
5. Verification of Norton's Theorem.
6. Verification of Maximum Power Transfer theorem.
7. Three phase power and power factor Measurement by two wattmeter method.
8. Verification of theorems using Digital simulation.
9. Circuit Transients by Digital simulation.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	MEASUREMENTS AND INSTRUMENTATION	3	0	0	3

Course Category: PCC

OBJECTIVES

- Acquire the knowledge on basic measurement concepts.
- Acquire the knowledge on basic electronic measurements.
- Acquire the knowledge on recording devices.

COURSE OUTCOMES

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

CO1. Understand Measurement systems, Bridge measurements.

CO2. Know the principles of cathode ray oscilloscopes and other measuring instruments.

CO3. Compare analog and digital techniques, and measurement errors.

CO4. Understand Measurement systems, Bridge measurements.

CO5. Know the principles of cathode ray oscilloscopes and other measuring instruments.

CO6. Compare analog and digital techniques, and measurement errors.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	M	L	L	-	L	L	-	M
CO2	M	M	M	M	S	L	-	-	M	L	-	S
CO3	M	S	S	S	S	L	-	-	M	M	-	S

SYLLABUS

UNIT I SCIENCE OF MEASUREMENT AND CHARACTERISTICS OF TRANSDUCERS
Functional elements of an instrument - Units and standards - calibration methods – errors in measurement - statistical methods - Static characteristics - accuracy, precision, sensitivity, linearity, Reproducibility, Repeatability and Noise - Dynamic characteristics – impulse, step, ramp and sinusoidal inputs.Classification of transducers – Selection of Transducer – Applications of Transducer -Resistive Transducer: Strain gauges, Resistance Thermometers, Thermistor - Inductive Transducers: LVDT, RVDT- Capacitive Transducers – Piezoelectric Transducer.
UNIT II POTENTIOMETERS AND ELECTRICAL INSTRUMENTS
DC potentiometer - Loading effect – Application – Basic circuit - standardization – Laboratory type (Crompton's) – AC potentiometer – Drysdale (polar type) type – Gall-Tinsley (coordinate) type – Limitations & applications –Instrument Transformer - C.T and V.T construction, theory, operation, phasor diagram, characteristics, testing, error elimination – Applications – Single and three Phase Wattmeters and Energy meter.
UNIT III MEASUREMENT OF RESISTANCE AND IMPEDANCE
Low Resistance: Kelvin's double bridge – Ductor Ohmmeter - Medium Resistance: Voltmeter Ammeter

method, Substitution method, Wheatstone bridge method – High Resistance: Megger, Direct deflection method, Megohm bridge method - Earth resistance measurement. Introduction to A.C. bridges – Sources and Detectors in A.C. bridges – Measurement of Inductance – Anderson Bridge. - Measurement of Capacitance: Schering's bridge, De-Sauty's bridge - Measurement of frequency using Wien's bridge- LCR meter- Q meter
UNIT IV CRO AND RECORDING INSTRUMENTS
Oscilloscope: CRO – CRT, Deflection System, Specifications, Controls, Phosphors -Dual Beam / Dual trace oscilloscope - Storage Oscilloscope, Digital Storage Oscilloscope and Sampling Oscilloscope. Recording Instruments: Method of Recording – Frequency Modulated (FM) recording-Pulse Duration Modulation (PDM) Recording - Strip Chart Recorders, X-Y, UV Recorders, and Plotters.
UNIT V ANALOG & DIGITAL INSTRUMENTS
Operating Forces – Deflecting Force, Controlling Force, Damping Force - Galvanometer, PMMC & moving iron instruments – Principle of operation, construction and sources of errors and compensation – Dynamo meter – True RMS meter - electronic voltmeter – Digital Voltmeter – Multimeter – vector voltmeter.

TEXT BOOKS

1. Patranabis, 'Sensors and Transducers', Prentice Hall of India, 2ndEdition 2013.

2. Cooper W.D., "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, New Delhi, 2003.Joseph J Carr, Elements of Electronic Instrumentation & Measurement, Pearson, 3rd Edition 1995.

3. Kalsi.H.S, "Electronics Instrumentation", Tata McGraw Hill, New Delhi, 3rdEdition 2017.

4. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2ndEdition 2018.

5. Sawhney A.K., "A Course in Electrical, Electronic measurement & Instrumentation", DhanpatRai& sons,18th Edition, Reprint 2015

6. Oliver B.H., and Cage J.M., "Electronics Measurements and Instrumentation", McGraw Hill, 2017.

7. M.M.S.Anand,"Electronic instruments and instrumentation thcnology,"PHI, 2006.

REFERENCES

1. Doeblin E.O. "Measurement System Applications and Design", McGraw Hill, 6th Edition, July2017.

2. S. Ranganathan, 'Transducer Engineering', Allied Publishers Pvt. Ltd., 2003.

3. Stout M.B., "Basic Electrical Measurement", Prentice Hall of India, 2012.

4. Dalley,J.W., Riley, W.F. and Meconnel, K.G., " Instrumentation for Engineering Measurement", John Wiley & Sons, 1999.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	DC MACHINES AND TRANSFORMERS	2	1	0	3

Course Category: PCC

OBJECTIVES

- To understand the generation of D.C. voltages by using different types of generators and Study their performance.
- To study the working principles of D.C. motors and their load characteristics, starting and Methods of speed control.
- To familiarize with the constructional details of different type of transformers, working principle and their performance.

COURSE OUTCOMES

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

CO1. The concepts of electromechanical energy conversions in D.C. machines and energy transfer in transformers and also to analyze their performance.

CO2. EMF Equation

CO3. D.C MACHINE CONSTRUCTION and DC Motor and Generator characteristics, Starting methods of DC motors

CO4. Transformer and special transformer Construction,

CO5. Speed control of DC Machines, Faradays Laws

CO6. Testing of DC Machines, Parallel operation of DC motor and generator,

CO7. Parallel operation of transformers,

CO8. Determination of losses and efficiency of DC Machines

CO9. Determination of losses, efficiency and regulation of Transformers

CO10. Equivalent circuit of transformer

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	-	-	-	-	L	L	-	M
CO2	M	L	L	L	M	L	-	-	L	M	-	M
CO3	M	L	S	L	M	L	-	-	L	L	-	S
CO4	S	S	M	S	S	L	-	-	M	L	-	M
CO5	M	S	S	M	L	-	-	-	-	L	-	M

SYLLABUS

UNIT I D.C MACHINE CONSTRUCTION
Field System-Armature Core-Commutatorand Brushes-Armaturewinding- E.M.F equation-Methodsof Excitation- ArmatureReaction-Commutation-Load Characteristicsof D.C generators-Series, shunt and

compoundmachines-Paralleloperation ofD.CGenerators.
UNIT II D.C MOTORS
Principle-BackEMF-Torque-Loadcharacteristicsofseries,shuntandcompoundmotors-Threepoint,Fourpoint&AutomaticstarterforD.CMotors-SpeedControlofD.CMotors.Losses-EfficiencyofD.Cmotors&Generators – Braketest,Swinburne'stest,Hopkinson'stest,FieldtestforSeriesMachines.
UNIT III TRANSFORMERS
Principle – EMF equation and Transformation Ratio-Types of transformers-Construction-phasor diagram at different load Equivalentcircuit-voltage regulation-losses and efficiency-Allday efficiency.
UNIT IV TRANSFORMERS TESTING & PARALLEL OPERATION
Polarity and ratio test-O.C and S.C test-Load test- Parallel operation -Three phase Transformer connections-Opendelta-Leblancconnection-Threephasetosinglephaseconversion-Tapchanging
UNIT V SPECIAL TYPE OF TRANSFORMERS
Auto Transformers- current & potential transformers - Earthling-Transformer-Welding Transformer-DistributionTransformer-PowerTransformer-Construction&Operatingprinciple.

TEXT BOOKS

1. Theraja&A.K.Theraja,"ElectricalTechnology",VolII,S.ChandCompanyLtd,NewDelhi,2008.

2. R.KRajput, "ElectricalMachines",4thEdition,Laxmipublications, 2008

REFERENCES

1. 1. Dr.MurgeshKumar,"D.CMachinesandTransformer",VikasPublishers,2nd Edition 2013

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	Data Structures and Algorithms[Common to EEE/ECE]	3	0	0	3

Course Category: PCC

OBJECTIVES

- Learn linear data structures – list, stack, and queue.
- Learn Non linear data Structures-Trees and Graphs.
- Be exposed to sorting, searching and hashing algorithms.

COURSE OUTCOMES

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

CO1. Implement application of linear and nonlinear data structures.

CO2. Apply the different linear data structures to solve problems .

CO3. Implement the various algorithms.

CO4. Select appropriate data structures as applied to specified problem definition.

CO5. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.

CO6. Students will be able to implement Linear and Non-Linear data structures.

CO7. Implement appropriate sorting/searching technique for given problem.

CO8. Determine and analyze the complexity of given Algorithms.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	-	-	S	M	L	S
CO2	M	S	M	S	S	M	-	-	S	M	L	S
CO3	M	M	M	M	S	M	-	-	S	M	L	S
CO4	M	S	M	S	S	M	-	-	S	M	M	M
CO5	M	S	M	S	S	M	-	-	S	M	M	M

SYLLABUS

UNIT I INTRODUCTION
Basic Terminologies: Elementary Data Organizations, Data Structure Operations: insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Searching: Linear Search and Binary Search Techniques and their complexity analysis
UNIT II STACKS AND QUEUES
ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation–corresponding algorithms and complexity analysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.

UNIT III LINKED LISTS
Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.
UNIT IV TREES & GRAPH
Trees - Basic Tree Terminologies, Different types of Trees: Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree: definitions, algorithms and analysis. Graph - Basic Terminologies and Representations, Graph search and traversal algorithms and complexity analysis.
UNIT V SORTING AND HASHING
Objective and properties of different sorting algorithms: Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort; Performance and Comparison among all the methods, Hashing.

LIST OF EXPERIMENTS

1. DATA STRUCTURES LAB

2. LIST OF PROGRAMS

3. Write simple program to implement Array data structure with all possible manipulation such as insertion, deletion, find & replace,, accepting array values from command line arguments

4. Write simple programs to implement structures with all possible manipulations such as passing structures and returning from functions, pointer to the structure, members as pointers in the structure and self referential structure.

5. Write simple programs to implement pointers with all manipulations such as pointer to arrays, pointer arithmetic, pointer to pointer, passing pointers to functions and returning from functions.

6. Implementation of Single Linked List

7. Implementation of Stack

8. Implementation of Queue

9. Sort the Given Numbers using

10. Bubble sort

11. Selection Sort.

12. Insertion Sort

13. Implement linear and Binary Search algorithms

TEXT BOOKS

1. “Fundamentals of Data Structures” ,Illustrated Edition by Ellis Horowitz, Sartaj Sahni, Computer Science Press

2. Seymour Lipschutz – “Theory and Problems of Data Structures”.(AVL Trees, B-Trees), Edition 2006,Tata mcgraw Hill, 12th Edition 2011.

3. Ellis Horowitz &SartajSahani – “Fundamentals of Data Structures in C ” – W.H. Freeman and Co., 2nd Edition, 2007.

REFERENCES

1. Hand book of Data Structures and Applications ,Dinesh P Mehta,SartajSahni, CRC Press, 2018

2. Algorithms, DataStructures, and Problem Solving with C++", Illustrated Edition by Mark Allen Weiss, Addison-Wesley Publishing Company

3. "How to Solve it by Computer",2nd Impression by R.G.Dromey, Pearson Education.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	GENERATION TRANSMISSION AND DISTRIBUTION	3	0	0	3

Course Category: PCC

OBJECTIVES

- To develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and operating
- Voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.

COURSE OUTCOMES

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

CO1. Ability to understand and analyze power system generation, transmission line parameter calculation, performance of transmission line, types of cables and insulators, HVDC transmission.

CO2. Calculate the transmission network parameters for various configurations

CO3. Calculate the performance characteristics of the given transmission line using nominal-T,π, rigorous methods and power circle diagram

CO4. Explain the effect of corona and sag on overhead transmission lines

CO5. Calculate the sag of a overhead line for various conditions

CO6. Explain the various types of insulators, cables and their construction

CO7. Calculate string efficiency of the suspension type insulators

CO8. Compute the insulation resistance, capacitance and grading of cables

CO9. Calculate the voltage at a point on the given type of distribution system

CO10. Determinetheconfigurationandapplythecharacteristicsofdiodes andtransistors.

CO11. Designandconstructvarioustypesofamplifiercircuits.

CO12. Designandconstructsinusoidalandnon-sinusoidaloscillators.

CO13. CharacterizethefunctioningofOP-AMPanddesignapplicationbased circuits.

CO14. DesignandconstructADCandDACcircuits.

CO15. CorrelationbetweenCourseOutcomes(COs)andProgramOutcomes(POs):

CO16. PO 1

CO17. S

CO18. S

CO19. S

CO20. S

CO21. S

CO22. Executeprogramsusingassemblylanguageof8085 Microprocessor.

CO23. Executeprogramsusingassemblylanguageof8086 Microprocessor.

CO24. DesigninterfacingcircuitsusingI/Oand Memorydevices.

CO25. Developsystemsusingdifferentmicrocontrollers.

CO26. DesignARMmicrocontrollerbasedsystems.

CO27. CorrelationbetweenCourseOutcomes(COs)andProgramOutcomes(POs):

CO28. PO 1

CO29. S

CO30. S

CO31. S

CO32. S

CO33. S

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	-	-	-	-	-	M	-	M
CO2	S	S	S	M	L	-	-	-	-	M	-	M
CO3	M	M	S	S	M	S	M	M	M	M	M	S
CO4	M	M	S	M	L	M	M	M	S	S	L	M
CO5	M	M	M	S	M	S	S	M	S	M	M	M
CO6	M	S	S	M	L	L	L	-	M	M	-	M
CO7	M	M	S	M	S	M	S	S	S	S	S	S
CO8	M	S	S	M	L	M	-	-	M	M	M	S

SYLLABUS

UNIT I GENERATIONANDDISTRIBUTIONSYSTEMS
Hydel, thermal, nuclear, tidal, Biogas,Biomassplants –structureof electric powersystem-One line diagram - Generation, Transmission and Distribution systems- Comparison of distribution systems- Radial and ring systems-twowireDC,ACsinglephaseandthreephasesystemsCurrentandvoltage calculationdistributionwithconcentratedanddistributedloads-Kelvin'sforthe designoffeeders and itslimitations.
UNIT II LINE PARAMETERS AND CORONA
Resistance and capacitance of single phase and three phase line - Stranded bundled conductor configuration - Symmetrical and unsymmetrical spacing- Transposition of line conductor - Double circuit lines - Application of self and GMD - Skin and proximity effects - Earth effect on capacitance – Interference - Corona characteristics – Effect on performance of lines.
UNIT III PERFORMANCE OF OVER HEAD LINE
Equivalent circuits for short, medium (PI and T circuits) and long lines- Efficiency and Regular - Tuned power lines - Attenuation and surge impedance loading - Power circle diagrams for receiving and sending ends- Transmission capacity - Steady state power limit - Voltage control of lines- Shunt and series compensation.
UNIT IV UNDERGROUND CABLES AND INSULATOR
Underground cables - types Construction- Capacitance of cables - Insulation resistance - Dielectric stresses and grading - Capacitance and intersheath grading - Dielectric loss - Thermal characteristics - Capacitance of three core cables - Fault location - Short circuit and open circuit in – Insulators - Types and comparison- Voltage distribution in string insulators - String efficiency - Methods of improving efficiency.

UNIT V MECHANICAL DESIGN AND HVDC TRANSMISSION
Stress and sag calculations- Effect of wind and ice- Supports at different levels - Stringing chart condition erection – Dampers - HVDC transmission: Comparison of AC and DC systems - Economics distance for DC - Terminal equipment for DC systems.
UNIT I AMPLIFIERMODELS 9HOURS
Voltage amplifier, Current amplifier, Trans-conductance amplifier and Trans-resistance amplifier. BiasingschemesforBJT and FETamplifiers,Biasstability, Variousconfigurations(CE/CS,CB/CG, CC/CD) andtheirfeatures,Smallsignalanalysis,Estimationof voltagegain,inputresistance, output resistance etc.,LowfrequencyandHighfrequencytransistormodels,DesignProcedureforparticular specifications,Lowfrequencyanalysisofmultistageamplifiers
UNIT II POWER&FEEDBACKAMPLIFIERS 9HOURS
Frequency response of single stage and multistage amplifiers, Cascode amplifier. Various classes of operation (Class A, B, AB, C), their power efficiency and linearity issues - Feedback Topologies: Voltageseries,Currentseries,Voltageshunt,Currentshunt,Effectoffeedbackongainand bandwidth,Calculationwithpracticalcircuits,Conceptofstability,gainmarginandphasemargin.
UNIT III OSCILLATORS&DIFFERENTIALAMPLIFIERS 9HOURS
Review of Basic Concept, Barkhausen criterion, RC oscillators (Phase shift, Wien Bridge), LC oscillators (Hartley,Colpitts,Clapp),Non- sinusoidal oscillators.Current mirror: Basic topology and itsvariants,V-Icharacteristics,output resistance,minimumsustainablevoltageandmaximumusable load. Differential amplifier: Basic structure and principle of operation, calculation of differential gain,common modegain,CMRR andICMR.OP-AMPdesign: Designof differentialamplifierfora givenspecification,Designofgainandoutputstages,compensation.
UNIT IV OP-AMPAPPLICATIONS 9HOURS
ReviewofInvertingandNon-invertingamplifiers,Integratoranddifferentiator,Summingamplifier,Precision rectifier,Schmitttriggeranditsapplications-Activefilters:Lowpass,highpass,bandpass and band stop, design guidelines.
UNIT V DAC&ADC 9HOURS
Digital-to-analog converters (DAC): Weighted resistor, R-2R ladder, Resistor string. Analog to- digital converters(ADC): Singleslope, Dual slope, Successive approximation, Flashtype-Switchedcapacitorcircuits:Basicconcept,practicalconfigurations,Applicationinamplifier,integrator,ADCetc. TotalHours 45Hours TextBook(s) 1. PaulR.GrayandRobertG.Meyer,“AnalysisandDesignofAnalogIntegratedCircuits”, JohnWiley, 3rdEdition,1992. 2 J.V.Wait,L.P.HuelsmanandGAKorn,“IntroductiontoOperationalAmplifiertheoryand applications”,McGrawHill,1992 ReferenceBook(s) 1 A.S.SedraandK.C.Smith,“MicroelectronicCircuits”,OxfordUniversityPress,5thEdition, 2004. 2. P.HorowitzandW.Hill,“TheArtofElectronics”,CambridgeUniversityPress,2ndEdition, 1989. 3 J.MillmanandA.Grabel,“Microelectronics”,McGrawHill,SecondEdition,1988.
UNIT I 8085MICROPROCESSOR 9HOURS
Microprocessor architecture and its operation, memory, I/O devices, 8085 microprocessor –Core architecture - Various registers- Bus Timings, Multiplexing and De-multiplexing of Address Bus, DecodingandExecution,Instructionset– Classification,InstructionFormat,AddressingModes,8085InterruptProcess,HardwareandSoftwareInterrupts.
UNIT II 8086MICROPROCESSOR 9HOURS
Core Architecture of the 8086 - Memory Segmentation, Minimum mode Operation and Maximum Mode Operation, Instruction Set of the 8086 processor- Classification - Instruction Format Addressing modes, Simple Assembly Language Programs - Arithmetic operations, Data transfer, String Manipulation, Searching and Sorting.

UNIT III I/O INTERFACING 9 HOURS
Memory Interfacing and I/O interfacing - Parallel communication interface – Serial Communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display ,LCD display, Keyboard display interface and Alarm Controller.
UNIT 14 UNIT-IVMICROCONTROLLER 9 HOURS
Architecture of 8051 – Special Function Registers (SFRs) - I/O Pins Ports and Circuits – Instruction set-Addressing modes - Assembly language programming - Programming 8051 Timers, Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & SensorInterfacing - External Memory Interface- Stepper Motor and Waveform generation.
UNIT V ADVANCEDMICROPROCESSOR& MICROCONTROLLER 9 HOURS
Advanced Microprocessor Architectures- 286, 486, Pentium - RISC Processors- RISC Vs CISC, RISC properties and evolution- ARM Processor – CPU: programming input and output supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPUperformance- CPU power consumption.
UNIT 16 TOTAL HOURS 45 HOURS
Text Book(s) R. S. Gaonkar, “Microprocessor Architecture: Programming and Applications with the 8085/8080A”, Penram International Publishing, Third Edition, 1996. D A Patterson and J H Hennessy, “Computer Organization and Design The hardware and software interface” Morgan Kaufman Publishers, Fourth Edition, 2011.
UNIT 17 REFERENCE BOOK(S)
Douglas Hall, “The Microprocessors and its Interfacing”, Tata McGraw Hill, Third Edition,2012. Kenneth J. Ayala, “The 8051 Microcontroller: Architecture Programming & Applications”,Penram International Publishing, Second Edition, 1996.

TEXT BOOKS

1. C.L.Wadhwa,Electricalpowersystems,WilleyEasternLimited,NewDelhi,5thEdition 2011.

REFERENCES

1. W.L.Stevenson,ElementsofpowersystemsanalysisMcGrawhill.S.L.Uppal,Electricalpower, khanna publishers,NewDelhi,4th Edition 1982.

2. Soni, BhatnagarandGupta, A course in electrical power DhanpatRaj &Sons,New Delhi,9th Edition 1985.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ANALOG AND DIGITAL ELECTRONICS LAB	0	0	3	2

Course Category: PCC

OBJECTIVES

- To expose the students to digital circuits
- To understand the basics of combinational logic circuits
- To understand characteristics of sequential logic circuits.

COURSE OUTCOMES

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

CO1. Ability to understand and analyse digital electronic circuits.

CO2. Demonstrate minimization of the given Boolean function using K-Map and realize it using logic gates

CO3. Construct combinational logic circuit for the given application and analyse its performance using PSIM software

CO4. Construct synchronous / asynchronous sequential logic circuits for the given application and analyse its performance using PSIM software

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	M	L	L	-	M	M	M	S
CO2	S	S	S	S	M	M	L	L	S	S	M	S
CO3	S	S	S	S	M	M	-	-	S	S	M	S

LIST OF EXPERIMENTS

1. LISTOFTHE EXPERIMENTS:
2. VI Characteristics of Semi conductor diode/ Zener diode
3. Input and output characteristics of a BJT in CE configuration
4. Characteristics of JFET/MOSFET
5. Clipper and Clamper
6. Frequency response of CE amplifier
7. Operational Amplifiers (IC741) – Characteristics and Applications
8. Differential Amplifier
9. Instrumentation amplifier using OP-AMP ICs
10. RC-Phase Shift Oscillator using OP-AMP IC.
11. Astable multivibrator and Schmitt trigger using OP-AMPIC.
12. Implementation of Boolean Functions, Adder and Subtractor circuits.
13. Implementation of Code converters

14. Implementation of Encoders and Decoders.
15. Implementation of Multiplexer and de multiplexer
16. Implementation of Counter circuits

WEB / ONLINE RESOURCES

- www.nptl.co.in
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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	DC MACHINES AND TRANSFORMER LAB	0	0	3	2

Course Category: PCC

OBJECTIVES

- To expose the students to the operation of D.C. machines and transformers and give them experimental skill.

COURSE OUTCOMES

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

CO1. After the laboratory,the students understand the basic operation of electrical dc machines and transformer and help them to develop experimental skills.

CO2. Three Phase Transformer Connections.

CO3. Load test on D.C shunt Generator

CO4. Load test on D.C Series Generator

CO5. Load test on Compound Generator

CO6. Load test on D.C Shunt Motor.

CO7. Load test on D.C Series motor

CO8. Speed control of D.C shunt Motor.

CO9. Parallel Operation of Single phase transformers.

CO10. Predetermination of Efficiency of D.C Shunt Generator by Swinburne's test

CO11. Sumpner's test

CO12. O.C& S.C Test on Single phase Transformer.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	S	L	M	L	L	M	M	L	M
CO2	S	S	S	S	M	M	M	L	S	S	M	M
CO3	S	S	S	S	M	S	M	L	S	S	M	M
CO4	S	S	S	S	M	S	S	M	S	M	M	S
CO5	S	S	S	S	M	S	M	L	S	M	M	S
CO6	S	S	S	S	M	M	L	L	S	M	M	M

LIST OF EXPERIMENTS

1. LISTOFTHE EXPERIMENTS:
2. LoadtestonD.CshuntGenerator
3. LoadtestonD.CSeriesGenerator.
4. LoadtestonD.CShuntMotor.

5. LoadtestonD.CSeriesmotor.
6. Speedcontrolof D.CshuntMotor.
7. Load test on Compound Generator
8. PredeterminationofEfficiencyofD.CShuntGeneratorbySwinburne'stest
9. O.C& S.CTestonSinglephaseTransformer.
10. LoadtestonSinglePhaseTransformer.
11. Sumpner'stest.
12. ParallelOperationofSinglephasetransformers.
13. ThreePhaseTransformerConnections.

TEXT BOOKS

1. Theraja&A.K.Theraja,"ElectricalTechnology",VolII,S.ChandCompanyLtd,NewDelhi,2002
2. R.KRajput, "ElectricalMachines",4thEdition,Laxmipublications,2008

REFERENCES

1. 1. Dr.MurgeshKumar,"D.CMachinesandTransformer",VikasPublishers,2013.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	INDUCTION AND SYNCHRONOUS MACHINES	2	1	0	3

Course Category: PCC

OBJECTIVES

- To know the Construction and performance of salient and non – salient type synchronous generators.
- To provide deep understanding of Principle of operation and performance of synchronous motor.
- To impart knowledge on Construction, principle of operation and performance of induction machines.

COURSE OUTCOMES

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

CO1. By studying the subject the students will understand the concepts of synchronous and asynchronous machines and also analyze their performance.

CO2. Types of alternators, induction motors.

CO3. Applications of alternators, induction motors and fractional horsepower motors.

CO4. Construction and working of synchronous, Induction and special types of machines.

CO5. Armature reaction and synchronizing methods.

CO6. Double Field revolving Theory.

CO7. Determination Voltage Regulation of Alternator by EMF, MMF, ZPF and ASA methods.

CO8. Performance analysis of three phase and single phase induction motors.

CO9. Phasor diagrams, v –curve and inverted v curves of synchronous machines.

CO10. Estimation of torque and power output.

CO11. Equivalent circuits of alternator, three and single phase induction machines.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	L	M	M	L	M	M	L	M
CO2	M	M	M	L	L	M	L	L	L	L	M	M
CO3	S	S	S	S	M	M	L	L	S	S	L	M
CO4	S	S	S	S	M	M	L	L	S	S	L	M
CO5	M	M	S	S	M	M	-	-	S	S	L	M

SYLLABUS

UNIT I ALTERNATORS
Construction- types - circuit model - synchronous reactance - voltage regulation - EMF, MMF, Potier and ASA methods - armature reaction – synchronizing - parallel operation.
UNIT II SYNCHRONOUS MOTORS
Principle -Starting-Speed-torque curves -phasor diagrams - V & inverted V curves- phase modifiers -

Hunting in synchronous machines and its prevention – applications.
UNIT III THREE PHASE INDUCTION MACHINES
Construction - types - principle of operation - equivalent circuit - torque and power output - testing - circle diagram - cogging and crawling - starting and speed control double cage rotor – induction generator.
UNIT IV SINGLE PHASE INDUCTION MACHINE
Single phase induction motor - double revolving field theory - equivalent circuit - performance analysis - load characteristics - starting methods
UNIT V FRACTIONAL HORSE POWER MOTORS
Shaded - pole induction motor - variable reluctance motor - stepper motor - AC series motor - repulsion motor - linear motor - permanent magnet DC and AC motors.

TEXT BOOKS

1. B.L.Theraja&A.K.Theraja, “Electrical Technology”,Vol-II, S.Chand Company Ltd, New Delhi,23rd Edition 2007.

REFERENCES

1. Fitzgerald, A.E.Charles Kingsley Jr.StephenD.Umans, “Electric Machinery”, McGraw-Hill Book Company, 5th Edition 2005.

2. Syed A.Nassar, “Electric Machines and Power System”, Vol - I, McGraw -Hill Inc., NewYork,

3. Dr.Murgesh Kumar, “Induction and synchronous machines”, vikas publications, New Delhi. 1st Edition 2004.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	POWER SYSTEMS – I [MODELLING AND COMPONENTS]	3	0	0	3

Course Category: PCC

OBJECTIVES

- Understand the concepts of power systems.
- Understand the various power system components.
- Evaluate fault currents for different types of faults.
- Understand the generation of over-voltages and insulation coordination.
- Understand basic protection schemes.

COURSE OUTCOMES

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

CO1. Study of relays & Study of protection scheme, solid state relays.

CO2. To understand instrument transformer and accuracy.

CO3. To understand the method of circuit breaking various arc theories Acing phenomena capacitive and inductive breaking.

CO4. Explain the Structure of a power system

CO5. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.

CO6. Calculation of Surge Impedance Loading.

CO7. Comparison of Series and Shunt Compensation of transmission lines.

CO8. Per-unit System and per-unit calculations.

CO9. Explain Lightning and Switching Surges.

CO10. Method of Symmetrical Components.

CO11. Types of Circuit Breakers.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	M	M	L	M	M	M	L
CO2	S	S	S	S	M	M	L	L	S	S	L	M
CO3	S	S	S	S	M	M	L	L	M	S	L	L
CO4	S	S	S	S	S	M	M	L	S	S	M	M
CO5	S	S	S	S	M	M	M	L	S	S	M	M
CO6	M	S	S	M	M	S	S	L	S	S	M	M
CO7	M	M	S	S	M	-	-	-	M	M	-	M
CO8	S	S	S	S	M	S	S	S	S	M	S	S

SYLLABUS

UNIT I BASIC CONCEPTS
Evolution of Power Systems and Present-Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources.Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radial systems). Synchronous Grids and Asynchronous (DC) interconnections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.
UNIT II POWER SYSTEM COMPONENTS
Overhead Transmission Lines and Cables: Types of Travelling-wave Equations. Sinusoidal Steady staterepresentation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power.Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines. Transformers: Vector Representation and Phase-shifts. Three-winding transformers, auto-transformers, Neutral Grounding transformers. Tap-Changing in transformers. Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical waveform under balanced terminal short circuit conditions – steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.
UNIT III OVER-VOLTAGES AND INSULATION REQUIREMENTS
Generation of Over-voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination.Propagation of Surges, lighting arresters, surge arresters. Voltages produced by traveling surges. BewleyDiagrams,Ground wire, protector tube.
UNIT IV FAULT ANALYSIS AND PROTECTION SYSTEMS
Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults.Representation of generators, lines and transformers in sequence networks.Computation of Fault Currents.Neutral Grounding. Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes(Over-current, directional, distance protection, differential protection) and their application. Earthing switches,
UNIT V NUMERICAL PROTECTION
Introduction, Block Diagram of a Numerical Relay, Numerical over current Protection, Numerical Transformer Differential protection, Numerical distance protection of Transmission line, Software and Hardware.

TEXT BOOKS

1. Ravindranath.B and Chander.N, “Power System Protection and Switchgear”, New Age International 2ndEdition 2018.

2. Chakrabarti .A, Soni .M.L, Gupta .P.V, “A text book on power system Engineering”, Dhanpatrai& Co. pvt.Ltd., 2013.

3. Y.G.Paithankar and S.R.Bhinde, “Fundamentals of power system protection”, PHI, New Delhi, 2010.

REFERENCES

1. Wadhwa C.L., “Electrical Power Systems”, New Age International Pvt. Ltd., Publishers, 2010 6th Edition.

2. Patra S.P., Basu S.K. and Chowduri S., “Power systems Protection”, Oxford and IBH Publishing Co, 1983.

3. Sunil.S.Rao, “Switchgear Protection and power systems”, Khanna Publishers, New Delhi, 13rd Edition, 2008.

WEB / ONLINE RESOURCES

- www.nptl.co.in

- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	CONTROL SYSTEMS	3	0	0	3

Course Category: PCC

OBJECTIVES

- Analyze representation of systems and to derive transfer function models.
- Provide adequate knowledge in the time response of systems and steady state error analysis.
- Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.

COURSE OUTCOMES

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

CO1. Describe various input/output models of dynamic system.

CO2. Be familiar with frequency domain descriptions and dynamic analysis.

CO3. Understand the concept of stability and effect of feedback control on sensitivity.

CO4. Basics of systems, Modelling of various kind of systems, detection of transfer function from the pictorial representation

CO5. Analyse the performance of the systems with time base

CO6. Analyse the performance of the systems with frequency base

CO7. Stability analysis and compensation technics

CO8. State space condition of the systems

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	L	L	M	M	L	M
CO2	S	S	S	S	M	M	M	L	S	S	M	M
CO3	S	S	S	S	M	S	M	L	S	M	M	M
CO4	S	S	S	S	S	S	M	L	S	M	M	S
CO5	S	S	S	S	S	M	M	L	S	M	M	S

SYLLABUS

UNIT I SYSTEM AND THEIR REPRESENTATION
Basic elements of control systems- open and close loop systems – Differential equation - Transfer function – Modelling of Electrical systems, translational and rotational mechanical systems – Block diagram reduction techniques – Signal flow graphs.
UNIT II TIME RESPONSE
Time response – Time domain specifications – types of input – I and II order system response – Error coefficients – Generalized error series – Steady state error –Effect of P,PI,PD and PID modes of feedback control ,Analysis using MATLAB.
UNIT III FREQUENCY RESPONSE

Frequency response – Bode plot – Polar plot – Nyquist plot – Frequency domain specifications from plots – Constant M and N circles – Nichol's chart– Analysis using MATLAB.
UNIT IV STABILITY AND COMPENSATOR DESIGN
Characteristic equation – BIBO stability - Routh Hurwitz criterion - Root locus technique Construction of Root locus - Nyquist stability criterion – Effect of Lag, Lead and lag-lead compensation on frequency response, Analysis using MATLAB.
UNIT V STATE VARIABLE ANALYSIS
Concept of state variables – State models for linear and time invariant systems – solution of state and output equation in controllable canonical form – concept of controllability and observability – Effect of state feedback .

TEXT BOOKS

1. M.Gopal,"Control system – Principle and Design," Tata McGraw Hill, 6th edition, 2012.

2. K.Ogata,"Modern control Engineering, "fifth edition, PHI, 2012.

REFERENCES

1. Benjamin C.Kuo, "Automatic control systems," PHI, 9thEdition 2014.

2. Nagrath I.J and Gopal M, "Control Systems Engineering", New Age Publishers, 6th Edition, 2018.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

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Dept. of EEE

Course Code		L	T	P	C
Course Title	DIGITAL SIGNAL PROCESSING AND ITS APPLICATIONS	3	0	0	3

Course Category: PCC

OBJECTIVES

- To introduce discrete Fourier transforms.
- To teach the design of infinite and finite impulse response filters for filtering undesired signals.
- To study the architecture of TMS320F24XX processor and about communication interface.

COURSE OUTCOMES

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

CO1. Perform frequency transforms for the signals.

CO2. Design IIR and FIR filters.

CO3. Apply TMS320F24XX processor for power electronic applications.

CO4. Characteristics of different digital systems

CO5. Compute Discrete Fourier Transform for the given signals.

CO6. Design the Digital Infinite Impulse Response Filters (IIR) from given Specifications

CO7. To describe about TMS320F24XX processor

CO8. Use of TMS320F24XX processor for power electronic applications.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	M	-	-	M	M	L	L
CO2	S	S	S	S	M	M	-	-	M	S	L	M
CO3	S	S	M	M	M	M	-	-	S	S	M	S
CO4	M	M	M	M	M	M	-	-	S	S	M	M
CO5	M	M	S	S	M	S	-	-	S	S	M	S

SYLLABUS

UNIT I INTRODUCTION
Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect. Digital signal representation.
UNIT II DISCRETE TIME SYSTEM ANALYSIS
Z-transform and its properties, inverse z-transforms; Fourier transform of discrete sequence – Discrete Fourier series.Computation of DFT using FFT algorithm - DIT & DIF - FFT using radix 2 - Butterfly structure.
UNIT III DESIGN OF DIGITAL FILTERS

FIR & IIR filter realization - Direct I, Direct II Parallel & cascade forms- IIR design: Analog filter design - Butterworth and Chebyshev approximations; digital design using impulse invariant and bilinear transformation.
UNIT IV DIGITAL SIGNAL PROCESSORS
Introduction - Architecture ofTMS320F24XX–Event Manager-General purpose Timer-SerialCommunication interface- Serial Peripheral Interface - CAN- Features – pipeline- Instruction set.
UNIT V DSP APPLICATIONS TO MOTOR CONTROL
PWM generation using LF24XX – Procedure; DSP control of BUCK-BOOST converter- Block diagram; DSP Control of BLDC Motor - Block diagram; SVPWM generation using LF24XX – Procedure.

TEXT BOOKS

1. Sanjit.K.Mitra, " Digital Signal Processing – A computer Based Approach", Tata McGraw – Hill Edition, Edition 4,2013.

2. Hamid A. Toliyat Steven Campbell ,"Dsp-Based Electromechanical Motion Control",CRC Press ,1st Edition 2019.

REFERENCES

1. John G. Proakis ,Dimitris K Manolakis , " Digital Signal Processing", Pearson Prentice Hall Publishing Ltd, 1st Edition 2009.

2. Lonnie C. Lumen, "Fundamentals of Digital Signal Processing', John WHily and sons, 1987.

3. R.G.Lyons, "Understanding Digital Signal Processing", Addison Wesley, 3rd Edition 1997.

4. TMS320C2xx User's Guide, Texas Instruments, 1999

WEB / ONLINE RESOURCES

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	POWER ELECTRONICS	3	0	0	3

Course Category: PCC

OBJECTIVES

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifier.
- To study the operation, switching techniques and basic topologies of DC-DC switching regulators.

COURSE OUTCOMES

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

CO1. Ability to understand &analyze various power converter circuits.

CO2. Understand the Basic structure, working and switching characteristics of Power semiconductor devices

CO3. Various protection circuit for power semiconductor devices.

CO4. Principle and working of AC-DC controlled converters

CO5. AC-DC Converters with different types of load

CO6. Working of Different types of DC Choppers

CO7. Voltage Control strategies for DC Choppers

CO8. Working of different types of DC-AC Converters

CO9. Calculating voltage in 120 degree and 180 degree modes operation

CO10. Operation of AC-AC Converters and control techniques

CO11. Calculate voltage and frequency for AC-AC Converters

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	L	L	L	M	M	-	M
CO2	M	S	M	S	S	M	M	L	M	M	L	M
CO3	S	S	M	M	S	M	M	L	M	M	-	M
CO4	S	S	S	S	S	M	M	-	S	S	-	M
CO5	S	M	M	M	S	M	M	-	S	S	-	M
CO6	S	S	S	S	S	M	L	L	S	S	L	M
CO7	M	M	M	M	S	M	M	M	S	S	L	M
CO8	M	M	S	S	S	M	M	L	S	S	L	M
CO9	M	M	M	M	S	M	L	L	S	S	L	M
CO10	S	S	S	S	S	L	L	L	S	S	L	M

SYLLABUS

UNIT I POWER SEMICONDUCTOR DEVICES
Basic structure and switching characteristics of Power Diode, Power Transistor, Power MOSFET, IGBT and GTO.SCR-Basic Operation- VI characteristics-Turn-on, Turn-off methods-Switching characteristics - Combination of SCRs - Snubber circuits - Ratings and Protection circuits.
UNIT II AC-DC CONVERTERS
Principles of Phase control - Natural commutation - Operation of 1Φ H.W controlled converters with R, RL, RL+FWD, RLE Loads - 1Φ F.W controlled converters with R, RL load, RL+FWD for bridge type converters. Operation of 3Φ H.W. controlled converters & F.W. controlled converters with R, RL - Effect of Source inductance on 1Φ and 3Φ F.W controlled converters - Operation of Dual converters.
UNIT III DC-DC CONVERTERS
Voltage, Current and Load commutation - Principles of chopper - Control strategies - T.R.C, C.L.C - Step-up, Step-down, Step-up-down choppers - Classification and operation of Choppers (A,B,C,D,and E). Introduction to Resonant converters – Effect of EMI on converters.
UNIT IV DC-AC CONVERTERS
Classification of Inverters - Basic Series Inverter - Basic Parallel Inverter - VSI Operation - single phase half Bridge and Full Bridge - three phase 180o & 120o conduction modes. CSI – Operation of single phase CSI with ideal switches – voltage control techniques in single phase inverters.
UNIT V AC-AC CONVERTERS
Types of control (phase & Integrated cycle control), Operation of single phase voltage regulator with R, RL Loads.Operation of three phase AC voltage controls (with Anti parallel SCR configuration) with R load operation.Cyclo converters: single phase - step up & step down cyclo converters, three phase cyclo converter with R, RL loads.

TEXT BOOKS

1. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition, 2014.

2. Theory of Power Electronics, “K.L.Rao, C.H.SaiBabu - S.Chand& Company Ltd.”, New Delhi.5th Edition 2010.

REFERENCES

1. M. D. Singh & K. B. Kanchandhani, “Power Electronics”, Tata McGraw – Hill Publishing Company, 2nd Edition, 2014.

2. N.Mohan, T.M.Undeland, W.P.Robbins, “Power Electronics, Converters and Applications & Design”,3rd Edition John Wiley & sons. 2007.

3. Dr P S Bimbhra “Power Electronics“, Khanna Publishers, New Delhi, Edition 2012.

WEB / ONLINE RESOURCES

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	EMBEDDED SYSTEM	3	0	0	3

Course Category: PCC

OBJECTIVES

- To study the architecture of LPC 2148 ARM processor.
- To learn the design aspects of LPC 2148's i/o and memory interfacing circuits.
- To study about communication and bus interfacing.

COURSE OUTCOMES

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

CO1. Design and implement programs on LPC 2148 Arm processor.

CO2. Design various scheduling algorithms.

CO3. Work with Task and Time management functions.

CO4. A. Understand basic concept of embedded systems. B. Analyze the applications in various processors and domains of embedded system.

CO5. To describe about ARM architecture

CO6. To understand the building blocks of ARM LPC 214X and its peripherals

CO7. To describe about the Real time Operating Systems

CO8. To understand the micro c/os Real time operating system and its functions

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	M	M	M	L	L	S	S	L	M
CO2	S	M	M	M	M	M	L	L	S	S	L	M
CO3	S	S	S	S	S	M	L	L	S	S	L	M
CO4	S	S	M	S	S	M	M	L	S	S	M	M
CO5	S	S	M	S	S	M	M	L	S	S	M	M

SYLLABUS

UNIT I ARM INTRODUCTION
Introduction - The ARM Architecture Overview - Instruction set Summary - Processor operating states- Memory formats - Memory Interface - Bus interface signals -Addressing signals Addressing timing - Data Timed Signals - Debug interface - Debug systems - Debug interface signals - ARM7TDMI Core and system state - About Embedded ICE-RT Logic – Instruction Set.
UNIT II LPC2148 ARM CPU
Introduction: - Architectural Overview - Memory Mapping -Block Diagram System control block functions: PLL - Power Control - Reset - VPB Divider - Wakeup Timer - Memory Acceleration Module - Timer0 and Timer1- PWM - RTC - On Chip ADC - On Chip DAC- Interrupts- Vector Interrupt Controller.

UNIT III LPC 2148 – PERIPHERALS
General Purpose Input/Output Ports (GPIO) - Universal Asynchronous Receiver/Trasmitter (UART) - I2C Interface – Multimaster and Multislave communication - SPI Interface - SSP Controller – USB 2.0 Device Controller.
UNIT IV OPERATING SYSTEM OVERVIEW
Introduction OS – Function of OS – Defining an RTOS – Differences in Embedded Operating Systems – Introduction to Kernel – Resources – Shared Resources - Defining a Task – Task States - Multitasking - Scheduling and Scheduling Algorithms - Context Switching – Clock Tick – Timing of Task.
UNIT V MC/OS – II
Introduction–II Task Management Functions – Creating a Task - Time Management Functions – OS Delay Functions - Implementation of Scheduling and rescheduling.

TEXT BOOKS

1. Embedded Systems Architecture - Tammy Noergaard, Newnes 2005.

2. ARM System Developer"s Guide – Andrew N.Sloss.

3. ARM Architecture Reference Manual - David Seal.

4. ARM System-on-Chip Architecture (2nd Edition) by Steve Furbe.

REFERENCES

1. Micro C/OS – II The Real Time Kernel Jean J. Labrosse.

2. Real Time Concepts for Embedded Systems – by Qing Li and Caroline Yao, 2003

3. Embedded / Real Time Systems : Concepts , Design & Programming by Dr. K.V.K.K PRASAD.

4. LPC 2148 User Manual.

WEB / ONLINE RESOURCES

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	DSP AND MICRO CONTROLLER LAB	0	0	3	2

Course Category: PCC

OBJECTIVES

- To provide training on programming of Microcontroller and DSP to understand the interface requirements.

COURSE OUTCOMES

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

CO1. To understand and apply computing platform and software for engineering problems.

CO2. Write 8051 assembly language programs and embedded 'C' programs for microcontroller to implement arithmetic operations and code conversions.

CO3. Develop 8051 based embedded 'C' programs for ADC and DAC interfacing, 7 segment LCD/LED display, stepper motor interface, Relay interface

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	L	L	S	S	M	M
CO2	S	S	S	S	S	S	L	M	S	S	S	S

LIST OF EXPERIMENTS

1. LIST OF THE EXPERIMENTS:

2. Using Assembly/Embedded 'C' Program with 8051 microcontroller

3. 1. Addition, Subtraction, Multiplication, Division

4. 2. Interfacing of 7 segment LED/LCD display

5. 3. Interfacing of ADC/DAC conversion

6. 4. Interfacing of Stepper Motor

7. 5. Relay Interface

8. 6. Keyboard Interface

9. 7. I2C based serial EEPROM/ RTC using I2C

10. Using Code Composer Studio with TMS320F2418 DSP

11. 1. Study of special instruction in C2418 and its programming.

12. 2. Waveform generation using C2418 and 12 bit DAC.

13. 3. Generation of fixed pulse width modulation using full compare unit/ Generation of pulse width modulation with specified switching frequency.

14. 4. Reading the analog voltage through on chip ADC module.

15. 5. Generation of Sine pulse width modulation with constant output frequency.

16. 6. Interfacing of limit switches and its programming/Interfacing of LCD display.

17. MODEL BASED DESIGN AND VERIFICATION USING SIMULINK AND REALIZATION WITH 2418.

18. 1. Model based design to access Input port using Simulink and realized with c2418 kit.

19. 2. Model based design to access pulse width modulator for generate fixed PWM using Simulink and realized with c2418 kit.

TEXT BOOKS

1. 1.John G. Proakis ,Dimitris K Manolakis , " Digital Signal Processing", Pearson Prentice Hall Publishing Ltd, 2007.

2. 2.Kenneth J.Ayala, "The 8051 microcontroller Architecture, Programming and applications" ,Third edition,Cengage Learning India pvt ltd,2009.

WEB / ONLINE RESOURCES

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	EMDEDDED SYSTEM DESIGN LAB	0	0	3	2

Course Category: PCC

OBJECTIVES

- Learn the working of ARM processor.
- Understand the Building Blocks of Embedded Systems.
- Learn the concept of memory map and memory interface.

COURSE OUTCOMES

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

CO1. Write programs in ARM for a specific Application

CO2. Interface memory and Write programs related to memory operations

CO3. Interface A/D and D/A convertors with ARM system

CO4. Analyze the architecture of a ARM processor

CO5. Write and execute program to generate PWM waveforms

CO6. Write and execute program to interface ADC and DAC with ARM Processor

CO7. Write and execute program to interface stepper motor , temperature sensor and others with ARM Processor

CO8. Design an embedded system for a specific application

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	L	L	L	S	M	L	M
CO2	S	S	S	M	S	M	M	-	S	S	M	M
CO3	S	M	M	S	S	M	M	-	S	M	M	S
CO4	S	S	M	M	S	S	L	-	S	S	M	M
CO5	S	S	S	S	S	M	L	L	S	S	M	M

LIST OF EXPERIMENTS

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox. 76
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.

10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	COMPUTER ARCHITECTURE	3	0	0	3

Course Category: PEC

OBJECTIVES

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the Arithmetic and Logical operations, fixed and floating point operations including the algorithms & implementation.
- To study in detail the different types of controls and the concept of pipelining.
- To study in detail the different types of Bus, Memory systems and I/O systems.
- To study in detail the different types of parallel processor model and its architectures.

COURSE OUTCOMES

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

CO1. An ability to design the arithmetic and logical unit.

CO2. An ability to implement different types of control and the concept of pipelining.

CO3. An ability to select appropriate computer systems for given application domains.

CO4. Understand what hardware and software problems will require solutions for future generations.

CO5. Organize a modern computer system and be able to relate it to real examples.

CO6. An ability to understand the various parallel processor model and architecture.

CO7. Understand the theory and architecture of central processing unit. Exemplify in a better way the I/O and memory organization.

CO8. Analyze some of the design issues in terms of speed, technology, cost, performance.

CO9. Design a simple CPU with applying the theory concepts.

CO10. Use appropriate tools to design verify and test the CPU architecture

CO11. Learn the concepts of parallel processing, pipelining and inter processor communication.

CO12. Define different number systems, binary addition and subtraction, 2's complement representation and operations with this representation.

CO13. Understand the architecture and functionality of central processing unit

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	S	M	L	L	S	S	L	M
CO2	S	S	S	S	S	M	L	L	S	S	L	L
CO3	S	S	M	M	S	M	L	L	S	S	M	L
CO4	S	S	M	M	S	L	L	L	S	M	M	M
CO5	S	S	M	M	M	L	L	-	S	M	M	L
CO6	S	S	M	M	M	L	L	-	M	M	-	M
CO7	S	M	M	M	M	L	L	-	M	M	-	L

SYLLABUS

UNIT I BASIC STRUCTURE OF COMPUTER & INSTRUCTIONS
Functional components and operations of general computer system, Interconnection of components, Computer Evolution and Performance, Representation of Instructions- Machine instructions, Operands, Addressing modes, Instruction cycles, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures.
UNIT II BASIC PROCESSING UNITS
Number Systems and conversions, Integer Arithmetic operations, Fixed and Floating point representation and operations, Organization of a processor - Single and Multiple bus organization, Processing units elements, Control unit, Data path in a CPU, Organization and operations of a control unit, Hardwired and Micro programmed control unit.
UNIT III MEMORY SYSTEM
Classification of memory - Internal Organization of a memory chip, Cache memories– Virtual memory – Secondary Storage devices Associative memories and Memory management requirements
UNIT IV I/O ORGANIZATION
Accessing I/O devices – Programmed Input/output –Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).
UNIT V PIPELINING
Basic concepts – Single-Cycle versus Pipelined Performance- Pipeline Hazards- Data hazards- forwarding vs. stalling, Control hazards–Pipeline Data path and control – Branch prediction- Performance considerations.

TEXT BOOKS

1. V. Carl, G. Zvonko and S. G. Zaky, “Computer organization”, McGraw Hill, 6th edition 2017.

2. J. L. Hennessy and D. A. Patterson, “Computer Architecture - A Quantitative Approach”, Morgan Kauffman, 5th2011.

3. Kai Hwang, “Advanced Computer Architecture, Parallelism, Scalability, Programmability”, McGraw Hill, 2003.

REFERENCES

1. W. Stallings, “Computer organization”, PHI, 8th 2010.

2. P. Barry and P. Crowley, “Modern Embedded Computing”, Morgan Kaufmann, 2012.

3. N. Mathivanan, “Microprocessors, PC Hardware and Interfacing”, Prentice Hall, 2004.

4. Y. C. Lieu and G. A. Gibson, “Microcomputer Systems: The 8086/8088 Family”, Prentice Hall India, 1986.

5. J. Uffenbeck, “The 8086/8088 Design, Programming, Interfacing”, Prentice Hall, 1987.

6. B. Govindarajalu, “IBM PC and Clones”, Tata McGraw Hill, 2 nd edition1991.

7. B. Brey and C. R. Sarma, “The Intel microprocessors”, Pearson Education, 2005.

8. P. Able, “8086 Assembly Language Programming”, Prentice Hall India.

9. Kai Hwang , Faye A. Briggs, “Computer Architecture and Parallel Processing”, McGraw-Hill series, 1985

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Dept. of EEE

Course Code		L	T	P	C
Course Title	**Java Programming and Applications [T & P]**	3	0	0	3

Course Category: PEC

OBJECTIVES

- To understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- To identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- To create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifies, automatic documentation through comments, error exception handling)

COURSE OUTCOMES

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

CO1. Design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and iterative structures, and functions.

CO2. Describe and use the mechanics of parameter passing.

CO3. Discuss and use primitive data types and User defined data types.

CO4. Design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and iterative structures, and function.

CO5. Describe and use the mechanics of Interfaces and Packages.

CO6. Discuss and use of Multithread Programming.

CO7. Implement applet exception handling.

CO8. Develop network and window application using awt and swings.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	M	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	S	M	S	L	M	S
CO3	S	S	M	S	S	M	M	M	S	M	M	S
CO4	M	M	S	M	M	M	S	S	S	M	M	S
CO5	S	S	S	M	S	S	M	S	S	M	M	S

SYLLABUS

UNIT I
Introduction to Java: Fundamentals of OOPS-Java Evolution, Java Vs C++-JVM-Java Tokens-Constants, Data Types & Variables, Operators and Expressions-String Handling: String Basics, String Operations, Character Extraction, String Buffer, Arrays, Classes, objects and Methods, Final, Static- Exception Handling. : Types of Errors, Exceptions, Exception Handling Mechanisms, Advantages, Throwing User defined

Exceptions-Exploring java.io: Buffered Input Stream& Buffered Output Stream-Modifiers-Inheritance.
UNIT II
Interfaces: Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interfaces-Packages: Creating and Accessing Packages, Mechanisms of Using Packages, Hiding Classes, Import command.
UNIT III
Multithread Programming: Fundamental Concepts, Thread Creations, Thread Life Cycle, Thread Priorities and Thread Scheduling, Thread Synchronization, Inter Thread Communication- Managing I/O Files: Concepts of I/O Streams, Stream classes, character Streams, Byte Streams, File Streams, random Access Files, and Serializations-Exploring java.net: Inet Address, Server Socket, socket, Datagram Packet, Datagram Socket, and Multicast Socket.
UNIT IV
Exploring java. Util: collections, Enumerations, iterations, String Tokenizer, Bitset, Date, Calendar, Gregorian Calendar, Time Zone, Currency-Applet Programming: Applet Fundamentals-Java Application Vs Java Applets, Applet life Cycle, Building the Applet code, Running the Applet-Passing Parameters to Applet, Applet tag, Java Applet Package.
UNIT V
Exploring javax.swing: J Component, containers, panes, Layout Managers, Basic Components, Advanced Components-Handling Events: Listener, Interfaces and Adapter classed for various components-JDBC principles: Exploring java.sql-connection, Driver Manager, Statement, Resultset, Callable statement, prepared Statement, Result set Metadata & Database Meta Data.

TEXT BOOKS

1. Herbert Schildt, “Java The Complete Reference” , 8th Edition, Tata McGraw Hill,9th edition 2017.

2. James Jaworski, “Java Unleashed”, 4th revised edition, SAMS Techmedia Publications, Digitized-2010.

REFERENCES

1. Kogent Solution Inc ,Java 6 Programming Black Book, New Ed, Dreamtech Press, 2007

2. Campione, Walrath and Huml, “The Java Tutorial”, Addison Wesley,3rd edition 2001.

3. Elliotte Rusty Harold ,Java Network Programming, Second Edition, O'Reilly Media, Inc.", 4th edition 2013, (for Java.net package in Unit -III)

4. Java Database Programming Bible, John O’ Donahue, illustrated Edition, Wiley, 2002 (for Unit -V)

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	JAVA PROGRAMMING LAB	3	0	0	3

Course Category: PEC

OBJECTIVES

- To introduce the students to some concepts of advanced programming and practice on reusing components.
- To focuses on Graphical User Interface (GUI), multithreading, networking, and database manipulation.
- To develop applet programs and swing concepts.

COURSE OUTCOMES

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

CO1. Develop applications in Java.

CO2. Use java libraries.

CO3. Create packages and develop interfaces.

CO4. Understanding reference to an instance of a Class(object), methods

CO5. Developing User defined packages in java

CO6. File operations in java

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	M	S	M	M	S
CO2	S	S	S	M	M	S	S	M	S	M	M	S
CO3	M	S	M	S	S	M	S	M	S	M	M	S

LIST OF EXPERIMENTS

1. LIST OF PROGRAMS
2. 1. Simple Java Applications
3. a. For understanding reference to an instance of a Class(object), methods
4. b. Handling Arrays, Control statements and operators.
5. c. Handling Strings in java.
6. 2. Package Creation
7. a. Developing User defined packages in java
8. 3. Interface
9. a. Developing user-defined interfaces and implementation.
10. b. Use of predefined Interfaces.
11. 4. Inheritance
12. a. Handling inheritance in java

13. 5. Threading
14. a. Creation of thread in java applications.
15. b. Multithreading
16. 6. Exception Handling Mechanisms
17. a. Handling pre-defined exceptions
18. b. Handling user-defined exceptions
19. 7. File operations in java
20. 8. Applets
21. a. Handling simple applet programs.
22. b. Creation of color Palette.
23. 9. Swings
24. a. Handling Layouts in java
25. b. Handling Events in javax.swing
26. c. Handling swing controls.
27. 10. Database connectivity
28. a. Handling backend connectivity for data retrieval

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Course Code		L	T	P	C
Course Title	CLOUD COMPUTING FUNDAMENTALS	3	0	0	3

Course Category: PEC

OBJECTIVES

- To understand the concepts of virtualization and virtual machines
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions

COURSE OUTCOMES

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

CO1. Employ the concepts of storage virtualization, network virtualization and its management

CO2. Apply the concept of virtualization in the cloud computing

CO3. Identify the architecture, infrastructure and delivery models of cloud computing

CO4. Define Cloud Computing and memorize the different Cloud service and deployment models.

CO5. Describe importance of virtualization along with their technologies.

CO6. Use and Examine different cloud computing services.

CO7. Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing.

CO8. Design & develop backup strategies for cloud data based on features.

CO9. Illustrate the capabilities of Cloud Security.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	S	S	S	S	M	M	S	M	M	S
CO3	S	S	S	S	S	S	M	M	S	M	M	S

SYLLABUS

UNIT I VIRTUALIZATION
Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines –Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machines. Virtualization –Management Virtualization — Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization
UNIT II VIRTUALIZATION INFRASTRUCTURE
Comprehensive Analysis – Resource Pool – Testing Environment –Server Virtualization – Virtual Workloads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.
UNIT III CLOUD PLATFORM ARCHITECTURE

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: everything as a service: infrastructure, platform, software .A generic cloud architecture design-layered cloud-architectural development-virtualization support and disaster recovery-architectural design challengers-public cloud platform-GAE, AWS-intercloud resource management
UNIT IV PROGRAMMING MODEL
Introduction to Hadoop Framework - MapReduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job –Developing Map Reduce Applications - Design of Hadoop file system –Setting up Hadoop Cluster - Cloud Software Environments -Eucalyptus, Open Nebula, Open Stack, Nimbus
UNIT V CLOUD SECURITY
Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

TEXT BOOKS

1. Danielle Ruest, Nelson Ruest, ―Virtualization: A Beginner‟s Guide‖, McGraw-Hill Osborne Media, 1st edition 2009.

2. Jim Smith, Ravi Nair , "Virtual Machines: Versatile Platforms for Systems and Processes", Elsevier/Morgan Kaufmann, 1st edition 2005

3. John W.Rittinghouse and James F.Ransome, "Cloud Computing: Implementation, Management, and Security", CRC Press, 2010.

REFERENCES

1. Kai Hwang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 1st edition2013.

2. Tim Mather, SubraKumaraswamy, and ShahedLatif ,"Cloud Security and Privacy", O‘Reilly Media, Inc.,2009.

3. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", McGraw-Hill Osborne Media, 2009.

4. Tom White, "Hadoop: The Definitive Guide", Yahoo Press, 2012.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	**Fundamentals of Big Data Analysis**	3	0	0	3

Course Category: PEC

OBJECTIVES

- To study in detail aboutprinciple of big data architecture and its technology foundations
- To study Compare and contrast the nature of data in distributed file systems.

COURSE OUTCOMES

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

CO1. To understand the concept ofbig data perspective and its real world requirement.

CO2. Determine the results of big data analysis using certain analytical techniques or tools.

CO3. Explain the big data perspective and its real world requirement.

CO4. Illustrate the working principle of big data architecture and its technology foundations.

CO5. Compare and contrast the nature of data in distributed file systems.

CO6. Utilize the hadoop platform to work on huge data.

CO7. Make use of certain analytical techniques on big data.

CO8. Determine the results of big data analysis using certain analytical techniques or tools.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	S	S	M	M	S	M	M	S
CO2	S	S	S	M	S	S	S	M	S	M	M	S
CO3	S	S	S	M	S	S	S	M	S	M	M	S
CO4	S	S	S	M	S	S	M	S	S	M	M	S
CO5	S	S	S	M	S	S	S	M	S	M	M	S
CO6	S	S	S	M	S	S	M	M	S	M	M	S

SYLLABUS

UNIT I INTRODUCTION TO BIG DATA
Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics – Validating – The Promotion of the Value of Big Data – Big Data Use Cases- Characteristics of Big Data Applications – Perception and Quantification of Value -Understanding Big Data Storage – A General Overview of High-Performance Architecture – HDFS – MapReduce and YARN – Map Reduce Programming Model
UNIT II CLUSTERING AND CLASSIFICATION
Advanced Analytical Theory and Methods: Overview of Clustering – K-means – Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions .- Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm – Decision Tree Algorithms – Evaluating a Decision Tree – Decision Trees in R – Naïve Bayes – Bayes‘ Theorem – Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM
Advanced Analytical Theory and Methods: Association Rules – Overview – Apriori Algorithm – Evaluation of Candidate Rules – Applications of Association Rules – Finding Association& finding similarity – Recommendation System: Collaborative Recommendation- Content Based Recommendation – Knowledge Based Recommendation- Hybrid Recommendation Approaches.
UNIT IV STREAM MEMORY
Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications – Case Studies – Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics
UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION
NOSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Databases Hive – Sharding Hbase – Analyzing big data with twitter – Big data for E-Commerce Big data for blogs – Review of Basic Data Analytic Methods using R.

TEXT BOOKS

1. Bill Franks, ―Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics‖, Wiley and SAS Business Series, 2012.

2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", 2013.

3. Michael Berthold, David J. Hand, ―Intelligent Data Analysis‖, Springer, Second Edition, 2007.

REFERENCES

1. Michael Minelli, Michelle Chambers, and Ambiga Dhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

2. P. J. Sadalage and M. Fowler, "NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Professional, 2012.

3. Richard Cotton, "Learning R – A Step-by-step Function Guide to Data Analysis, , O'Reilly Media, 2013

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Course Code		L	T	P	C
Course Title	**Electrical Machine Design [T & P]**	3	0	0	3

Course Category: PEC

OBJECTIVES

- To study MMF calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C. machines.
- To design core, yoke, windings and cooling systems of transformers.

COURSE OUTCOMES

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

CO1. Ability to model and analyze electrical apparatus and their application to power system.

CO2. Calculation of MMF for air gap and teeth sections.

CO3. Explain heating and cooling characteristics of rotating machines.

CO4. Derive the output equations of DC and AC Machines.

CO5. Design of main dimensions of DC & AC machines and transformers.

CO6. Explain the concept of computer aided design.

CO7. Concept of analysis and synthesis methods.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	S	M	M	S
CO2	S	S	S	S	S	M	M	M	S	S	S	S
CO3	S	S	S	S	S	M	M	M	S	S	M	S
CO4	S	S	S	S	S	S	M	M	S	M	M	S
CO5	S	S	S	S	S	S	M	M	S	S	M	S
CO6	S	S	S	S	S	M	M	M	S	S	M	S

SYLLABUS

UNIT I MAGNETIC CIRCUIT CALCULATIONS
Magnetization characteristics - loss curves - estimation of total mmf - mmf for airgap - mmf for teeth - significance of Carter's coefficient - real and apparent flux densities - leakage flux - Leakage reactance in transformer - leakage reactance in rotating machines - Heating and cooling characteristics.
UNIT II DESIGN OF DC MACHINES
Standard specifications - output equation - output coefficient - choice of specific magnetic and electric loadings - choice of number of poles - length of airgap - design of armature slot - dimensions of pole - design of field windings - design of commutator and brushes - design of interpole and its winding.
UNIT III DESIGN OF TRANSFORMERS

Design of transformers - standard specification - EMF per turn - output equation - window space factor - specific loadings - dimensions of core and yoke - design of winding - cooling tubes - estimation of no load current of transformer - change of parameters with change of frequency.
UNIT IV DESIGN OF SYNCHRONOUS MACHINES
Standard specifications - output equation - choice of specific loadings - design of salient pole machines - short circuit ratio - length of air gap - armature design - design of rotor - design of damper winding -design of turbo alternator design of three phase induction motor - output equation - choice of specific loadings - main dimensions - design of stator windings and core - length of air gap - design of cage rotor - design of wound rotor.
UNIT V COMPUTER AIDED DESIGN
Introduction of computer aided design - advantages - methods of approach- Analysis method - synthesis method – optimization - general procedure - variables and constraints - optimal design of power transformer - optimal design of induction motor - optimal design of synchronous machine. (Only for Demo) Design of DC Machines, Single phase &Three phase Transformer, Single phase & Three phase induction motor, Synchronous Machines using MAGNET Software.

TEXT BOOKS

1. A course in Electrical Machine Design A.K.Sawhney, Dhanpatrai& co, 2016.

2. Principles of Electrical Machine Design, R.K.Agarwal, S.K.Kataria& sons, 1997.

3. Computer Aided Design of Electrical Equipment, M.Ramamoorthy, Associated East West Press, 2008.

REFERENCES

1. The Performance and Design of DC Machines, Clayton & Hancock, oxford and IBH Publishing co, 2004.

2. The Performance and Design of AC Machines, M.G.Say, ELBS, 3rd edition2002.

3. Electrical Machine Design Data Book, A.Shanmugasundram,G.Gangadhar&R.palani, wileyEstern Ltd., NewDelhi, 1979.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	SPECIAL ELECTRICAL MACHINES	3	0	0	3

Course Category: PEC

OBJECTIVES

- To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors.
- To impart knowledge on the Construction, principle of operation, control and performance of stepping motors.
- To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors.

COURSE OUTCOMES

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

CO1. Ability to model and analyze electrical apparatus (machines) and their application to power system

CO2. Illustrate the basic construction and operating principle of synchronous reluctance motor, SRM, Stepper motor, PMSM, PMBLDC motor and linear induction motor

CO3. Explain the motor characteristics, power input and torque developed for Synchronous Reluctance Motor, SRM, Stepper motor.PMSM and PMBLDC Motor

CO4. Develop the drive systems and control schemes for stepper motors. SRM, PMSM and PMBLDC motor

CO5. Select the suitable special purpose motor for the specific application

CO6. Explain the Microprocessor /DSP based control of stepper motors, SRMPMSM and PMBLDC motor

CO7. Analyse the performance of a drive system using Matlab-Simulink

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PSO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	M	S	S	S	M	S	M	S	S
CO3	M	M	M	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	M	M	M	S	M	S	S	S
CO5	S	S	S	M	S	S	S	M	M	M	M	S
CO6	M	S	S	S	S	S	S	S	S	S	S	S

SYLLABUS

UNIT I SYNCHRONOUS RELUCTANCE MOTORS
Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.
UNIT II STEPPING MOTORS
Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and

Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits.
UNIT III SWITCHED RELUCTANCE MOTORS
Constructional features – principle of operation – torque prediction – power controllers –Nonlinear analysis – Microprocessor based control - characteristics – computer control.
UNIT IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS
Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.
UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS
Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

TEXT BOOKS

1. Miller, T.J.E., “Brushless Permanent Magnet and Reluctance Motor Drives”, Clarendon Press, Oxford, 1989.

2. Aearnley,P.P., “Stepping Motors - A Guide to Motor Theory and Practice”, Peter Perengrinus, London, 4th edition 2002.

REFERENCES

1. Kenjo T., “Stepping Motors and their microprocessor Controls”, Claredon Press London, 1995.

2. Kenjo T and Nagamori S., “Permanent Magnet and Brushless DC Motors”, Clarendon Press, London, 1988.

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	CONTROL AND MAINTENANCE OF ELECTRICAL EQUIPMENTS	3	0	0	3

Course Category: PEC

OBJECTIVES

- To enable the students to understand the basic operation of Electrical Equipments.
- To enable the students to understand the principle of control and maintenanceof Electrical Equipments.

COURSE OUTCOMES

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

CO1. Ability to understand the basic things about the control as well as maintenance of electrical equipments.

CO2. Symbols for various components, Control diagram- Two wire control circuit, Three wire control circuit

CO3. Primary cell – storage batteries

CO4. Requirements of electric drive, Solid state devices used in electric drive

CO5. Fuses and combination fuse switch units, Miniature circuit breaker, Contactors-Solenoid type, Clapper type, Over-load relays-Thermal over-load relay, Ratchet type over load relay, Magnetic over load relay, Dash pot type oil filled relay, Timing relays, Phase failure relay, Push buttons, Selector switches, Limit switches – types, Temperature controller (Thermostat), Float switches, Mechanical brakes for motors, Control transformer

CO6. Forward/reversing of 3 phase motors-With push button inter-locking, withAuxillary contact inter-locking, Sequence starting of motors, Starting multispeed squirrel cage motor, Dynamic braking of squirrel cage induction motor, Plugging of squirrel cage induction motor, Over-load protection of motors, Single phase protection, Over-temperature protection, Voltage stabilizer for 3 phase and single phase motors

CO7. Requirements of electric drive, Solid state devices used in electric drive – DC Motor Drives – AC Motor Drives

CO8. care – service and maintenance of motors

CO9. Preventive and predictive maintenance of electric machines

CO10. selection of batteries- troubleshooting of batteries

CO11. Maintenance management of rotating machines

CO12. Mechanical Maintenance

CO13. Digital UPS testing systems

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	M	S	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S	S	M	S	M	S
CO4	M	M	S	S	S	S	M	M	S	M	M	M
CO5	S	S	S	M	S	S	S	S	S	S	S	S

SYLLABUS

UNIT I CONTROL COMPONENTS
Fuses and combination fuse switch units, Miniature circuit breaker, Contactors-Solenoid type, Clapper type, Over-load relays-Thermal over-load relay, Ratchet type over load relay, Magnetic over load relay, Dash pot type oil filled relay, Timing relays, Phase failure relay, Push buttons, Selector switches, Limit switches – types, Temperature controller (Thermostat), Float switches, Mechanical brakes for motors, Control transformer, Symbols for various components, Control diagram- Two wire control circuit, Three wire control circuit.
UNIT II A.C. CONTROL CIRCUITS
Forward/reversing of 3 phase motors-With push button inter-locking, withAuxillary contact inter-locking, Sequence starting of motors, Starting multispeed squirrel cage motor, Dynamic braking of squirrel cage induction motor, Plugging of squirrel cage induction motor, Over-load protection of motors, Single phase protection, Over-temperature protection, Voltage stabilizer for 3 phase and single phase motors.
UNIT III CONTROL OF ELECTRIC DRIVES
Requirements of electric drive, Solid state devices used in electric drive – DC Motor Drives – AC Motor Drives.
UNIT IV MAINTENANCE OF ROTATING MACHINES
Mechanical – site testing and checking – care – service and maintenance of motors - Maintenance management of rotating machines, Preventive and predictive maintenance of electric machines.
UNIT V
Maintenance of Batteries Primary cell – storage batteries; charging and maintenance – fuel cells, fuels and fuel cell power plants - acid water - selection of batteries- troubleshooting of batteries – Digital UPS testing systems.

TEXT BOOKS

1. Electric Contacts- Theory and Application by RagnarHalm; Springer Publication 1967

2. Industrial Electronics & Control by S.K. Bhattacharya & S. Chatterji; New AgeInternational Publications(P) Ltd., New Delhi, 2017

3. Testing, Commissioning, Operation and Maintenance of Electrical Equipment by S Rao,Khanna Technical Publication, New Delhi.6th edition1991

REFERENCES

1. Preventive Maintenance of Electrical Apparatus by SK Sharotri, Katson Publishing House, Ludhiana.2nd edition1980

2. Installation and Maintenance of Electrical Equipment by Praveen Kumar, North Publication, Jalandhar.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTRICAL ENERGY CONSERVATION AND AUDITING	3	0	0	3

Course Category: PEC

OBJECTIVES

- Understand the methods of improving energy efficiency in different electrical systems.
- Understand the concepts of different energy efficient devices.

COURSE OUTCOMES

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

CO1. Understand the current energy scenario and importance of energy conservation.

CO2. Understand the concepts of energy management.

CO3. To have knowledge in the concepts of Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply.

CO4. To analyze the importance of Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents .

CO5. To understand and apply the concepts of energy management (audit) approach understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

CO6. To evaluate the concepts of .Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency.

CO7. To evaluate the concepts of Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, performance evaluation.

CO8. To analyze the concepts of Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient transformers etc.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	M	M
CO3	M	S	M	M	M	S	S	S	S	S	S	S
CO4	S	S	S	S	M	M	M	M	M	M	S	S
CO5	S	M	S	S	S	S	S	S	S	S	M	S
CO6	M	S	M	M	S	S	S	S	S	S	S	S

SYLLABUS

UNIT I ENERGY SCENARIO
Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.
UNIT II BASICS OF ENERGY AND ITS VARIOUS FORMS
Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer.
UNIT III ENERGY MANAGEMENT & AUDIT
Definition, energy audit, need, types of energy audit. Energy management (audit) approach understanding energy costs, bench marking, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.
UNIT IV ENERGY EFFICIENCY IN ELECTRICAL SYSTEMS
Electrical system: Electricity billing, electrical load management and maximum demand control, power factor improvement and its benefit, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors.
UNIT V ENERGY EFFICIENCY IN INDUSTRIAL SYSTEMS
Compressed Air System: Types of air compressors, compressor efficiency, efficient compressor operation, Compressed air system components, capacity assessment, leakage test, factors affecting the performance and savings opportunities in HVAC, Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities. Pumps and Pumping System: Types, Cooling Tower: Types and performance evaluation,

TEXT BOOKS

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)

2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)

3. S. C. Tripathy, “Utilization of Electrical Energy and Conservation”, McGraw Hill, 1991.

4. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org) 2015.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTRICAL SAFETY AND MANAGEMENT	3	0	0	3

Course Category: PEC

OBJECTIVES

- Explain the importance of electrical safety measurements tools available.
- Different types of grounding methods for electrical equipment.
- Necessary core to handle electrical protection systems.

COURSE OUTCOMES

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

CO1. It gives a very comprehensive idea about safety measures to be undertaken by the person before attains any electrical failure.

CO2. To understand different types of protection systems ,electrical hazards and safety equipments

CO3. To analyse the importance of grounding of electrical equipment- hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers.

CO4. To understand the six step safety methods- pre job briefings- hot -work decision tree-safe switching of power system lockout-tag out- safety equipment.

CO5. To evaluate Electrical safety programme structure, development- company safety team- safety policy- programme implementation- employee electrical safety teams- safety meetings- safety audit- accident prevention- first aid- rescue techniques-accident investigation.

CO6. To apply Safety related case for electrical maintenance- reliability centered maintenance (RCM) - eight step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S

SYLLABUS

UNIT I
Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment.
UNIT II
General requirements for grounding and bonding- definitions- grounding of electrical equipment- hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one line diagram- electrician’s safety kit.

UNIT III
The six step safety methods- pre job briefings- hot -work decision tree-safe switching of power system lockout-tag out- safety equipment , procedure for low, medium and high voltage systems- the one minute safety audit .
UNIT IV
Electrical safety programme structure, development- company safety team- safety policy- programme implementation- employee electrical safety teams- safety meetings- safety audit- accident prevention- first aid- rescue techniques-accident investigation.
UNIT V
Safety related case for electrical maintenance- reliability centered maintenance (RCM) - eight step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies-

TEXT BOOKS

1. Dennis Neitzel, Al Winfield,'Electrical Safety Handbook', McGraw-Hill Education , 4th Edition,2012.

REFERENCES

1. John Cadick, 'Electrical Safety Handbook', McGraw-Hill School Education Group,July 2019.

2. Maxwell Adams.J, "Electrical safety- a guide to the causes and prevention of electric hazards",The Institution of Electric Engineers, 1994.

3. Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

WEB / ONLINE RESOURCES

- www.nptl.co.in
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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	SMART GRID	3	0	0	3

Course Category: PEC

OBJECTIVES

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To familiarize the recent communication and security technologies in Smart Grid.
- To familiarize with the high performance computing for Smart Grid applications

COURSE OUTCOMES

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

CO1. Ability to understand and analyze Smart grid operation, Advanced metering Techniques.

CO2. Explain the fundamentals of smart power grids and its international & Indian scenarios.

CO3. Calculate voltage and power loss for the given distribution system.

CO4. Explain advanced metering infrastructure and demand side management.

CO5. Describe the operation of transmission system with synchrophasor measurement.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	S	M	M	M	S
CO2	M	S	S	S	M	S	S	S	M	M	M	S
CO3	S	M	S	M	M	S	S	S	S	M	M	S
CO4	S	S	S	S	M	S	S	S	S	M	M	S

SYLLABUS

UNIT I INTRODUCTION TO SMART GRID
Evolution of Electric Grid, Concept and Definitions, Need for Smart Grid, drivers for Smart grid,opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient and self- healing grid, Low carbon central generation, Micro-grid and distributed energy resources, Power quality issues connection of renewable energy sources, Need for islanding, National and International Initiatives in Smart Grid, Smart cities and pilot projects in India, Case study.
UNIT II SMART GRID TECHNOLOGIES (TRANSMISSION)
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control
UNIT III SMART GRID TECHNOLOGIES (DISTRIBUTION)
DMS, Fault Detection, Isolation and service restoration, Volt/VAr control, Outage management system (OMS), High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).
UNIT IV SMART METERS AND ADVANCED METERING INFRASTRUCTURE

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits,AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor MeasurementUnit(PMU), Intelligent Electronic Devices(IED) & their application for monitoring & protection.
UNIT V IT, COMMUNICATIONTECHNOLOGY AND SECURITY FOR SMARTGRID
Local Area Network (LAN), Home Area Network (HAN), Wide Area Network (WAN),Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUDComputing for Smart Grids, Cyber Security for Smart Grid.

TEXT BOOKS

1. Stuart Borlase “Smart Grid :Infrastructure, Technology and Solutions”,CRC Press 1st Edition2012.

2. Janaka Ekanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley.1st Edition 2012.

3. James Momoh,” Smart Grid: Fundamentals of Design and Analysis”-Wiley, IEEE Press,2012

REFERENCES

1. Vehbi C. Güngör, DilanSahin, TaskinKocak, Salih Ergüt, Concettina Buccella, Carlo Cecati,

2. and Gerhard P. Hancke, Smart Grid Technologies: Communication Technologies and

3. Standards IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.

4. Xi Fang, Satyajayant Misra, Guoliang Xue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids,

5. A.G.Phadke and J.S. Thorp, “synchronized Phasor Measurements and their applications”, Springer Edition, 2012

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Dept. of EEE

Course Code		L	T	P	C
Course Title	DESIGN AND LAY OUT OF POWER SYSTEMS APPARATUS	3	0	0	3

Course Category: PEC

OBJECTIVES

- This course offers the preliminary instructions and techniques to design the main dimensions and other major part of the transformer and DC and AC rotating machines.
- The course also provides the students with an ability to understand the step by step procedure for the complete design of electrical machines.

COURSE OUTCOMES

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

CO1. The student will be able to understand the design of main dimensions and other major part of the transformer and DC and AC rotating machines.

CO2. The student will be capable of evaluating the procedure for the design of main dimensions and other major part of the transformer and DC and AC rotating machines.

CO3. Design of main dimensions and other major part of the transformer

CO4. Design of main dimensions and other major part DC and AC rotating machines

CO5. Procedure for the design of main dimensions and other major part of the transformer

CO6. Procedure for the design of main dimensions and other major part of the AC and DC machines

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	M	M	M	M	M
CO2	S	S	S	M	S	S	S	S	S	M	M	S
CO3	M	S	S	S	S	M	M	S	M	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S	M	S

SYLLABUS

UNIT I DESIGN AND LAYOUT OF TRANSMISSION LINES
Requirements of transmission Lines - Selection of voltage levels for H.T. transmission lines - Choice of conductors - spacing of conductors - Types of Insulators - specifications of transmission lines - Electrical and Mechanical design of transmission lines - Surge Impedance loading - stringing of transmission lines - Tower designs - Types, single circuit, Double circuit towers - Transmission line Earth wires – IEE rules.
UNIT II DESIGN AND LAYOUT OF DISTRIBUTION SYSTEMS
Primary and secondary distribution system design - Calculation of distribution sizes, voltage drops - voltage regulation - Design scheme for Rural Distribution system - Design scheme for industrial distribution schemes - Power distribution for computer automation - layout for Town Electrification - types of distribution cables - Switchgear for L.T. and H.T. Distributions - IEE rules for Distribution.
UNIT III LAYOUT AND INSTALLATION OF POWER EQUIPMENT'S

Installation of power transformers - Reactors - Installation of Insulators - Erection of earthing systems and secondary circuits - Installation of CT's and PT's and CVT's - Installation of fuses and their rating - Installation of Isolators and Circuit breakers - Installation of Capacitor banks - IEE rules
UNIT IV LAYOUT AND DESIGN FOR ELECTRIC DEVICE
Low voltage and metal clad and Switchgear for Electric drives - single-phase preventer - Contactors Types and their definition - Contactor starters for motors - limit switches for process control devices - IEE rules for Motors Erection.
UNIT V DESIGN AND LAY OUT OF SUBSTATIONS
Types of Substations - Indoor and outdoor substations - Selection of Site and Location - Layout diagram of 11 kV / 440V, 220 / 11KV substations - Substations requirements, their functions and location – Substation – Switchgear installations -Busbar arrangements and design - Load break switches - Switching substations - Location CT's and PT's - materials for Busbar - Substations earthing.

TEXT BOOKS

1. M.V. Deshpande, “Electric Power system design”, Edition illustrated, Tata Mcgraw hill education , 2001.

REFERENCES

1. Suni S Rao, “Switchgear Protection & power systems” Khanna publishers, `1999.

WEB / ONLINE RESOURCES

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	HIGH VOLTAGE ENGINEERING	3	0	0	3

Course Category: PEC

OBJECTIVES

- Knowledge of tests on H. V. equipment and on insulating materials, as per thestandards.
- Knowledge of how over-voltages arise in a power system, and protection againstthese over-voltages

COURSE OUTCOMES

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

CO1. Understand the basic physics related to various breakdown processes in solid, liquidand gaseous insulating materials.

CO2. Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.

CO3. Understanding the over voltage phenomenon and insulation coordination in electrical Power systems.

CO4. Ability to understand the various breakdown mechanisms of different dielectrics

CO5. Able to analyse and generate high voltage and high current

CO6. Understanding measurements techniques of high voltages & currents with their relative merits and demerits

CO7. Ability to understand dielectric tests on various electrical equipment with safety precautions in HV Labs

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	M	M	M	S
CO2	M	S	M	S	S	M	S	S	M	S	S	S
CO3	S	S	S	S	S	M	S	S	S	M	S	S
CO4	M	S	S	M	M	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	M	M	S	M	M	S

SYLLABUS

UNIT I BREAKDOWN IN GASES
Ionization processes and de-ionization processes, Types of Discharge, Gases as insulatingmaterials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streammechanism, Corona discharge
UNIT II BREAKDOWN IN LIQUID AND SOLID INSULATING MATERIALS
Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics,intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge,applications of insulating materials.
UNIT III GENERATION OF HIGH VOLTAGES
Generation of high voltages, generation of high D. C. and A.C. voltages, generation ofimpulse voltages, generation of impulse currents, tripping and control of impulse generators.
UNIT IV MEASUREMENTS OF HIGH VOLTAGES AND CURRENTS

Peak voltage, impulse voltage and high direct current measurement method, cathode rayoscillographs for impulse voltage and current measurement, measurement of dielectricconstant and loss factor, partial discharge measurements.
UNIT V LIGHTNING AND SWITCHING OVER-VOLTAGES
Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges.Switching overvoltages,Protection against over-voltages, Surge diverters, and Surge modifiers.
UNIT VI HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS AND HIGH VOLTAGE LABORATORIES
Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing ofinsulators and bushings, testing of isolators and circuit breakers, testing of cables, powertransformers and some high voltage equipment, High voltage laboratory layout, indoor andoutdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXT BOOKS

1. M. S. Naidu and V. Kamaraju, “High Voltage Engineering”, McGraw Hill Education,2013.

2. C. L. Wadhwa, “High Voltage Engineering”, New Age International Publishers,3rd Edition 2012.

3. D. V. Razevig (Translated by Dr. M. P. Chourasia), “High Voltage EngineeringFundamentals”, Khanna Publishers, 1993.

REFERENCES

1. Kuffel, W. S. Zaengl and J. Kuffel, “High Voltage Engineering Fundamentals”,Newnes Publication, 2nd Edition 2000.

2. R. Arora and W. Mosch “High Voltage and Electrical Insulation Engineering”, JohnWiley & Sons, 2011.

3. Various IS standards for HV Laboratory Techniques and Testing.

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- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	HIGH VOLTAGE DC TRANSMISSION	3	0	0	3

Course Category: PEC

OBJECTIVES

- To understand the concept, planning of DC power transmission and comparison with AC Power transmission.
- To analyze HVDC converters
- To study about the HVDC control

COURSE OUTCOMES

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

CO1. Ability to understand and analyze power system operation, stability, control and protection.

CO2. Explain the modern technology used in HVDC.

CO3. Describe control strategies used in HVDC system with HVDC converters.

CO4. Apply suitable method for power flow analysis in AC/DC systems.

CO5. Simulate simple HVDC system for the given specifications.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	S	S	S	0	S
CO2	M	M	M	M	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	M	S	S	S	M	S
CO4	S	M	M	M	M	S	S	S	S	S	S	S

SYLLABUS

UNIT I GENERAL ASPECTS
HistoricaldevelopmentHVACandDClinks-KindsofDClinks-HVDC Projects in India and abroad-Advantages and disadvantages of HVDCtransmission-PrincipleApplicationof DC transmission- Economic factors-DevelopmentofpowerdevicesforHVDCTransmission-Thyristor-Lightactivated thyristors-MOScontrolledThyristors (MCTS)-Switchingandsteadystatecharacteristics.
UNIT II THYRISTOR CONVERTERS
ThreephasesfullycontrolledThyristorbridgeconverters-Operation as rectifiers and line commutated inverters-Converterequivalent circuits- Parametersandcharacteristicsofrectifiersandinverters-Seriesandparallelarrangements ofThyristors- Multibridgeconverters.
UNIT III CONTROL OF CONVERTERS
Gatecontrol-basicmeansofcontrol-Power reversal-DesiredFeaturesofcontrol-Controlcharacteristics-Constantcurrentcontrol-Constant extinctionangleControl-Stability ofcontrol-Tapchangercontrol-Power controlandcurrentlimits.
UNIT IV PROTECTION

Oasisof protection of HVDC systems-DCreactors-Voltageand currentOscillations-DClineoscillations-Clearinglinefaultandre-energizingtheline-Circuitbreakers-Overvoltageprotection.
UNIT V HARMONICS, FILTERS AND GROUND RETURN
Characteristicsanduncharacteristic Harmonics- Troublescaused by harmonics. Means ofreducingharmonics-Telephone Interference- Harmonicfilters-groundreturn-Currentfields-Compatibilitywithotherservices-Electrodes.

TEXT BOOKS

1. EWKelmark,"DirectcurrentTransmission",Vol.I.willeyInterscienceNewYork 2013.

2. K RPadiyar,"HVDC Power TransmissionSystem Technologyand Systeminteractions", Willey EasternLtd.,1991.

REFERENCES

1. ColinAdamsonandNGHingorani,"HighVoltageDirectCurrentPowertransmission",Garraway limitedEngland1960.

2. BJKORY(Ed),"HighVoltageDirectCurrentConvertersandSystems",MacdonaldCo.,London, 1965.

3. BMWEEDY,"Electricpowersystems",JohnWilley&sons,London,5thEdition 2012.

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PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	POWER PLANT ENGINEERING	3	0	0	3

Course Category: PEC

OBJECTIVES

- Providing an overview of power plants and developing the role of mechanical and electrical engineering in their operation and maintenance.

COURSE OUTCOMES

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

CO1. Analyze and solve energy and economic related issues in power section.

CO2. Able to get the basics of Power Plants.

CO3. Able to get the idea about the power generation by renewable and non-renewable energy resources.

CO4. Able to know about the different types of cycles and natural resources used in power plants and their applications.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	M	S	M	S
CO2	M	S	S	S	S	M	M	L	M	M	M	S
CO3	S	S	S	S	S	M	S	M	S	M	M	S

SYLLABUS

UNIT I THERMAL POWER PLANTS
Basic thermodynamic cycles, various components of steam power plant-layout pulverized c o a l burners-Fluidized bed combustion-coal handling systems-ash handling systems- Forced draft and induced draft fans-Boilers- feed pumps-super heater- regenerator-condenser- deaerators-cooling tower.
UNIT II HYDRO ELECTRIC POWER PLANTS
Layout-dams-selection of water turbines-types-pumped storage hydel plants.
UNIT III NUCLEAR POWER PLANTS
Principles of nuclear energy- Fission reactions- nuclear reactor-nuclear power plants.
UNIT IV GAS AND DIESEL POWER PLANTS
Types, open and closed cycle gas turbine, work output &thermal efficiency, methods to improve performance-reheating, intercoolings, regeneration-advantage and Disadvantages- Diesel engine power plant-component and layout
UNIT V NON-CONVENTIONAL POWER GENERATION
Solar energy collectors, OTEC, wind power plants, tidal power plants and geothermal resources, fuel cell, MHD power generation-principle, thermoelectric power generation, thermionic power generation.

TEXT BOOKS

1. Arora and Domkundwar, "A Course in Power Plant Engineering", Co.Pvt.Ltd., New Delhi. 8th Edition 2018.

2. P.K. Nag, "Power Plant Engineering", Tata McGraw Hill,4th Edition 2017.

REFERENCES

1. Bernhardt G.A.Skrot , "Power station Engineering and Economy", Vopat - Tata McGraw Hill Publishing Company Ltd., New Delhi,

2. G.D. Rai-Khanna , "An introduction to power plant technology", M.M. El-Wakil McGraw Hill 1995.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	AUTOMOTIVE ELECTRONICS	3	0	0	3

Course Category: PEC

OBJECTIVES

- To understand the concepts of Automotive Electronics and it's evolution and trends
- Automotive systems & subsystems overview.
- To understand sensors and sensor monitoring mechanisms aligned to automotive systems

COURSE OUTCOMES

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

CO1. Obtain an overview of automotive components, subsystems, design cycles and safety systems employed in today's automotive industry

CO2. Understand concepts of Automotive Electronics

CO3. Understand various the sensor and Actuators used in theAutomotive Electronics

CO4. Understand the various Electronics fuel and ignition system

CO5. Apply the control techniques in different subsystem of the automobiles.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	M	M	S	M	S
CO2	S	S	M	M	S	S	S	M	S	S	M	S
CO3	S	S	S	S	S	M	S	S	M	M	S	S
CO4	S	S	S	S	M	M	M	S	M	S	S	S

SYLLABUS

UNIT I FUNDAMENTAL OF AUTOMOTIVE ELECTRONICS
Current trends in modernAutomobiles, Open loop and closedloopsystems-Componentsforelectronic enginemanagement.Electronic managementofchassissystem-Vehiclemotioncontrol.
UNIT II SENSORS AND ACTUATORS
Introduction,basicsensorarrangement,typesof sensorssuchas - oxygensensors,Crank angle position sensors - Fuel metering / vehicle speed sensor and detonationsensor - Altitude sensor, flow sensor. Throttle positionsensors,solenoids, steppermotors,relays.
UNIT III ELECTRONIC FUEL INJECTION AND IGNITION SYSTEMS
Introduction,Feedbackcarburetorsystems(FBC)Throttlebodyinjectionandmultiportor pointfuel injection,Fuelinjection systems, injection system controls. Advantages ofelectronicignition systems.Types ofsolidstate ignition systems andtheir principle ofoperation,Contactlesselectronicignition system,Electronicsparktimingcontrol.
UNIT IV DIGITAL ENGINE CONTROL SYSTEM

Open loop and closed loop control systems - Engine cranking and warm up control - Acceleration enrichment -Deceleration leaning and idle speed control. Distributor less ignition - Integrated engine controlsystem,Exhaust emission control engineering.
UNIT V ELECTROMAGNETIC INTERFERENCE SUPPRESSION
Electromagnetic compatibility - Electronic dash board instruments - Onboard diagnosis system.Securityandwarning system.

TEXT BOOKS

1. WilliamB.Riddens,“UnderstandingAutomotiveElectronics",5thEdition,Butterworth, Heinemann Woburn,1998.

2. OmWeatherJrandClandC.Hunter,"AutomotiveComputersandControlSystem". PrenticeHallInc.,New Jersey. July 1984.

REFERENCES

1. Young. A.P. and Griffths.L. “Automobile Electrical Equipment ", English Language Book Society and New Press.

2. Crouse. W.H., " Automobile Electrical equipment ", McGraw Hill Book Co Inc., New York, 1955.

3. Robert N Brady, " Automotive Computers and Digital Instrumentation ". A reston Book.Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988.

4. Bechtold., " Understanding Automotive Electronic ", SAE, 5thEdition 1998.

5. T.Mellard, " Automotive Electronics ".1stEdition 1997.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	VIRTUAL INSTRUMENTATIONLAB	3	0	0	3

Course Category: PEC

OBJECTIVES

- To impart knowledge on basics of virtual instrumentation flow and programming techniques.
- To study the concept of tools used for industrial application using MATLAB and LABVIEW.
- To create virtual instrumentation programming for various industrial applications.

COURSE OUTCOMES

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

CO1. Know the fundamental principles of virtual instrumentation using MAT LAB & LABVIEW.

CO2. Understand Real time industrial application programs.

CO3. Understand the fundamental principles of virtual instrumentation using MAT LAB & LABVIEW

CO4. Understand various functions available in Lab VIEW for engineering applications

CO5. Understand the Data acquisition through virtual instrumentation using LABVIEW

CO6. Understand Real time industrial application programs

CO7. Implement the simple real time application using LABVIEW

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	S	M	S	M	M	S
CO2	S	M	S	M	S	S	M	M	S	S	S	S
CO3	S	S	M	S	S	M	S	M	M	M	M	S
CO4	S	S	S	S	M	S	S	S	S	M	M	S
CO5	S	M	S	M	S	S	M	M	S	S	M	S

LIST OF EXPERIMENTS

1. ListofExperiments UsingMATLAB
2. 1. TimeresponsesofvarioussystemcompensationstabilityandanalysisusingMATLAB.
3. 2. SimulationofcomplexcontrolsystemusingMATLAB.
4. 3. DesignoffiltersandresonantcircuitsusingMATLAB.
5. ListofExperiments UsingLABVIEW
6. 4. CreatingvirtualinstrumentationforsimpleapplicationsusingLABVIEW.
7. 5. ProgrammingexercisesforloopandchartsusingLABVIEW.
8. 6. ProgrammingexercisesforclustersandgraphsusingLABVIEW.
9. 7. Programmingexercisesoncaseandsequencestructure,fileinput/output singLABVIEW.
10. 8. DataacquisitionthroughvirtualinstrumentationusingLABVIEW.

11. 9. SimulatingreactorcontrolusingvirtualinstrumentationusingLABVIEW.
12. 10. RealtimetemperaturecontrolusingvirtualinstrumentationusingLABVIEW.
13. 11. RealtimesequentialcontrolofanybatchprocessusingLABVIEW.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	BIOMEDICAL INSTRUMENTATION	3	0	0	3

Course Category: PEC

OBJECTIVES

- To Introduce Fundamentals of Biomedical Engineering
- To study the communication mechanics in a biomedical system with few examples
- To study measurement of certain important electrical and non-electrical parameters

COURSE OUTCOMES

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

CO1. Ability to understand and analyse Instrumentation systems and their applications to various industries

CO2. Understand the basic structure of a cell, its functionalities. To understand various recording systems like ECG,EEG&EMG.

CO3. To analyse the importance of pick-ups, transducers. Significance of transducers.

CO4. To understand the applications of transducers in BMI field.

CO5. To analyse the need for recorders, plotters and signal conditioners.

CO6. To understand various display devices.

CO7. To understand various cardiac measurements

CO8. To apply how computers can be applied for medicines.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	M	S	S	S	S	S	S	S	M	S
CO3	S	M	S	M	S	S	M	M	S	M	M	S
CO4	S	S	S	S	S	S	M	M	S	M	M	S
CO5	S	M	S	M	S	S	M	S	S	S	M	S
CO6	M	S	S	S	S	S	S	S	S	M	S	S
CO7	S	M	S	S	S	S	M	S	S	M	S	S

SYLLABUS

UNIT I INTRODUCTION
Cell structure– electrode – electrolyte interface, electrode potential, restingand action potential - electrodesfortheirmeasurement,ECG,EEG,EMG–machinedescription-methodsofmeasurement – threeequipmentfailuresandtroubleshooting.
UNIT II TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATION
Basictransducerprinciples–sourceofbioelectricpotentials-resistive,inductive,capacitive, fiber-optic, photoelectric andchemical transducers – theirdescription andfeatureapplicablefor

biomedicalinstrumentation.
UNIT III SIGNAL CONDITIONING, RECORDING AND DISPLAY
Input isolation, DC amplifier, power amplifier, and differential amplifier –feedback, op Amp-electrometeramplifier,carrierAmplifier–instrumentpowersupply.Oscillagraphic–galvanometric–X-Y,magneticrecorder,storageoscilloscopes-electron microscope-PMMCwritingsystems.
UNIT IV CARDIAC MEASUREMENTS
Electrocardiograph measurements – blood pressure measurement: by ultrasonic method- plethysonography – blood flow measurement by electromagnetic flow meter- cardiacoutput measurementbydilutionmethod–phonocardiography –vectorcardiography.Heart lung machine – artificialventilator–Anestheticmachine–BasicideasofCT scanner–MRTandultrasonicscanner- bio- telemetry–laserequipmentandapplication–cardiacpacemaker- DC - defibrillatorpatientsafety –electricalshockhazards. , Nano-robots (Basics only)
UNIT V COMPUTERS IN BIO-MEDICAL INSTRUMENTATION
Introduction-computersinmedicine- basicsofsignalconversionan digitalfiltering –datareduction technique–timeandfrequencydomaintechnique–ECGAnalysis.

TEXT BOOKS

1. Khandpur,R.S.,'HandbookofBiomedical Instrumentation',TMH,3rdEdition 2014.

2. ArumugamM.,"BioMedicalInstrumentation",AnuradhaagenciesPub.,2017.

REFERENCES

1. GeddesL.A.,andBaker,L.E.,'PrinciplesofAppliedBio-medicalInstrumentation',3rd Edition,JohnWileyand Sons,2008.

2. Cromwell,Weibell andPfeiffer,"BiomedicalInstrumentationand Measurements',2ndEdition,PrenticeHallofIndia,1999.

3. TompkinsW.J.,BiomedicalDigitalSignalProcessing,PrenticeHallofIndia,1998.

4. ieeexplore.ieee.org

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	PRINCIPLES OF COMMUNICATION ENGINEERING	3	0	0	3

Course Category: PEC

OBJECTIVES

- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission

COURSE OUTCOMES

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

CO1. Basic theories behind the various communication systems are studied.

CO2. Features of the various communication systems are studied.

CO3. Describe the basic principle of communication system,

CO4. Demonstrate and solve communication system parameters for various types of modulation and demodulation techniques,

CO5. Use of different modulation and demodulation techniques used in analog communication,

CO6. Identify and solve basic communication problems,

CO7. Analyze transmitter and receiver circuits,

CO8. Compare and contrast design issues, advantages, disadvantages and limitations of analog communication systems,

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	S	M	S	M	M	S	S	S
CO2	M	M	S	S	S	S	S	M	M	S	M	S
CO3	S	S	S	S	M	S	S	M	S	S	M	S
CO4	S	S	S	M	S	S	M	M	M	S	S	S
CO5	S	S	M	M	S	M	S	M	S	M	M	S
CO6	S	S	S	M	M	S	S	S	M	S	S	S

SYLLABUS

UNIT I RADIO COMMUNICATION SYSTEMS
Frequencyspectrum-principle ofAMandFM-AMandFMtransmitters andreceivers-introductionto microwavecommunicationsystems-principleofsatellitecommunication.
UNIT II PULSE COMMUNICATION SYSTEMS
PAM,PPM,PDM,PCM-deltamodulation-differentialPCM-meritsanddemerits-comparisonofpulse modulationschemes.

UNIT III DATA TRANSMISSION
Base band Signal receiver -error probability - optimum and m a t c h e d filter techniques - coherent reception - digital modulation systems - FS, PSK - comparison of data transmission systems.
UNIT IV TRANSMISSION MEDIUM
Characteristicsof cables-opticalfibers-effects of EM radiation-band width andnoiserestrictions statisticalmeasurementof random noise-concept ofmultiplexing–FDMandTDM.
UNIT V TELEVISION
Scanning methods - B/W and colour systems - cameraand picture tubes - synchronization -transmitters and receivers.

TEXT BOOKS

1. KennedyG,"ElectronicCommunicationSystems",McGraw-Hill, 5thEdition,2011.

2. TaubandSchillingPrinciplesofCommunicationSystems, 4thEdition,McGraw-Hill,2015.

REFERENCES

1. SimonHaykins,"CommunicationSystems",5thEdition,JohnWiley,Inc., 2009.

2. BruceCarlson.A,"CommunicationSystems",5thEdition,TataMcGraw-Hill,2009.

3. RoodyandCoolen,"Electronic Communication",4thEditionPrenticeHallof&India,2008.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	SENSORS FOR ENGINEERING APPLICATIONS [T&P]	2	1	0	3

Course Category: [PEC]

OBJECTIVES

- Sensors and transducers form an indispensible part in Industrial automation today.
- With the competition in industries there is a necessity that down time need to be controlled as well as the process parameters be monitored accurately for making quality products.
- Digitalization of the automation process also requires new sensors.

COURSE OUTCOMES

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

CO1. Explain the static and dynamic characteristics of transducers

CO2. Explain the operation of electrical, magnetic, piezoelectric, fiber optic transducers

CO3. Explain the operation of digital transducers and their application

CO4. Explain the application of smart sensors

CO5. Identify a sensor for a particular industrial application

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L										
CO2	M	L										
CO3	M	L										
CO4	M	L										
CO5	S	M	L	L								

SYLLABUS

UNIT I
STRAIN AND PRESSURE MEASUREMENT: Resistance strain guage, piezoelectric pressure gauge, characteristics. Electronic circuits for strain gauge, load cells. Interferometer, Fibre-optic methods. Pressure gauges aneroid capacitance pressure gauge, ionization gauge, using the transducers for applications
UNIT II
MOTION SENSORS: Capacitor plate sensor, Inductive sensors, LVDT Accelerometer systems, rotation sensors drag cup devices, piezoelectric devices. Rotary encoders.
UNIT III
LIGHT RADIATION: Color temperature, light flux, photo sensors, photomultiplier, photo resistor and photoconductors, photodiodes, phototransistors, photovoltaic devices, fiber-optic applications, light transducer, solid-state, transducers liquid crystal devices.
UNIT IV

HEAT AND TEMPERATURE: Bimetallic strip, Bourdon temperature gauge, thermocouples, Resistance thermometers, thermistors, PTC thermistors, bolometer, Pyroelectric detector.
UNIT V
ELECTRONIC SENSORS: Proximity detectors – Inductive and capacitive, ultrasonic, photo beam detectors Reed switch, magnet and Hall-effect units, Doppler detectors, liquid level detectors, flow sensors, smoke sensors.

TEXT BOOKS

1. 1. Doebelin E O, ―Measurement Systems, Application and Design‖ , McGraw Hill, Fifth Edition, 2004

2. 2. Ian R Sinclair, ―Sensors and Transducers‖, Third Edition, Newnes publishers, 2001.

REFERENCES

1. 1. Jack P Holman, ―Experimental Methods for Engineers‖, Seventh Edition, McGraw Hill, USA, 2001.

2. 2. Robert G Seippel, ―Transducers, Sensors and Detectors‖, Reston Publishing Company, USA, 1983.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	PROCESS CONTROL LAB	3	0	0	3

Course Category: PEC

OBJECTIVES

- To verify the process concept on the selected process loops.

COURSE OUTCOMES

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

CO1. Ability to understand and analyse the process control loops

CO2. Design the ON/OFF controller and PID Controller using EDA tool

CO3. Apply the PID controller on various bench mark processes.

CO4. Apply the different PID controller tuning methods on various bench mark processes

CO5. Analyze the characteristics of control valve with and without positioner.

CO6. Demonstrate the PID implementation issues using EDA tool.

CO7. Design and implement PID controller for multi variable systems

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	S	M	M	S
CO2	S	S	S	S	S	M	M	M	S	S	M	S
CO3	S	M	S	S	S	S	S	M	S	M	S	S
CO4	S	M	S	S	S	S	M	M	S	S	M	S
CO5	S	S	S	S	S	M	M	M	S	S	M	S
CO6	S	S	S	S	S	S	M	M	M	M	M	M

LIST OF EXPERIMENTS

1. LISTOFTHE EXPERIMENTS:
2. Operation of interacting and non-interacting systems.
3. Responsesofdifferentorder processes withandwithouttransportationlag.
4. Responseofon-offcontroller.
5. Responseof PIDcontroller.
6. Characteristicsofcontrolvalvewithandwithout positioned.
7. Operationofon-offcontrolledthermalprocess.
8. Closedloopresponseofflowcontrolloop.
9. Closedloopresponseoflevelcontrolloop.
10. Closedloopresponseoftemperaturecontrolloop.
11. Closedloopresponseof pressurecontrolloop.

12. Tuningof controllers.

13. Studyofcomplexcontrolsystem(ratio/cascade/feedforward).

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	DIGITAL CONTROL SYSTEMS	3	0	0	3

Course Category: PEC

OBJECTIVES

- Design and analyse digital controllers.
- Design state feedback and output feedback controllers.

COURSE OUTCOMES

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

CO1. Obtain discrete representation of LTI systems.

CO2. Analyse stability of open loop and closed loop discrete-time systems.

CO3. Basics of discrete control systems

CO4. Z & inverse Z transforms for discrete system with time response analysis

CO5. Analyse the performance of the discrete systems with stability

CO6. State Space Approach for discrete time systems

CO7. Design of controllers and compensators for discrete System

CO8. Feedback controllers design for discrete time systems.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	S	S	S	S	M	M	S	M	M	S
CO3	S	S	S	S	S	S	S	M	S	M	M	S
CO4	S	S	S	S	S	S	M	M	M	M	M	S
CO5	S	S	S	S	S	S	M	M	S	M	M	S
CO6	S	S	S	S	S	S	M	M	S	M	M	S

SYLLABUS

UNIT I
Discrete Representation of Continuous Systems (6 hours) Basics of Digital Control Systems.Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization.Choice of sampling frequency.ZOH equivalent.
UNIT II
Discrete System Analysis (6 hours) Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane.Solution of Discrete time systems.Time response of discrete time system.
UNIT III

Stability of Discrete Time System (4 hours) Stability analysis by Jury test.Stability analysis using bilinear transformation. Design ofdigital control system with dead beat response. Practical issues with dead beat response design.
UNIT IV
State Space Approach for discrete time systems (10 hours) State space models of discrete systems, State space analysis. Lyapunov Stability.Controllability,reach-ability, Reconstructibility and observability analysis. Effect of polezero cancellation on the controllability & observability.
UNIT V
Design of Digital Control System(8 hours) Design of Discrete PID Controller, Design of discrete state feedback controller.Design of setpoint tracker.Design of Discrete Observer for LTI System.Design of Discrete compensator.
UNIT VI
Discrete output feedback control (8 hours) Design of discrete output feedback control. Fast output sampling (FOS) and periodic outputfeedback controller design for discrete time systems.

TEXT BOOKS

1. K. Ogata, “Digital Control Engineering”, Prentice Hall, Englewood Cliffs,5th Edition 2010.

2. M. Gopal, “Digital Control Engineering”, Wiley Eastern, 2nd Edition 2014..

REFERENCES

1. G. F. Franklin, J. D. Powell and M. L. Workman, “Digital Control of DynamicSystems”, Addison-Wesley, 3rd Edition 1998.

2. B.C. Kuo, “Digital Control System”, Holt, Rinehart and Winston, 1980.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ROBOTICSLAB	3	0	0	3

Course Category: PEC

OBJECTIVES

- To introduce different types of robotics and demonstrate them to identify different parts andComponents.
- To write programming for simple operations like pick and place, rotoxim etc.,

COURSE OUTCOMES

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

CO1. Use of MAT Lab software to model the different types of robots and

CO2. Calculate work volume for different robots.

CO3. model the different types of robots using EDA tool

CO4. Differenttypeof links and joints used in robots

CO5. Calculate work volume for different robots

CO6. Programming of ROBOTs

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	S	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	S	M	S	M	S
CO3	M	S	S	S	S	S	S	S	S	S	S	S
CO4	S	M	S	M	S	S	S	S	S	S	S	S

LIST OF EXPERIMENTS

1. LISTOFTHEEXPERIMENTS:
2. Studyofdifferenttypesofrobotsbasedon configurationand application.
3. Studyofdifferenttypeoflinksandjointsused inrobots.
4. Studyofcomponentsofrobotswithdrivesystemandendeffectors.
5. Determinationofmaximumandminimumpositionoflinks.
6. Verification of transformation (Position and orientation) with respect to gripper andworld coordinatesystem.
7. Estimationofaccuracy,repeatabilityandresolution.
8. Robotprogrammingexercises.
9. Point-to-pointandcontinuouspathprogramming.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ADVANCED POWER ELECTRONICS AND DRIVES	3	0	0	3

Course Category: PEC

OBJECTIVES

- To introduce the basic concept of power electronics.
- To study the AC to DC converters & DC to AC converters.
- To study the DC motor drives and Ac motor drives.

COURSE OUTCOMES

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

CO1. Ability to understand and design converters

CO2. Understand the Basic structure, working and switching characteristics of Power semiconductor devices

CO3. Principle and working of configuration of AC-DC controlled converters

CO4. Working of different types of DC-AC Converters

CO5. Apply different PWM methods and control strategies

CO6. Speed control of different types of DC converters fed DC Drives

CO7. Speed control of AC drives using different Converter configuration

CO8. Slip power recovery scheme

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	S	M	M	S	S	M	S
CO4	S	S	S	M	S	S	S	M	S	M	M	S
CO5	S	S	S	S	S	M	M	M	M	S	M	S
CO6	S	M	S	M	S	S	M	M	S	M	M	S
CO7	S	S	S	S	S	S	S	M	S	S	M	S

SYLLABUS

UNIT I INTRODUCTION
Basic Concept of Power Electronics, Different types of Power Electronic Devices – Diodes, Transistors and SCR, MOSFET, IGBT and GTO's.
UNIT II AC TO DC CONVERTERS
Single Phase and three phase bridge rectifiers, half controlled and Fully Controlled Converters with R, RL, and RLE loads. Free Wheeling Diodes, Dual Converter, Sequence Control of Converters – inverter operation, Input Harmonics and Output Ripple, Smoothing Inductance.

UNIT III DC TO AC CONVERTERS
Basics of Inverter – Classifications – VSI - single Phase Half and Full Bridge Inverters, three phase 180o and120o Configurations – Basic current source inverters- Need for feedback diodes in anti parallel with switches - Voltage Control and PWM strategies – single phase multilevel Inverter.
UNIT IV DC MOTOR DRIVES
Speed control of DC motors – Thyristor converter fed DC drives : Single, two and four quadrant operations - Chopper Drives.
UNIT V AC MOTOR DRIVES
Speed control of Induction motors – Stator control – stator voltage and frequency control, Rotor Control , Slip Power Recovery Schemes – Kramer and scherbius Drives - AC chopper, Inverter, cycloconverter fed induction motor drives. Introduction - Synchronous Motor drives

TEXT BOOKS

1. Dr P S Bimbhra “Power Electronics“, Khanna Publishers, New Delhi, 6thEdition 2012.

2. Dubey G.K. and Kasara .Bada Rao.,Power Electronic and Drives, Narosa Publications, 2nd Edition2010.

3. G.K.Dubey, Doradia, S.R. Joshi and R.M.Sinha, Thyristorised, Power Controllers, New Age International Publishers, New Delhi, 1996.

REFERENCES

1. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition,2014.

2. P.C.Sen, Modern Power Electronics, S Chand & Co Ltd, 2nd edition 2005.

3. Vedam Subramaniyam, Electric Drives, Tata McGraw Hill Ltd, 2012.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ELECTRICAL AND HYBRID VEHICLES	3	0	0	3

Course Category: PEC

OBJECTIVES

- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems.

COURSE OUTCOMES

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

CO1. Understand the models to describe hybrid vehicles and their performance.

CO2. Basic concepts of hybrid and electric vehicles.

CO3. Basic concepts of hybrid traction, types of hybrid drive-train topologies, Power flow control in hybrid drive-train topologies.

CO4. Analysis of fuel efficiency.

CO5. Study the configuration and control of Permanent Magnet Motor drives ,Switch Reluctance Motor drives .

CO6. Matching the electric machine and the internal combustion engine (ICE).

CO7. Classification of different energy management strategies.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	S	S	S
CO2	S	M	S	M	S	S	S	M	S	S	S	S
CO3	S	S	S	S	M	S	M	S	S	S	M	M
CO4	S	S	S	S	S	S	M	S	S	M	S	S
CO5	S	S	S	M	M	S	S	S	S	S	S	S
CO6	S	S	S	S	S	S	S	S	S	S	S	S

SYLLABUS

UNIT I INTRODUCTION
Conventional Vehicles: Basics of vehicle performance, vehicle power sourcecharacterization, transmission characteristics, mathematical models to describe vehicleperformance.Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social andenvironmentalimportance of hybrid and electric vehicles, impact of modern drive-trains onenergy supplies.
UNIT II ELECTRIC DRIVE
Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybriddrive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiencyanalysis.
UNIT III ELECTRIC TRAINS
Electric Drive-trains: Basic concept of electric traction, introduction to various electric drivetraintopologies,

power flow control in electric drive-train topologies, fuel efficiency analysis.Electric Propulsion unit: Introduction to electric components used in hybrid and electricvehicles,Configuration and control of DC Motor drives, Configuration and control ofInduction Motor drives, configuration and control of Permanent Magnet Motor drives,Configuration and control of Switch Reluctance Motor drives, drive system efficiency.
UNIT IV ENERGY STORAGE
Energy Storage: Introduction to Energy Storage Requirements in Hybrid and ElectricVehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage andits analysis, Super Capacitor based energy storage and its analysis, Flywheel based energystorage and its analysis, Hybridization of different energy storage devices. Sizing the drivesystem: Matching the electric machine and the internal combustion engine (ICE), Sizing thepropulsion motor, sizing the power electronics, selecting the energy storage technology,Communications, supportingsubsystems
UNIT V ENERGY MANAGEMENT STRATEGIES
Energy Management Strategies: Introduction to energy management strategies used in hybridand electric vehicles, classification of different energy management strategies, comparison ofdifferent energy management strategies, implementation issues of energy managementstrategies.CaseStudies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery ElectricVehicle (BEV).

TEXT BOOKS

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles andApplications with Practical Perspectives”, John Wiley & Sons, 2011.

2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy ManagementStrategies”, Springer, 2015.

REFERENCES

1. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and FuelCell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.

2. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	ADVANCED POWER ELECTRONICS AND DRIVES LAB	3	0	0	3

Course Category: PEC

OBJECTIVES

- Tostudy,analyzetheperformanceofdifferentpowerelectronicconvertercircuits.

COURSE OUTCOMES

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

CO1. Abilitytoconstructtestplatformsandanalyzepowerelectroniccircuits.

CO2. Analyse Single phase full converter with R, RL and RLE load

CO3. Analyze Three phase AC voltage regulator and Resonant DC to DC converter

CO4. Obtain speed control of Microcontroller based VSI fed three phase Induction motor drive

CO5. Simulation of Single Phase Full Converter with different loads ,Single Phase Semi Converter with different loads

CO6. Simulation of Buck, Boost, Buck-Boost Converter.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	S	M	M	S
CO2	S	M	M	M	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	M	S	M	S	S	M	M
CO4	S	S	S	S	S	M	M	M	S	M	M	S
CO5	S	S	S	S	S	S	M	S	S	S	M	S

LIST OF EXPERIMENTS

1. UsingMatlab,PSIM Software’s

2. 1.SinglephasehalfandfullconverterwithR,RLandRLEload

3. 2.IGBTbasedsinglephasePWMinverter

4. 3.ThreephaseACvoltageregulator

5. 4.ResonantDCtoDCconverter

6. 5.MicrocontrollerbasedspeedcontrolofVSIthreephaseInductionmotordrive.

7. 6.SimulationofSinglePhaseFullConverterwithdifferentloads.

8. 7.SimulationofSinglePhaseSemiConverterwithdifferentloads.

9. 8.SimulationofBUCKConverter.

10. SimulationofBOOSTConverter.

11. SimulationofBUCK-BOOSTConverter.

WEB / ONLINE RESOURCES

- www.nptl.co.in
- www.electrical4u.com

PREPARED BY

Dept. of EEE

Course Code		L	T	P	C
Course Title	POWER QUALITY	3	0	0	3

Course Category: PEC

OBJECTIVES

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring.

COURSE OUTCOMES

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

CO1. Ability to understand and analyze power quality problem, stability, control and protection.

CO2. Explain various power quality problems

CO3. Discuss the root cause of power quality problems

CO4. Explain the impact of PQ issues on various electrical components

CO5. Discuss the need for PQ monitoring and measurement

CO6. Compute the harmonics distortion in the given electrical drive

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	S	S
CO2	S	S	M	M	S	S	S	M	S	M	M	S
CO3	S	S	S	S	S	M	M	M	S	M	M	S
CO4	S	S	M	M	S	S	S	M	S	M	S	S
CO5	S	S	S	S	S	S	M	M	M	M	M	S

SYLLABUS

UNIT I INTRODUCTION
Definitions-Powerquality,Voltage quality-Powerqualityissues:Shortdurationvoltagevariations,Long duration voltage variations, Transients, Waveform distortion,Voltage imbalance, Voltage fluctuation, Power frequency variations-Sources andEffectsof powerqualityproblems-Powerqualityterms-PowerqualityandElectroMagneticCompatibility(EMC),IEEEandIECStandards.
UNIT II SHORT AND LONG INTERRUPTIONS
Introduction-Originof shortinterruptions:Voltagemagnitudeeventsduetore-closing,Voltageduringtheinterruption-Monitoringofshortinterruptions-Influenceoninductionmotors, Synchronousmotors,Adjustablespeeddrives,Electronicequipments-Singlephasetripping:Voltageduring faultandpostfaultperiod, Currentduringfaultperiod-PredictionofshortInterruptions. LONGINTERRUPTIONS:Definition-Failure,Outage,Interruption-Originof interruptions-Causesoflong

interruptions – Principlesofregulatingthevoltage-Voltageregulatingdevices, Applications: Utility side, End-User side-Reliability evaluation-Cost ofinterruptions.
UNIT III VOLTAGE SAG AND TRANSIENTS
VOLTAGE SAG: Introduction-Definition-Magnitude, Duration-CausesofVoltageSag-Load influenceon voltage sags on Adjustable speed drives, Power electronics loads, Sensitiveloads- Stochastic assessment of voltagesags – Overviewof mitigationmethods. TRANSIENTS: Definition-powersystemtransientmodel-Principlesofovervoltageprotection –Typesand causesof transients- Devicesfor over voltageprotection-Capacitorswitchintransients- Lightning transients-Transientsfromloadswitching.
UNIT IV WAVEFORM DISTORTION
Introduction - Definition and terms - Harmonics, Harmonics indices, Inter harmonics, Notching - voltage Vs Current distortion - Harmonics Vs Transients - Sources and effects of harmonic distortion - System response characteristics - Principles of controlling harmonics - Standards and limitation
UNIT V POWER QUALITY SOLUTIONS
Introduction-Powerqualitymonitoring:Needforpowerqualitymonitoring, Evolutionof power quality Monitoring,Deregulationeffect on power quality monitoring-Brief introductiontopowerquality measurementequipmentsandpowerconditioningequipments-Planning,ConductingandAnalyzingpower qualitysurvey-Mitigationandcontroltechniques- ActiveFiltersforHarmonicReduction

TEXT BOOKS

1. RogerC.Dugan,MarkF.McGranaghanandH.WayneBeaty,"ElectricalPowerSystemsQuality", McGraw-Hill,NewYork,3rd Edition 2017.

2. Barry W.Kennedy, “Power QualityPrimer”, McGraw-Hill,NewYork, 2007.

REFERENCES

1. Sankaran.C,"PowerQuality",CRCPress,Washington,D.C., 2019.

2. MathH.J.Bollen,"UnderstandingPowerQualityProblems:VoltageSagsandInterruptions",IEEEPress, NewYork, 2000.

3. Arrillaga.J,Watson.N.RandChen.S,"PowerSystemQualityAssessment",JohnWiley. 2011.

WEB / ONLINE RESOURCES

- www.nptel.ac.in
- www.electrical4u.com

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Dept. of EEE

Course Code		L	T	P	C
Course Title	APPLIED MACHINES AND FLUID MECHANICS	3	0	0	3

Course Category: OEC

OBJECTIVES

- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders andspheres.
- The applications of the conservation laws to flow through pipes and hydraulic machines arestudied.
- To understand the importance of various types of flow in pumps and turbines.

COURSE OUTCOMES

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

CO1. The students can be to apply mathematical knowledge to predict the properties and characteristics of a fluid.

CO2. Can critically analyze the performance of pumps and turbines

CO3. Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures and different types of loads.

CO4. The students can be to apply mathematical knowledge to predict the properties and characteristics of a fluid.

CO5. Can critically analyze the performance of pumps and turbines

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												

SYLLABUS

UNIT I GEOMETRICAL PROPERTIES OF SECTIONS
Centroid, Centroidal axis Moments of inertia – Polar moment of inertia – Principal moments of inertia – Graphical treatment – Center of Gravity of solids by integration. Combined stresses- Principle stresses and planes- Graphical treatment- Stresses in thin cylinders and shells.
UNIT II ANALYSIS OF STATICALLY DETERMINATION PLANE STRESSES
Method of joints – Method of sections –Tension coefficient method - Graphical method. BEAMS AND BENDING: Beams and support conditions- Types of support- Shear force and bending moment –There dynamics for simply support beams. Cantilevers and over hanging beams with concentrated and /or distributed loads- Theory of simple bending stress distribution at a cross section due to B.M.Shear - Leaf springs.
UNIT III TORSION OF CIRCULAR SHAFTS
Theory of Torsion –Torsion of circular and hollow circular shaft and Shear due to torsion closed open coiled helical springs - Strain Energy due to axial force, bending moment flexural and torsional shear- Resilience stresses due to impact and suddenly applied loads.
UNIT IV PROPERTIES OF FLUIDS

Properties of fluids – types of fluid flow – Euler‟s and Bernoulli‟s equation, limitations, pressure and flow measuring devices- manometers – Orifice meter – venturi meter and Pitot tube. Reciprocating and centrifugal pumps- principles and operation –work done- efficiency- characteristics- specific speed- selection of pumps.
UNIT V CLASSIFICATION OF TURBINES
Hydraulic turbines – Classification - Working principles of Pelton wheel, Francis and Kalpan turbines- Work done – Efficiency – Velocity triangles- Specific speed- Characteristics curves- Selection off turbines.

TEXT BOOKS

1. 1.Jain op and jain B.K “Theory and Analysis of Structure”, Nem chand & Brothers
2. publishers, 1957.
3. 2.Kazimi, “Solid Mechanics”, Mc Graw hill Inc. US, 2nd Revised edition,1st Jan 1982.
4. 3.S.Ramamrutham& R.Narayan, “Strength of Materials”, 15th edition 2004, Dhanpat Rai
5. Publishers, New Delhi.
6. 4.Dr.R.K.Bansal, “Fluid mechanics and machinery”, Laxmi Publication pvt. Ltd, Bangalore,
7. 2010.
8. REFERENCE BOOKS:
9. 1.James M. Gere & Stephen, P.Timoshenko, “Mechanics of Materials”, CBS Publishers and
10. Distributors, Delhi.
11. 2.Gere and Timoshenko, “Mechanics of Materials”, 4th edition, A Math CAD Based e book.
12. 3.Egor P Popov, “Introduction to Mechanics of solids”, Englewood clitts, New Jersey ,
13. Prentice-Hall,1968.

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Course Code		L	T	P	C
Course Title	Thermodynamics	3	0	0	3

Course Category: OEC

COURSE OUTCOMES

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

CO1. Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

CO2. Apply the different gas power cycles and use of them in Internal Combustion Engines.

CO3. Apply the different gas power cycles and use of them Steam boilers and Turbines, Compressors

CO4. and Refrigeration and Air conditioning systems

CO5. Apply different heat transfer principles of different applications.

CO6. Apply the Thermodynamic Principles to Mechanical Engineering Application.

CO7. Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

CO8. Apply the different gas power cycles and use of them in Internal Combustion Engines.

CO9. Apply the different gas power cycles and use of them Steam boilers and Turbines, Compressors and Refrigeration and Air conditioning systems

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												

SYLLABUS

UNIT I SYSTEM AND LAWS OF THERMODYNAMICS
Closed and open systems – equilibrium – first law – second law – reversibility – entrophy – processes – heat and work transfers- entrophy change – Carnot's cycle.
UNIT II 10
POWER CYCLES AND INTERNAL COMBUSTIONS ENGINES Carnot's cycle – otto cycle – diesel cycle – dual cycle – brayton cycle – air standard efficiency – two stroke and four stroke engines – SI and CI engines-gas turbine operation.
UNIT III 10
STEAM BOILERS AND TURBINES Steam properties – use of steam tables and charts – steam power cycle – boilers and accessories – boilertesting – layout of thermal power stations – steam turbines – impulse and reaction turbine – compounding of turbines – simple velocity diagrams.
UNIT IV 10
AIR COMPRESSORS, REFRIGERATION AND AIR CONDITIONING Reciprocating and rotary compressors – staging compressor work – vapour compressionrefrigeration cycle – applications-air conditioning system layout- selection.

UNIT V 10
HEAT TRANSFER Conduction – plane wall, cylinder, sphere, composite walls – critical insulation thickness – simple fins – convection – free convection and forced convection flow over flat plates and flow through pipes – empirical relations – radiation – Black body – grey body radiation exchanges – cooling of machines.Learning Resources:

TEXT BOOKS

1. 1. Nag P. K,"Engineering Thermodynamics", Tata McGraw-Hill, 1995.

2. 2. Kothadaraman and Domkundwar, "Applied Thermodynamics",Dhanput Rai & co (p) ltd, 1998.

3. 3. Sachdeva R.C, "Heat Transfer", Wiley Eastern Ltd.1992.

4. 4. T.RoyChoudhury, "Basic Engineering Thermodynamics", Tata McGraw-Hill Publishing

5. Co.Ltd.1997.

REFERENCES

1. 1. Ballancy P. L, "Applied Thermodynamics", Edition 5, Khanna Publishers, 1984.

2. 2. Rai and Sorao, „Applied Thermodynamics", Satya Prakasm 1985.

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Dept. of EEE

Course Code		L	T	P	C
Course Title	THERMAL ENGINEERING &FLUID MECHANICS LAB	3	0	0	3

Course Category: OEC

COURSE OUTCOMES

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

CO1. Able to conduct experiment on Compressors and Blowers.

CO2. Able to have hands on experience in flow measurements using different devices.

CO3. Able to perform calculation related to losses in pipes.

CO4. Able to conduct experiment on Pumps and Turbines

CO5. On Completion of the course the student will be able to conduct experiment on Internal Combustion Engines to study the characteristic and performance of Internal Combustion Engines.

CO6. Conduct experiment on Compressors and Blowers.

CO7. Experience in flow measurements using different devices and perform calculation related to losses in pipes.

CO8. Conduct experiment on Pumps and Turbines

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												

LIST OF EXPERIMENTS

1. 1. Value and port diagram.
2. 2. Performance test of constant speed engines.
3. 3. Determination of fractional power. a. By performance test.
4. b. By Retardation test.
5. 4. Heat balance sheet of IC Engines. a. By Air Measurements.
6. b. Using Exhaust Gas calorimeter.
7. 5. Performance test on compressors and Blowers.
8. 1. Performance study of centrifugal Pump.
9. 2. Performance study of Reciprocating Pump.
10. 3. Performance study of Gear oil Pump.
11. 4. Performance study of Jet Pump / Deep well pump.
12. 5. Performance study of submersible pump.
13. 6.Performance study of Pelton / Francis Turbines.

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Course Code		L	T	P	C
Course Title	ELECTRICAL MATERIALS	3	0	0	3

Course Category: OEC

COURSE OUTCOMES

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

CO1. To understand the various principles of emission

CO2. To understand about dielectric and magnetic material

CO3. To analyse the electro chemical properties, concentration cells etc.

CO4. To evaluate various properties of special material

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S

SYLLABUS

UNIT I INTRODUCTION
Review of "structure of atom"- conductivity of metals Electrons mobility – Energy levels of a molecule – fermi –dirac distribution – Emission – Superconductivity – Thermal conductivity of metals – Thermoelectric effects of metals.
UNIT II DIELECTRIC PROPERTIES
Dielectric properties – (static fields) – polarization – Mechanisms of polarization polarisability –Dielectric properties – (Alternating fields)-Frequency dependence of polarisability – Dielectric losses –dielectric properties of polymeric systems – Ferro and piezo electricity.
UNIT III MAGNETIC PROPERTIES OF MATERIALS
Magnetic properties of materials – classification – dia, para, ferro magnetism – magnetic resonance – Measurement of electro magnetic properties.
UNIT IV LIQUIDS AND OPTICS
Conduction in liquids – classification –electrolysis –lonic velocities- chemical cells and concentration cells – corrosion cells –corrosion by electric currents optical properties of solids – photo emission – electro luminescence –panels –photo emitters LED"s – lasers – smart sensor materials- Material for fabrication of integrated circuits.
UNIT V SPECIAL MATERIALS
Metallic glasses as transformer core material – nano phase material – shape memory alloys – advanced ceramic materials – polymers – biomaterials – non-linear materials and their applications.

TEXT BOOKS

1. 1. Arumugam.M, „Material science", Anuradha Technical book Publishers, Kumbakonam1997.

2. REFERENCE BOOKS

3. 1. Electrical Engineering Materials –A.J.Dekker , prentice Hall,1961.

4. 2. Materials for Electrical Engineering –B.M.Tareev, Higher school pub –co.

5. 3. An introduction to electrical Engineering materials – C.S .Indulkar. S. Chand & co 1998.

6. 4. Raghavan, V. „Materials science and Engineering", Prentice Hall of India, New Delhi, 1993.

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Course Code		L	T	P	C
Course Title	**Total Quality Management**	3	0	0	3

Course Category: OEC

COURSE OUTCOMES

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

CO1. Explain the different meanings of the quality concept and its influence.

CO2. Describe, distinguish and use the several techniques and quality management tools.

CO3. Explain and distinguish the normalization, homologation and certification activities.

CO4. Identify the elements that are part of the quality measuring process in the industry.

CO5. Predict the errors in the measuring process, distinguishing its nature and the root causes.

CO6. Justify whether or not a measuring process fulfils the established quality requirements.

CO7. Explain the regulation and the phases of a quality system certification process.

CO8. The different meanings of the quality concept and its influence.

CO9. Describe, distinguish and use the several techniques and quality management tools.

CO10. Distinguish the normalization, homologation and certification activities.

CO11. Identify the elements that are part of the quality measuring process in the industry.

CO12. Predict the errors in the measuring process, distinguishing its nature and the root causes.

CO13. Justify whether or not a measuring process fulfils the established quality requirements.

CO14. The regulation and the phases of a quality system certification process.

CO – PO / PSO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

UNIT I INTRODUCTION
Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques forQuality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM,Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, StrategicPlanning, Deming Philosophy, Barriers to TQM Implementation.
UNIT II TQM PRINCIPLES
Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality, CustomerRetention, Employee Involvement - Motivation, Empowerment, Teams, Recognition and

Reward,Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen,Supplier Partnership - Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development,Performance Measures - Basic Concepts, Strategy, Performance Measure.
UNIT III STATISTICAL PROCESS CONTROL (SPC)
The seven tools of quality, Statistical Fundamentals - Measures of central Tendency and Dispersion,Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability,Concept of six sigma, New seven Management tools.
UNIT IV TQM TOOLS
Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) - House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance(TPM) - Concept, Improvement Needs, FMEA - Stages of FMEA.
UNIT V QUALITY SYSTEMS
Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements,Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept,Requirements and Benefits.

TEXT BOOKS

1. 1. Dale H.Besterfiled, “Total Quality Management”, Pearson Education Asia, 1999. (Indian reprint2002).

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edn), South-

2. Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).

3. Feigenbaum.A.V. “Total Quality Management”, McGraw-Hill, 1991.

4. Oakland.J.S “Total Quality Management Butterworth - Hcinemann Ltd., Oxford. 1989.

5. Narayana V. and Sreenivasan N.S., “ Quality Management - Concepts and Tasks”, New Age

6. International 1996.

7. Zeiri, “Total Quality Management for Engineers Wood Head Publishers, 1991

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