USHARAMA
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(Approved by A.I.C.T.E & Permanently Affiliated to JNTU, Kakinada)

COURSE STRUCTURE AND SYLLABUS

For 3rd and 4th Year B.Tech

IN

ELECTRICAL AND ELECTRONICS ENGINEERING

(Applicable for batches admitted from 2020-2021)

UR-20

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Usha Rama College of Engineering and Technology
Electrical and Electronics Engineering
Course Structure (UR20)

FIRST SEMESTER (I -YEAR)

I SEMESTER								
S. No	**Course Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Contact Hrs./wk**	**C**
1	ESC	UR20ES101	Problem Solving and Programming using C	3	0	0	3	3
2	BSC	UR20BS102	Applied Physics	3	0	0	3	3
3	ESC	UR20ES103	Basic Electrical Engineering	3	0	0	3	3
4	BSC	UR20BS104	Linear Algebra & Calculus	3	0	0	3	3
5	ESC	UR20ES114	Engineering Workshop & IT Workshop	1	0	4	5	3
6	ESC	UR20ES111	Problem Solving and Programming using C Lab	0	0	3	3	1.5
7	BSC	UR20BS112	Applied Physics Lab	0	0	3	3	1.5
8	ESC	UR20ES113	Basic Electrical Engineering Lab	0	0	3	3	1.5
			Total	13	0	13	26	19.5

SECOND SEMESTER (I –YEAR)

II SEMESTER								
S. No	**Course Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Contact Hrs./wk**	**C**
1	ESC	UR20ES201	Problem Solving Methods using Python	3	0	0	3	3
2	BSC	UR20BS202	Engineering Chemistry	3	0	0	3	3
3	HSC	UR20HS203	Communicative English	3	0	0	3	3
4	BSC	UR20BS204	Differential Equations & Vector Calculus	3	0	0	3	3
5	ESC	UR20ES205	Engineering Graphics & Drafting	1	0	4	5	3
6	ECS	UR20ES211	Problem Solving Methods using Python Lab	0	0	3	3	1.5
7	BSC	UR20BS212	Engineering Chemistry Lab	0	0	3	3	1.5
8	HSC	UR20HS213	Communicative English Lab	0	0	3	3	1.5
MANDATORY COURSES								
9	MC	UR20MC200	Science, Technology & Society	0	0	0	2	0
10	MC	UR20MC201	Social Service Activity-I (NCC/NSS/Social Service Club)	0	0	0	0	0
			Total	13	0	13	28	19.5

THIRD SEMESTER (II –YEAR)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	BSC	UR20BS301	Numerical Methods and Transform	3	0	0	3	3
2	PCC	UR20PCEE302	Electrical Circuit Analysis –II	3	0	0	3	3
3	PCC	UR20PCEE303	Electronic Devices and Circuits	3	0	0	3	3
4	PCC	UR20PCEE304	DC Machines and Transformers	3	0	0	3	3
5	PCC	UR20PCEE305	Electro Magnetic Fields	3	0	0	3	3
6	PCC	UR20PCEE311	Electronic Devices and Circuits lab	0	0	3	3	1.5
7	PCC	UR20PCEE312	Electrical Circuits Lab	0	0	3	3	1.5
8	PCC	UR20PCEE313	DC Machines and TransformersLab	0	0	3	3	1.5
9	SO	UR20SOEE314	Design of Electrical Circuits using Engineering Software Tools	1	0	2	3	2
			Total	16	0	11	27	21.5
MANDATORY COURSE								
10	MC	UR20MC300B	Professional Ethics & Human Values	0	0	0	2	0
11	MC	UR20MC300D	Social Service Activity-II (NCC/NSS/Social Service Club)	0	0	0	2	0

FOURTH SEMESTER (II –YEAR)

S. No	**Course Category**	**Course Code**	**Course Name**	**L**	**T**	**P**	**Contact Hrs./wk**	**C**
1	ESC	UR20ES401A	Data Structures Through C	3	0	0	3	3
2	HSMC	UR20HS402A	Managerial Economics and Financial Accountancy	3	0	0	3	3
3	PCC	UR20PCEE403	Digital Electronics	3	0	0	3	3
4	PCC	UR20PCEE404	Power System-I	3	0	0	3	3
5	PCC	UR20PCEE405	Induction and Synchronous Machines	3	0	0	3	3
6	ESC	UR20ES411	Data Structures Through C Lab	0	0	3	3	1.5
7	PCC	UR20PCEE412	Induction and Synchronous Machines Lab	0	0	3	3	1.5
8	PCC	UR20PCEE413	Digital Electronics Lab	0	0	3	3	1.5
9	SO	UR20SOEE414	IoT Applications of Electrical Engineering	1	0	2	3	2
			Total	16	0	11	29	21.5
Minor Courses				3	1	0	4	4
Internship 2 Months (Mandatory) during summer vacation								

FIFTH SEMESTER (III –YEAR)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	PCC	UR20PCEE501	Power Systems-II	3	0	0	3	3
2	PCC	UR20PCEE502	Power Electronics	3	0	0	3	3
3	PCC	UR20PCEE503	Control Systems	3	0	0	3	3
	Professional Elective - I							
4	PEC	UR20PEEE504A	Linear IC Applications	3	0	0	3	3
		UR20PEEE504B	Utilization of Electrical Energy					
		UR20PEEE504C	Computer Architecture and Organization					
		UR20PEEE504D	Optimization Techniques					
		UR20PEEE504E	Object Oriented Programming through Java					
5	OEC		Open Elective- I/ Job Oriented Elective-I	3	0	0	3	3
6	PCC	UR20PCEE511	Control Systems Lab	0	0	3	3	1.5
7	PCC	UR20PCEE512	Power Electronics Lab	0	0	3	3	1.5
8	SC	UR20SOEE514	Soft Skill Course: Employability Skills	1	0	2	3	2
9	PROJ	UR20PREE513	Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)	0	0	0	3	1.5
			Total	17	0	6	26	21.5
MANDATORY COURSE								
10	MC	UR20MC500B	Environmental Science	0	0	0	2	0
Minor Courses				3	1	0	4	4

SIXTH SEMESTER (III –YEAR)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	PCC	UR20PCEE601	Microprocessors and Microcontrollers	3	0	0	3	3
2	PCC	UR20PCEE602	Electrical Measurements and Instrumentation	3	0	0	3	3
3	PCC	UR20PCEE603	Power System Analysis	3	0	0	3	3
	Professional Elective - II							
4	PEC	UR20PEEE604A	Signal and Systems	3	0	0	3	3
		UR20PEEE604B	Electric Drives					
		UR20PEEE604C	Advanced Control Systems					
		UR20PEEE604D	Switchgear and Protection					
		UR20PEEE604E	Big Data Analytics					
5	OEC		Open Elective –II/ Job Oriented Elective-II	3	0	0	3	3
6	PCC	UR20PCEE611	Electrical Measurements and Instrumentation Lab	0	0	3	3	1.5
7	PCC	UR20PCEE612	Microprocessors and Microcontrollers Lab	0	0	3	3	1.5
8	PCC	UR20PCEE613	Power Systems and Simulation Lab	0	0	3	3	1.5
9	SC	UR20SOEE614	**Skill Advanced Course:** Machine Learning with Python	2	0	0	2	2
			Total	17	0	9	26	21.5
MANDATORY COURSE								
10	MC	UR20MC600C	Constitution of India	0	0	0	2	0
Minor Courses				3	1	0	4	4

SEVENTH SEMESTER (IV –YEAR)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
	Professional Elective – III							
1	PEC	UR20PEEE701A	Digital Signal Processing	3	0	0	3	3
		UR20PEEE701B	Renewable and Distributed Energy Technologies					
		UR20PEEE701C	Flexible AC Transmission Systems					
		UR20PEEE701D	Power Systems Deregulation					
		UR20PEEE701E	Data Base Management Systems					
	Professional Elective – IV							
2	PEC	UR20PEEE702A	Hybrid Electric Vehicles	3	0	0	3	3
		UR20PEEE702B	High Voltage Engineering					
		UR20PEEE702C	Programmable Logic Controllers and Applications					
		UR20PEEE702D	Cloud Computing with AWS					
		UR20PEEE702E	Deep Learning Techniques					
	Professional Elective – V							
3	PEC	UR20PEEE703A	Power System Operation and Control	3	0	0	3	3
		UR20PEEE703B	Switched Mode Power Conversion					
		UR20PEEE703C	AI Applications to Electrical Engineering					
		UR20PEEE703D	Data Science					
		UR20PEEE703E	MEAN Stack Technologies					
4	OEC		Open Elective- III /Job Oriented Elective-III	3	0	0	3	3
5	OEC		Open Elective-IV /Job Oriented Elective-IV	3	0	0	3	3
6	HSC	UR20HS706	Universal Human Values-2: Understanding Harmony	3	0	0	3	3
7	SC	UR20SOEE711	**Skill Advanced Course** Machine Learning with Python Lab	0	0	4	4	2
8	PROJ	UR20PREE712	Industrial/ Research Internship 2 months (to be evaluated during VII sem)	0	0	0	3	3
			Total	21	0	4	25	23
MANDATORY COURSE								
9	MC	UR20MC700C	Research Methodology	0	0	0	2	0
Minor Courses				3	1	0	4	4

EIGHT SEMESTER (IV –YEAR)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	Major Project	UR20PREE801	Project work, seminar and internship in industry (6 Months)	0	0	0	0	12
			Total	0	0	0	0	12

Note:

i) For MOOC Courses: Based on the student's interest, student can register and complete a 12 week course one year advance, by prior information to the concern.

ii) For courses with L-T-P-C:3-0-2-4/2-0-2-3, the distribution shall be 30 marks for internal evaluation (15 marks for day–to–day work & lab internal exam and 15 marks for mid exam from theory part) and 70 marks for semester end examination. There shall be two mid exams in a semester for 15 marks each and final marks can be calculated with 80% weightage for better of the two mids and 20% weightage for other mid and these are to be added to the marks obtained in day-to-day work & lab internal exam.

List of Open Electives Offered by the Institute

I. Open Electives offered by CE department for other branches (Except forCE branch)

Open Elective-I								
S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	OEC	UR20OECE505A	Remote Sensing and GIS	3	0	0	3	3
2	OEC	UR20OECE505B	Environmental Pollution Control	3	0	0	3	3
3	OEC	UR20OECE505C	Conservation of Water Resources	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OECE605A	Environmental Engineering	3	0	0	3	3
2	OEC	UR20OECE605B	Disaster Management	3	0	0	3	3
3	OEC	UR20OECE605C	Green Technologies	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OECE704A	Safety Engineering	3	0	0	3	3
2	OEC	UR20OECE704B	Water Resources Engineering	3	0	0	3	3
3	OEC	UR20OECE704C	Elements of Civil Engineering	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OECE705A	Air Pollution Control Engineering	3	0	0	3	3
2	OEC	UR20OECE705B	Urban Planning	3	0	0	3	3
3	OEC	UR20OECE705C	Environmental Impact Assessment	3	0	0	3	3

II. Open Electives offered by CSE department for other branches (Except for CSE branch)

Open Elective-I								
S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	OEC	UR20OECS505A	Data Structures	3	0	0	3	3
2	OEC	UR20OECS505B	Object Oriented Programming through JAVA	3	0	0	3	3
3	OEC	UR20OECS505C	Data Base Management Systems	3	0	0	3	3
4	OEC	UR20OECS505D	Computer Graphics	3	0	0	3	3
5	OEC	UR20OECS505E	Advanced UNIX Programming	3	0	0	3	3
6	OEC	UR20OECS505F	Computer Organization and Architecture	3	0	0	3	3
7	OEC	UR20OECS505G	Operating Systems	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OECS605A	Python Programming	3	0	0	3	3
2	OEC	UR20OECS605B	Web Technologies	3	0	0	3	3
3	OEC	UR20OECS605C	Soft Computing	3	0	0	3	3
4	OEC	UR20OECS605D	Distributed Computing	3	0	0	3	3
5	OEC	UR20OECS605E	AI and ML for Robotics	3	0	0	3	3
6	OEC	UR20OECS605F	Computer Networks	3	0	0	3	3
7	OEC	UR20OECS605G	Big Data Analytics	3	0	0	3	3
8	OEC	UR20OECS605H	Computational Tools	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OECS704A	AI Tools & Techniques	3	0	0	3	3
2	OEC	UR20OECS704B	Image Processing	3	0	0	3	3
3	OEC	UR20OECS704C	Information Security	3	0	0	3	3
4	OEC	UR20OECS704D	Mobile Application Development	3	0	0	3	3
5	OEC	UR20OECS704E	Data Science	3	0	0	3	3
6	OEC	UR20OECS704F	Cyber Security	3	0	0	3	3
7	OEC	UR20OECS704G	Introduction to Internet of Things	3	0	0	3	3

Open Elective-IV								
1	OEC	UR20OECS705A	MEAN Stack Technologies	3	0	0	3	3
2	OEC	UR20OECS705B	Deep Learning Techniques	3	0	0	3	3
3	OEC	UR20OECS705C	Cloud computing with AWS	3	0	0	3	3
4	OEC	UR20OECS705D	Block Chain Technologies	3	0	0	3	3
5	OEC	UR20OECS705E	Cryptography & Network Security	3	0	0	3	3
6	OEC	UR20OECS705F	Introduction to Machine Learning	3	0	0	3	3
7	OEC	UR20OECS705G	Machine Learning with Python	3	0	0	3	3

III. Open Electives offered by ECE department for other branches (Except forECE branch)

Open Elective-I								
S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	OEC	UR20OEEC505A	Basic Electronics	3	0	0	3	3
2	OEC	UR20OEEC505B	Basics of Signals and systems	3	0	0	3	3
3	OEC	UR20OEEC505C	Digital logic design	3	0	0	3	3
4	OEC	UR20OEEC505D	Consumer Electronics	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEEC605A	Electronic measurements and instrumentation	3	0	0	3	3
2	OEC	UR20OEEC605B	Principles of communications	3	0	0	3	3
3	OEC	UR20OEEC605C	Industrial Electronics	3	0	0	3	3
4	OEC	UR20OEEC605D	Fundamentals of Microprocessors and Microcontrollers	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEEC704A	IC Applications	3	0	0	3	3
2	OEC	UR20OEEC704B	Transducers and Sensors	3	0	0	3	3
3	OEC	UR20OEEC704C	Data Communications	3	0	0	3	3
4	OEC	UR20OEEC704D	Bio Medical Instrumentation	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEEC705A	IOT and applications	3	0	0	3	3
2	OEC	UR20OEEC705B	Remote Sensing and GIS	3	0	0	3	3
3	OEC	UR20OEEC705C	Soft computing Techniques	3	0	0	3	3
4	OEC	UR20OEEC705D	Principles of Signal Processing	3	0	0	3	3

IV. Open Electives offered by EEE department for other branches (Except for EEE branch)

Open Elective-I								
S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	OEC	UR20OEEE505A	Renewable Energy Sources	3	0	0	3	3
2	OEC	UR20OEEE505B	Concepts of Optimization Techniques	3	0	0	3	3
3	OEC	UR20OEEE505C	Concepts of Control Systems	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEEE605A	Battery Management Systems and Charging Stations	3	0	0	3	3
2	OEC	UR20OEEE605B	Fundamentals of utilization of Electrical Energy	3	0	0	3	3
3	OEC	UR20OEEE605C	Indian Electricity Act	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEEE704A	Concepts of Microprocessors and Microcontrollers	3	0	0	3	3
2	OEC	UR20OEEE704B	Fundamentals of Electric Vehicles	3	0	0	3	3
3	OEC	UR20OEEE704C	Concepts of Internet of Things	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEEE705A	Concepts of Power System Engineering	3	0	0	3	3
2	OEC	UR20OEEE705B	Concepts of Smart Grid Technologies	3	0	0	3	3

V. Open Electives offered by IT department for other branches (Except for IT branch)

S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
Open Elective-I								
1	OEC	UR20OEIT505A	Full Stack Technologies	2	0	2	4	3
2	OEC	UR20OEIT505B	R-Programming	2	0	2	4	3
3	OEC	UR20OEIT505C	Scripting Languages	2	0	2	4	3
Open Elective-II								
1	OEC	UR20OEIT605A	Basics of AWS Framework	2	0	2	4	3
2	OEC	UR20OEIT605B	Mobile Application Development	2	0	2	4	3
3	OEC	UR20OEIT605C	NoSQL Databases	2	0	2	4	3
Open Elective-III								
1	OEC	UR20OEIT704A	Advanced python Programming	2	0	2	4	3
2	OEC	UR20OEIT704B	Deep Learning	2	0	2	4	3
3	OEC	UR20OEIT704C	Web Technologies	2	0	2	4	3
Open Elective-IV								
1	OEC	UR20OEIT705A	Network Programming	2	0	2	4	3
2	OEC	UR20OEIT705B	Big Data Technologies	2	0	2	4	3
3	OEC	UR20OEIT705C	Data Science	2	0	2	4	3

VI. Open Electives offered by ME department for other branches (Except forME branch)

Open Elective-I								
S. No	Course Category	Course Code	Course Name	L	T	P	Contact Hrs./wk	C
1	OEC	UR20OEME505A	Robotics	3	0	0	3	3
2	OEC	UR20OEME505B	Fundamentals of Hybrid Vehicles	3	0	0	3	3
3	OEC	UR20OEME505C	Industrial Safety And Environment	3	0	0	3	3
Open Elective-II								
1	OEC	UR20OEME605A	Fundamentals of Operations Research	3	0	0	3	3
2	OEC	UR20OEME605B	Finite Element Analysis	3	0	0	3	3
3	OEC	UR20OEME605C	Principles of Nano Technology	3	0	0	3	3
Open Elective-III								
1	OEC	UR20OEME704A	Sustainable energy Technologies	3	0	0	3	3
2	OEC	UR20OEME704B	Optimization Techniques	3	0	0	3	3
3	OEC	UR20OEME704C	Advanced materials	3	0	0	3	3
Open Elective-IV								
1	OEC	UR20OEME705A	Fundamentals of Mechatronics	3	0	0	3	3
2	OEC	UR20OEME705B	Industrial Engineering & Quality Control	3	0	0	3	3
3	OEC	UR20OEME705C	Rapid prototyping	3	0	0	3	3

LIST OF SUBJECTS OFFERED BY ELECTRICAL AND ELECTRONICS ENGINEERINGFOR MINOR DEGREE

S.No	Course Code	Course Title	Pre - requisites	L	T	P	Contact Hrs./Wk	C
1	UR20MDEE01	Fundamentals of electrical circuits	NIL	4	0	0	4	4
2	UR20MDEE02	Concepts of electrical measurements	NIL	4	0	0	4	4
3	UR20MDEE03	Analysis of linear systems	Electrical circuits	3	1	0	4	4
4	UR20MDEE04	Energy Auditing, conservation and management	NIL	3	1	0	4	4
5	UR20MDEE05	Evolutionary algorithms	NIL	3	1	0	4	4
6	UR20MDEE06	Fundamentals of power electronics	Basic Electronics	3	1	0	4	4
7	UR20MDEE07	Neural networks and Fuzzy logic	NIL	3	1	0	4	4
8	UR20MDEE08	Concepts of electric drives and its applications	NIL	3	1	0	4	4

Note:

If the student registrations are less for a particular subject, then the subject will not be offered. However, student has to submit a course certificate through NPTEL/SWAYAM/MOOCS etc. The department will suggest an appropriate/relevant NPTEL/SWAYAM/MOOCS course. The chairman, BOS decision is final in this regard.

B.Tech - V Semester **COURSE CODE: UR20PCEE501** **L T P C**
3 0 0 3

POWER SYSTEMS-II

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To compute inductance and capacitance of transmission lines and to understand the concepts of GMD, GMR.
2. To study short and medium length transmission lines, their models and performance computation.
3. To study the performance and modeling of long transmission lines.
4. To study the transient on transmission lines.
5. To study the factors affecting the performance of transmission lines and power factor improvement methods.
6. To discuss sag and tension computation of transmission lines as well as to study the over head insulators.

UNIT–I:
Transmission Line Parameters
Types of conductors – Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Concept of GMR and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition– Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical–double circuit lines–Numerical Problems.

UNIT–II:
Performance of Short and Medium Length Transmission Lines
Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks– Numerical Problems– Mathematical Solutions to estimate regulation and efficiency of all types of lines – Numerical Problems.

UNIT–III:
Performance of Long Transmission Lines
Long Transmission Line–Rigorous Solution – Evaluation of A,B,C,D Constants– Interpretation of the Long Line Equations – Incident, Reflected and Refracted Waves – Surge Impedance and SIL-(Numerical Problems).

UNIT – IV:
Power System Transients
Types of System Transients – Attenuation–Distortion – Reflection and Refraction Coefficients.

Various Factors Governing the Performance of Transmission line

Skin and Proximity effects –Ferranti effect – Charging Current – Effect on Regulation of the Transmission Line–Shunt Compensation –Corona – Description of the phenomenon–Factors affecting corona– Radio Interference –Power factor improvement methods- Numerical Problems.

UNIT–V:

Sag and Tension - Line Insulators

Sag and Tension calculations with equal and unequal heights of towers– Effect of Wind and Ice on weight of Conductor–Stringing chart and sag template and its applications– Types of Insulators – String efficiency and Methods for improvement–Numerical Problems.

Text Books:

1. Electrical power systems – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I.J. Nagarath and D.P.Kothari, Tata Mc Graw Hill, 2nd Edition.
3. Electrical Power Systems by P.S.R. Murthy, B.S. Publications.

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R. Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S. Bhatnagar A .Chakrabarthy, DhanpatRai& Co Pvt. Ltd.

Course Outcomes:

Students will be able to

1. Understand parameters of various types of transmission lines for using calculation and behavior during different operating conditions.
2. Understand parameters of various types of transmission lines for using calculation
   and behavior during different operating conditions.
3. Understand the insight into specific transmission lines short and medium type would have application in medium and high voltage power transmission systems.
4. Understand the surge propagation, reflection and refraction in transmission lines. Such output will be useful in protecting transmission line insulators and designing level of insulation coordination at various high voltages.
5. Understanding the surge behavior of transmission line for protection of connects equipments,viz.power transformer and system connected shunt reactors.
6. Understand physical and geometrical parameters of transmission line for safe and efficient performance during operating condition of voltage and power.

B.Tech - V Semester **COURSE CODE: UR20PCEE502** **L T P C**
3 0 0 3

POWER ELECTRONICS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To study the characteristics of various power semiconductor devices and to design firing
   circuits for SCR.
2. To understand the operation of single phase full–wave converters and analyze harmonics in the input current.
3. To study the operation of three phase full–wave converters.
4. To understand the operation of different types of DC-DC converters.
5. To understand the operation of inverters and application of PWM techniques for voltage
   control and harmonic mitigation.
6. To analyze the operation of AC-AC regulators.

UNIT–I:

Power Semi-Conductor Devices

Thyristors–Silicon controlled rectifiers (SCR's) –Basic theory of operation of SCR–Static characteristics– Turn on and turn off\ methods–Dynamic characteristics of SCR–Static V-I characteristics of TRIAC and modes of operation-Characteristics of power MOSFET and power IGBT– Snubber circuit design.

UNIT–II:

AC-DC Single-Phase Converters

Single phase diode bridge rectifier with capacitor filter-1-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – 1-phase full wave controlled rectifiers (single phase fully controlled rectifier and single phase semi controlled rectifier) –bridge configuration – analysis with R load and RL load– continuous and discontinuous conduction.

UNIT–III:

AC-DC 3-Phase Converters

3-phase half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled rectifier with R and RL load – 3-phase fully controlled rectifier with R and RL load – 3-phase semi controlled rectifier with R and RL load.

UNIT–IV:

DC–DC Converters

Analysis of Buck, boost and buck, buck-boost converters in ContinuousConduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM –design consideration of DC-DC converters in continuous conduction mode.

UNIT – V:

DC–AC Converters

Single phase full bridge inverters with R and RL loads – bipolar and unipolar PWM techniques- 3-phase square wave inverters – 120^0 conduction and 180^0 conduction modes of operation – PWM inverters – Quasi-square wave PWM – Sinusoidal pulse width modulation –third harmonic PWM- Space vector PWM.

AC – AC Regulators.

1-phase AC-AC regulator phase angle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load .

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:

1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
5. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

Course Outcomes:

Student will be able to

1. Understand the characteristics of various power semiconductor devices and analyze the
   static and dynamic characteristics of SCR's.
2. Design firing circuits for SCR.
3. Understand the operation of single phase full–wave converters and analyze harmonics in
   the input current.
4. Understand operation of three phase full–wave converters.
5. Analyze the operation of different types of DC-DC converters.
6. Understand the operation of inverters and application of PWM techniques.

B.Tech -V Semester **COURSE CODE: UR20PCEE503** **L T P C**
3 0 0 3

CONTROL SYSTEMS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function.
2. To analyze the time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers.
3. To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
4. To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
5. To discuss basic aspects of design and compensation of linear control systems using Bode plots.
6. Ability to formulate state models and analyze the systems. To present the concepts of Controllability and Observability.

UNIT – I
MATHEMATICAL MODELING OF CONTROL SYSTEMS
Open Loop and closed loop control systems and their differences,Classification of control systems, transferfunction of linear system, Differential equations of electrical networks,Translational and Rotational mechanical systems, Transfer Function of DCServo motor - AC Servo motor, Blockdiagram algebra – Signal flow graph - Reduction usingMason's gain formula.

UNIT-II
TIME RESPONSE ANALYSIS
Standard test signals - Time response of first order systems –Time responseof second order systems - Time domain specifications - Steady state errorsand error constants – Feed back Characteristics, PID controllers.
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UNIT – III
STABILITY AND ROOTLOCUS TECHNIQUE
The concept of stability – Routh's stability criterion –limitations of Routh'sstability – The root locus concept - construction of root loci (Simpleproblems).

UNIT–IV
FREQUENCY RESPONSE ANALYSIS
Introduction, Frequency domain specifications-Bode diagrams- transferfunction from the Bode Diagram-Phase margin and Gain margin-StabilityAnalysis from Bode Plots, Polar Plots, Nyquist Stability criterion.

UNIT–V

CLASSICAL CONTROL DESIGN TECHNIQUES

Lag, Lead, Lag-Lead compensators, design of compensators – using Bodeplots.

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state space representation f transfer function, Diagonalization- Solving the Time invariant stateEquations- State Transition Matrix and it's Properties – Concepts ofControllability and Observability.

TEXT BOOKS:

1. Modern Control Engineering, Kotsuhiko Ogata, 4th edition, Prentice Hall ofIndia.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.
3. Control Systems Engineering, Norman S.Nise, 6th edition, Wiley publication.

REFERENCE BOOKS:

1. Control Systems, ManikDhanesh N, 3rd edition, Cengagepublications.
2. Control Systems principles and design, M.Gopal, Tata McGraw Hilleducation Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, 4th edition, Tata McGraw HillPublications.

Course Outcomes:

1. Ability to represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.
2. Ability to derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
3. Capability to determine time response specifications of second order systems and to determine error constants.
4. Acquires the skill to analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
5. Capable to analyze the stability of LTI systems using frequency response methods.
6. Able to design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams.

B.Tech - V Semester **COURSE CODE: UR20PEEE504A**

L	T	P	C
3	0	0	3

LINEAR IC APPLICATIONS
(Professional Elective-I)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. Draw a block diagram representing a typical op-amp with various definitions.
2. Draw and explain the open-loop configuration and feedback configuration and can determine Voltage gain, the input resistance, the output resistance.
3. Differentiate between Ideal and Non-Ideal Op-Amp, Determination of closed loop voltage gain, the input resistance, the output resistance for Non-Ideal Op-Amp Circuits.
4. Perform various mathematical Operations, Trigonometric & Logarithmic Operations, and Instrumentation Amplifier with relevant Circuits.
5. Design waveform generators (Astable, Monostable, Schmitt Trigger) using Single Op-Amp.
6. Study of 555 timer & its applications using Astable and Monostable Operations.
   Can design various types of Active Filters such as LPF, HPF, BPF, BRF, NBPF, Notch Filter, ALL pass filters.

UNIT–I:

Introduction To Operational Amplifier

Block diagram of Typical Op–Amp With Various Stages– BJT DifferentialAmplifier With RE DC Analysis– AC Analysis –BJT differential amplifierwith constant current source – Analysis Different input/output configurationsdual input balanced output–Signal inputbalanced output–AC analysis with r–parameters –Current repeater circuits– Current mirror circuits.

UNIT–II:

OP–AMP Parameter

Input offset voltage – Input off–set current–Input bias current–Differentialinput resistance–Common mode rejection ratio–Slew ratio–PSRR–definitions andexplanations. Measurement of bias current–Measurement of offset currents– Measurement of offset voltage –Measurement of slew rate –Bias current compensations circuit–Dual powersuppliers with shunt capacitance filter..

UNIT–III

Ideal Operational Amplifier Theory and Basic Circuits

Ideal operational amplifier properties–Ideal assumptions–Basic circuits suchas non inverting type comparator–Inverting type comparator–Voltagefollower– sub-tractor– Differentiator–Integrator–Scale changer–Instrumentation amplifier– V to I and I to V convertors—Schmitt-trigger peakdetector– Half-wave and full-wave rectifiers.

UNIT–IV:

Wave form generator in angular waveform generator using op–amps and PLL Design of Astablemultivibrator –Monostable multivibrator usingsignal op-amp–Trigging waveform generator 555 timer**:**Introduction–Pindiagram–Functional diagram for 8pin DIP–Astable application –Monostable applications– PLL**:**Introduction,basic blockdiagram– Functions of each block–566 VC0– 565PLL block diagram –Function of each block–Applications of PLL.

UNIT–V:

Active filters

Introduction– Merits and demerits of active filters–Over passive filters– Firstorder low pass Butter–Worth filter –LPF – HPF- First and Second order–Higher-order filters– BPF wide band–pass and narrow band–pass filter–All-pass filter.

Digital to Analog Convertors

Digital to Analog Convertors(D to A) – Introduction–Specifications–BasicDAC techniques– Weighted resistor DAC– R–2R ladder DAC–Invested R–2R –Output expression for each type.

Analog to Digital Convertors

Introduction–Specifications–Parallel comparator type–Counter type–Dualslope–Successive approximation type ADCs– Merits and demerits of eachtype.

Text Books:

1. OP–AMPS and liner integrator circuits by RamakanthAGayakwad(PHI).
2. Linear Integrated Circuits by D.Roychowdary, New ageinternational.
3. Op–amp and linear integrated circuits by sanjaysharma, S.K.Kataria& son's New Delhi.

Reference Books:

1. Micro Electronics– Mclliman Mc Graw Hill.
2. Analog Electronics– L.K.Maheswari, PHI.
3. Linear Integrated circuits by S.Salivahan, TMH.

Course Outcomes:

Students will be able to

1. Understand differentiate of "Analog Circuits & DigitalCircuits".
2. Design the "Linear Circuits" with their own innovative skills.
3. Understand concept of operational amplifier and parameters.
4. Understand different multivibrators.
5. Study the operation & applications of PLA.
6. Know operation of A/D and D/A Converters.

B.Tech - V Semester **COURSE CODE: UR20PEEE504B** **L T P C**
3 0 0 3

UTILIZATION OF ELECTRICAL ENERGY
(Professional Elective-I)

Internal Marks: 30
External Marks: 70

CourseObjectives:

1. To understand the operating principles and characteristics of traction motors with

respect to speed, temperature, loading conditions.

2. To acquaint with the different types of heating and welding techniques.
3. To study the basic principles of illumination and its measurement.
4. To understand different types of lightning system including design.
5. To understand the basic principle of electric traction including speed–time curves of different traction services.
6. To understand the method of calculation of various traction system for braking,

UNIT – I:
Selection of Motors
Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II:
Electric Heating

Principle of heating – modes of heat transferAdvantages and methods of electric heating–Resistance heating induction heating and dielectric heating – Arc furnaces – Direct and indirect arc furnaces

Electric Welding
Principles of welding – types of welding- Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – III:
Illumination fundamentals
Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating
sphere–Lux meter–Discharge lamps, MV and SV lamps – Lumen or flux method of calculation - Sources of light.

UNIT – IV:

Various Illumination Methods

Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Lighting systems – indoor / outdoor lighting Electrical lamps – discharge / arc lamps Sodium Vapour – High Pressure Mercury Vapour lamps Neon lamps – Fluorescent tubes-Design of lighting and flood lighting–LED lighting Conservation of energy.- illumination calculations.

UNIT – V:

Electric Traction – I

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement– Speed– time curves for different services – Trapezoidal and quadrilateral speed time curves-High speed transportation trains.Modern traction motors.

Electric Traction – II

Calculations of tractive effort– power –Specific energy consumption for given run– Effect of varying acceleration and braking retardation.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

Course Outcomes:

1. Able to identify a suitable motor for electric drives and industrial applications
2. Able to identify most appropriate heating or welding techniques for suitable applications.
3. Able to understand various level of illuminosity produced by different illuminating sources.
4. Able to estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
5. Able to determine the speed/time characteristics of different types of traction motors.
6. Acceleration and other related parameters, including demand side management of energy.

B.Tech - V Semester **COURSE CODE: UR20PEEE504C** **L T P C**
3 0 0 3

COMPUTER ARCHITECTURE AND ORGANIZATION
(Professional Elective-I)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1. To impart basic concepts of computer architecture and organization,
2. To explain key skills of constructing cost-effective computer systems.
3. To familiarize the basic CPU organization.
4. To help students in understanding various memory devices.
5. To facilitate students in learning IO communication

UNIT - I STRUCTURE OF COMPUTERS:

Computer types, Functional units-Basic operational concepts-Von Neumann Architecture-Bus Structures-Software-Performance-Multiprocessors and Multicomputer-Data representation, Fixed and Floating point-Error detection and correction codes.

COMPUTER ARITHMETIC: Addition and Subtraction-Multiplication and Division algorithms, Floating-point Arithmetic Operations-Decimal arithmetic operations.

UNIT - II BASIC COMPUTER ORGANIZATION AND DESIGN:

Instruction codes-Computer Registers- Computer Instructions and Instruction cycle. Timing and Control, Memory-Reference Instructions - Input-Output and interrupt. Central processing unit: Stack organization- Instruction FormatsAddressing Modes-Data Transfer and Manipulation, Complex Instruction Set Computer (CISC) Reduced Instruction Set Computer (RISC)- CISC vs RISC.

UNIT - III REGISTER TRANSFER AND MICRO-OPERATIONS:

Register Transfer Language- Register Transfer- Bus and Memory Transfers-Arithmetic Micro-Operations-Logic Micro-Operations- Shift Micro-Operations-Arithmetic logic shift unit. MICRO-PROGRAMMED CONTROL: Control Memory-Address Sequencing -Micro-Program example, Design of Control Unit.

UNIT - IV MEMORY SYSTEM:

Memory Hierarchy-Semiconductor Memories-RAM(Random Access Memory)-Read Only Memory (ROM)-Types of ROM-Cache Memory-Performance considerations-Virtual memory, Paging Secondary Storage-RAID.

UNIT – V INPUT OUTPUT:

I/O interface-Programmed IO- Memory Mapped IO-Interrupt Driven IODMA. MULTIPROCESSORS: Characteristics of multiprocessors-Interconnection structures-Inter Processor Arbitration-Inter processor Communication and Synchronization-Cache Coherence.

TEXT BOOK:

1. M. Moris Mano (2006), Computer System Architecture, 3rd edition, Pearson/PHI, India.

REFERENCE BOOKS:

1. Carl Hamacher, ZvonksVranesic, SafeaZaky (2002), Computer Organization, 5th edition, McGraw Hill, New Delhi, India.
2. William Stallings (2010), Computer Organization and Architecture- designing for performance, 8th edition, Prentice Hall, New Jersy.
3. Anrew S. Tanenbaum (2006), Structured Computer Organization, 5th edition, Pearson Education Inc,
4. John P. Hayes (1998), Computer Architecture and Organization, 3rd edition, Tata McGrawHill

COURSE OUTCOMES:

Students will be able to:

1. Identify various components of computer and their interconnection
2. Identify basic components and design of the CPU: the ALU and control unit.
3. Compare and select various Memory devices as per requirement.
4. Compare various types of IO mapping techniques
5. Critique the performance issues of cache memory and virtual memory
6. Understand IO memory.

B.Tech - V Semester **COURSE CODE: UR20PEEE504D**

L	T	P	C
3	0	0	3

OPTIMIZATION TECHNIQUES
(Professional Elective-I)

Internal Marks: 30
External Marks: 70

CourseObjectives:

1. To understand the optimization techniques
2. To acquaint with the different types of techniques involved for programming.
3. To study the basics of assessment problems.

Unit-I

Introduction to Operation Research:
Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.

Unit-II

Linear Programming (LP): Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

Unit-III

Transportation & Assignment Problems: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems.

Unit-IV

Sequencing: Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines.
Inventory Model: Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.

Unit-V

Queuing Models: Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.

Replacement & Maintenance Models: Replacement of items, subject to deterioration of items subject to random failure group vs. individual replacement policies.

Text Books:

1. J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.
2. N D Vohra, Quantitative Techniques in management, Tata McGraw Hill.
3. Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.

Reference Books:

1. Wagner H M, Principles of Operations Research: With Applications to Management Decisions, Prentice-Hall of India, New Delhi.
2. Hillier F S and Lieberman G J, Operations Research, Holden Day Inc., San Francisco.

Course Outcomes:

Students will be able to

1. Understand the optimization techniques
2. Acquaint with the different types of techniques involved for programming.
3. Understand the basics of assessment problems.
4. Understand various transportation problems
5. Understand quantity discount methods.
6. Understand replacement models.

B.Tech - V Semester **COURSE CODE: UR20PEEE504E** **L T P C**
3 0 0 3

OBJECT ORIENTED PROGRAMMING THROUGH JAVA
(Professional Elective-I)

Internal Marks: 30
External Marks: 70

Course Objectives

1. Understand the basic object oriented programming concepts and apply them in problem solving.
2. Illustrate inheritance concepts for reusing the program.
3. Demonstrate on the multi-tasking by using multiple threads.
4. Develop data-centric applications using JDBC.
5. Understand the basics of java console and GUI based programming.

UNIT-I**OOP concepts**:
Classes and objects, data abstraction, encapsulation, inheritance, benefits of inheritance, polymorphism, procedural and object oriented programming paradigm. Java programming: History of java, comments data types, variables, constants, scope and life time of variables, operators, operator hierarchy, expressions, type conversion and casting, enumerated types, control flow statements, jump statements, simple java stand alone programs, arrays, console input and output, formatting output, constructors ,methods, parameter passing, static fields and methods, access control, this reference, overloading methods and constructors, recursion, garbage collection, exploring.

UNIT-II
Inheritance: Inheritance hierarchies, super and subclasses, member access rules, super keyword, preventing inheritance: final classes and methods, the object class and its methods; Polymorphism: dynamic binding, method overriding, abstract classes and methods; Interface: Interfaces VS Abstract classes, defining an interface, implement interfaces, accessing implementations through interface references, extending interface; Packages: Defining, creating and accessing a package, understanding CLASSPATH, importing packages.

UNIT-III
Exception Handling: Benefits of exception handling, the classification of exceptions , exception hierarchy, checked exceptions and unchecked exceptions, usage of try, catch, throw, throws and finally, rethrowing exceptions, exception specification, built in exceptions, creating own exception sub classes. Multithreading: Differences between multiple processes and multiple threads, thread states, creating threads, interrupting threads, thread priorities, synchronizing threads, inter thread communication.

UNIT-IV
Files: streams, byte streams, character stream, text input/output, binary input/output, random access file operations, file management using file class: Connecting to Database, querying a database and processing the results, updating data with JDBC.

UNIT-V

GUI Programming with Java: The AWT class hierarchy, introduction to swing, swings Vs AWT, hierarchy for swing components.Containers: JFrame, JApplet, JDialog, Jpanel, overview of some swing components: JButton, JLabel, JTextField, JTextArea, simple applications.Layout management: Layout manager types, border, grid and flow.Applets: Inheritance hierarchy for applets, differences between applets and applications, life cycle of an applet, passing parameters to applets.

TEXT BOOKS

1. Herbert Schildt and Dale Skrien, "Java Fundamentals – A comprehensive Introduction", McGraw Hill, 1st Edition, 2013.
2. Herbert Schildt, "Java the complete reference", McGraw Hill, Osborne, 7th Edition, 2011.
3. T.Budd, "Understanding Object- Oriented Programming with Java", Pearson Education, Updated Edition (New Java 2 Coverage), 1999.

REFERENCE BOOKS

1. P.J.Dietel and H.M.Dietel , "Java How to program", Prentice Hall, 6th Edition, 2005.
2. P.Radha Krishna , "Object Oriented programming through Java", CRC Press, 1 st Edition, 2007.
3. S.Malhotra and S. Choudhary, "Programming in Java", Oxford University Press, 2nd Edition, 2014

COURSE OUTCOMES:

Students will be able to

1. Use object oriented programming concepts to solve real world problems.
2. Understand the concept of class and objects with access control to represent real world entities.
3. Understand the behavior of programs involving the basic programming constructs like control structures, constructors, string handling and garbage collection.
4. Understand the Use of overloading methodology on methods and constructors to develop application programs.
5. Understand the concept of inheritance (multilevel, hierarchical and multiple) by using extend and implement keywords.
6. Understand the concept of interface and abstract classes to define generic classes.

B.Tech - V Semester **COURSE CODE:** **L T P C**
3 0 0 3

OPEN ELECTIVE-I

Internal Marks: 30
External Marks: 70

The student can choose any one open elective -I (OE-I) subject offered by other branches. The list of OEs are available in course structure.

B.Tech - V Semester **COURSE CODE: UR20PCEE511** **L T P C**
0 0 3 1.5

CONTROL SYSTEMS LAB

Internal Marks: 15
External Marks: 35

Course Objectives:

1. To impart hands on experience to understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.
2. To understand time and frequency responses of control system with and without controllers and compensators.

List of Experiments

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – characteristics of stepper motor
4. Effect of feedback on DC servo motor
5. Effect of P, PD, PI, PID Controller on a second order systems
6. Lag and lead compensation – Magnitude and phase plot
7. DC position control system
8. Transfer function of DC motor
9. Temperature controller using PID
10. Characteristics of magnetic amplifiers
11. Characteristics of AC servo motor
12. Characteristics of DC servo motor
13. Potentiometer as an error detector
14. Matlab programming on root locus, bode plot, nyquist plot.

Course Outcomes

1. Able to analyze the performance and working Magnetic amplifier, D.C. servo motors, A.C. Servo motors and synchronous motors.
2. Able to design P,PI,PD and PID controllers
3. Able to design lag, lead and lag–lead compensators
4. Able to control the temperature using PID controller
5. Able to determine the transfer function of D.C.motor
6. Able to control the position of D.C servo motor performance

Note:

Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations.In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

B.Tech - V Semester **COURSE CODE: UR20PCEE512** **L T P C**
0 0 3 1.5

POWER ELECTRONICS LAB

Internal Marks: 15
External Marks: 35

Learning objectives:

1. To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
2. To analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.

List of experiments

1. Study of Characteristics of Thyristor, MOSFET & IGBT.
2. Design and development of a firing circuit for Thyristor.
3. Design and development of gate drive circuits for IGBT.
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Regulator with R and RL Loads
7. Single -Phase square wave bridge inverter with R and RL Loads
8. Three- Phase fully controlled converter with RL–load.
9. Design and verification of voltages gain of Boost converter in Continuous Conduction
Mode(CCM) and Discontinuous Conduction Mode(DCM).
10. Design and verification of voltages ripple in buck converter in CCM operation.
11. Single -phase PWM inverter with sine triangle PWM technique.
12. 3-phase AC-AC voltage regulator with R-load.
13.1-Ph Parallel Inverter With R and RL Load
14. 1-Ph Series Inverter With R and RL Load.

CourseOutcomes:

Students able to

1. Study the characteristics of various power electronic devices and analyze gate drive circuits of IGBT.
2. Analyze the performance of single–phase and three–phase full–wave bridge converters with both resistive and inductive loads.
3. Understand the operation of single phase AC voltage regulator with resistive and inductive loads.
4. Understand the working of Buck converter, Boost converter, single–phase square wave inverter and PWM inverter.
5. Understand the operation of AC voltage regulator with resistive and inductive loads.
6. Understand the working of Buck converter, Boost converter and inverters.

Note:

Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations.In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

B.Tech - V Semester **COURSE CODE: UR20PREE513** **L T P C**

0 0 0 1.5

SUMMER INTERNSHIP

Internal Marks: 00
External Marks: 50

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 50 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

B.Tech - V Semester **COURSE CODE: UR20SOEE514** **L T P C**
1 0 2 2

SKILL ORIENTED COURSE
SOFTSKILL COURSE: EMPLOYABILITY SKILLS

Internal Marks: 0
External Marks: 50

Course Objectives:

1.ToDevelop effective communication skills (spoken and written).

2.ToDevelop effective presentation skills.

3.To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.

TOPICS:

1.GroupDiscussion–dynamicsofgroupdiscussion,Lateralthinking,Brainstorming.

2. Interview Skills– concept and process, pre-interview planning, opening strategies,answeringstrategies,interview through teleand video-conferencing.

3.Meetings-makingmeetingeffective,chairingameeting,decision-making,Seekingopinions,interrupting and handlinginterruptions, clarifications, closure,Negotiation skills.

4. Listening comprehension – Achieving ability to comprehend material delivered at relatively fastspeed; comprehending spoken material in Standard Indian English, British English, and AmericanEnglish.

5. Cross-Cultural Communication / Non-Verbal Communication, Problems of Language, Lack ofLanguage equivalency/ difficulties in using English.

6. Vocabularybuilding,CreativityinusingAdvertisements,CaseStudiesetc.

7. Personality Development: Decision-Making, Problem Solving, GoalSetting, Time Management&Positive Thinking.

8. Resumewriting –structureandpresentation,planning,definingthecareer objective.

9.WritingSkills–Letterwriting,Emailetiquette;Essaysforcompetitiveexaminations,Analyzingnewspaperarticles.

10.TechnicalReportWriting/ProjectProposals–Typesofformatsandstyles,Subjectmatter–organization,clarity,

11.Coherenceandstyle,planning,data-collection,tools,analysis.-Progress And ProjectReports.

REFERENCE BOOKS:

1.M.AshrafRizvi,"EffectiveTechnicalCommunication",TataMcGraw-HillPublishingCompany Ltd.2005.
2.AndreaJ.Rutherford,"BasicCommunicationSkillsforTechnology"2nd Edition,PearsonEducation,2007.
3.MeenakshiRaman&SangeetaSharma,"TechnicalCommunication",OxfordUniversityPress,2011.
4.DELTA'skeytotheNextGenerationTOEFLTest, "AdvancedSkillPractice,"NewAge

Course Outcomes:

Student will be able to:

1.communicateEffectively through verbal/oral communication and improvethe listening.
2. Write precise briefs or reports and technical documents.
3. Participate in group discussion / meetings / interviews and prepare and deliver presentations.
4. Become more effective individual through goal/target setting.
5. Become self motivatedand practicing creative thinking
6. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work.

Note:

Skill courses may be registered at the college or at any external agency. Student shall submit a report/ record on the list of skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of semester for 50 marks (record :15M and viva-voce:35M) along with laboratory end examinations in the presence of external examiner (appointed by the principal) and internal examiner (course instructor or mentor). there are no internal for skill courses

B.Tech -V Semester COURSE CODE: UR20MC500B **L T P C**
0 0 0 0

ENVIRONMENTAL SCIENCE

Internal Marks: 30
External Marks:00
Semester End Exam Marks:70

Course Objectives:
1. Overall understanding of the natural resources
2. Basic understanding of the ecosystem and its diversity
3. Acquaintance on various environmental challenges induced due to unplannedanthropogenic activities
4. An understanding of the environmental impact of developmental activities
5. Awareness on the social issues, environmental legislation and global treaties.

UNIT – I
Multidisciplinary nature of Environmental Studies: Definition, Scope andImportance –Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Globalwarming and climate change, Carbon Credits, acid rains, ozone layer depletion,population growth and explosion, effects. Role of information Technology in Environmentand human health.

Ecosystems: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers,consumers and decomposers. - Energy flow in the ecosystem – Ecologicalsuccession. - Food chains, food webs and ecological pyramids. - Introduction, types,characteristic features, structure and function of Forest ecosystem, Grassland ecosystem,Desert ecosystem, Aquatic ecosystems.

UNIT – II
Natural Resources: Natural resources and associated problems Forest resources–Use andover–exploitation, deforestation–Timber extraction–Mining, dams and other effects onforest and tribal people Water resources – Use and over utilization of surface and groundwater – Floods, drought, conflicts over water, dams – benefits and problems Mineralresources: Use and exploitation, environmental effects of extracting and using mineralresources, Sustainable mining of Granite, Literate, Coal, Sea and River sands.
Food resources: World food problems, changes caused by non-agriculture activities-effectsof modern agriculture, fertilizer-pesticide problems, water logging, salinityEnergy resources: Growing energy needs, renewable and non-renewable energy sources useof alternate energy sources Vs Oil and Natural Gas Extraction.
Land resources: Land as a resource, land degradation, Wasteland reclamation, man inducedlandslides, soil erosion and desertification. Role of an individual in conservation of naturalresources.Equitable use of resources for sustainable lifestyles.

UNIT – III
Biodiversity and its conservation:
Definition: genetic, species and ecosystemdiversityclassification- Value of biodiversity: consumptive use, productive use, social-Biodiversity atnational and local levels. India as a mega-diversity nation - Hot-spots of biodiversity -Threats to biodiversity: habitat loss, man-wildlife conflicts - Endangered and endemicspecies of India – Conservation of biodiversity: conservation of biodiversity.

UNIT – IV

Environmental Pollution: Definition, Cause, effects and control measures of air pollution,Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual inprevention of pollution. - Pollution case studies, Sustainable Life Studies. Impact of FireCrackers on Men and his well being.

Solid Waste Management: Sources, Classification, effects and control measures ofurbanand industrial solid wastes. Consumerism and waste products, Biomedical, Hazardousand e – waste management.

UNIT – V

Social Issues and the Environment: Urban problems related to energy – Waterconservation,rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns.Environmental ethics: Issues and possible solutions. Environmental Protection Act –Air(Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement ofenvironmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance variousstages of EIA,preparation of EMP and EIS, Environmental audit. Ecotourism, Green Campus – Greenbusiness and Green politics. The student should Visit an Industry / Ecosystem and submit areport individually on any issues related to Environmental Studies course and make a powerpoint presentation.

TEXT BOOKS:

1. Environmental Studies, K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada.
2. Environmental Studies, R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
3. Environmental Studies, P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula
Rani; Pearson Education, Chennai.

REFERENCE BOOKS:

1. Text Book of Environmental Studies, Deeshita Dave & P. UdayaBhaskar, Cengage Learning.
2. A Textbook of Environmental Studies, ShaashiChawla, TMH, New Delhi.
3. Environmental Studies, Benny Joseph, Tata McGraw Hill Co, New Delhi.
4. Perspectives in Environment Studies, AnubhaKaushik, C P Kaushik, New Age International Publishers, 2014.

Course Outcomes:

Students will be able to

1.Identify the natural resources, ecology, Biodiversity, and conservation of natural resources.

2.Explain various attributes of the pollution and their impacts and measures to reduce or controlthe pollution along with waste management practices.

3.Judge the social issues both rural and urban environment and the possible means to combatthe challenges.

4.Identify the Environmental Impact Assessment and environmental legislations of India andglobal initiatives towards sustainable development.

5.Analyze the concept of Biodiversity and its conservation.

6.Survey the concept of Solid Waste Management.

B.Tech- VI Semester **COURSE CODE: UR20PCEE601** **L T P C**
3 0 0 3

MICROPROCESSORS AND MICROCONTROLLERS

Internal Marks: 30
External Marks: 70

CourseObjectives:

1. To understand the organization and architecture of Micro Processor
2. To understand addressing modes to access memory
3. To understand 8051 micro controller architecture
4. To understand the programming principles for 8086 and 8051
5. To understand the interfacing of MP with IO as well as other devices.
6. To understand how to develop cyber physical systems

UNIT–I:
Introduction to Microprocessor Architecture
Introduction and evolution of Microprocessors– Architecture of 8086– Register Organization of 8086–Memory organization of 8086– General bus operation of 8086– Introduction to 80286–80386 and 80486 and Pentium.

UNIT–II:
Minimum and Maximum Mode Operations
Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycletiming diagrams.

UNIT–III:
Assembly Language Programming
Assembly Directives–Macro's– Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE Features–Addressing modes and Instruction set of 8051– Assembly language programming of 8051– Development systems and tools.

UNIT–IV:
I/O Interface
8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086– DMA controller (8257)– Architecture–Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259).

UNIT–V:
Introduction to 8051 Micro Controller
Overview of 8051 Micro Controller– Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

Cyber physical systems and industrial applications of 8051
Applications of Micro Controllers– Interfacing 8051 to LED's–Push button– Relay's and Latch Connections– Interfacing Seven Segment Display–ADC and DAC Interfacing.

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V Hall, Mc–Graw Hill, 2nd Edition.
2. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming andApplications", Thomson Publishers, 2nd Edition.
3. Ray and Burchandi, "Advanced Micro Processors and Interfacing", Tata McGraw–Hill.

REFERENCE BOOKS:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw–Hill Companies –2005.
3. Ajit Pal, "Microcontrollers – Principles and Applications", PHI Learning Pvt Ltd, 2011.

Course Outcomes:

Students will be able to

1. Understand the microprocessor capability in general and explore the evalution ofmicroprocessors.
2. Understand the addressing modes of microprocessors
3. Understand the micro controller capability
4. Program mp and mc
5. Interface mp and mc with other electronic devices
6. Develop cyber physical systems

B.Tech-VI Semester **COURSE CODE: UR20PCEE602** **L T P C**
3 0 0 3

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To study the principle of operation and working of different types of instruments.
   measurement of voltage and current.
2. To study the working principle of operation of different types of instruments for measurement of power and energy
3. To understand the principle of operation and working of dc and ac potentiometers.
4. To understand the principle of operation and working of various types of bridges for measurement of parameters –resistance, inductance, capacitance and frequency.
5. To study the principle of operation and working of various types of magnetic measuring instruments.
6. To study the applications of CRO for measurement of frequency, phase difference and hysteresis loop using Lissajous patterns

UNIT–I:
Measuring Instruments
Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer– Expression for thedeflecting torque and control torque – Errors and compensations–CT and PT– Numerical problems.

UNIT –II:
Measurement of Power and Energy
Single phase and three phase dynamometer wattmeter – LPF and UPF – Expression fordeflecting and control torques – Type of P.F. Meters –moving irontype Single phase induction type energy meter – Driving and braking torques – errors andcompensations — Three phase energy meter – Weston typeSynchroscope.

UNIT – III:
Potentiometers
Principle and operation of D.C. Crompton's potentiometer – Standardization – Measurementof unknown resistance – Measurementof unknown Current – Measurementof unknown voltage.AC Potentiometers**: P**olar and coordinate types – Standardization – Applications.

UNIT – IV:
Measurements of Parameters
Method of measuring low, medium and high resistance – Sensitivity of Wheat stone's bridge– Carey Foster's bridge– Kelvin's double bridge for measuring low resistance– Loss ofcharge method for measurement of high resistance – Megger– Measurement of earthresistance – Measurement of inductance – Quality Factor – Maxwell's bridge– Anderson's bridge–Measurement of capacitance— ScheringBridge.

UNIT – V:

Magnetic Measurements

Ballistic galvanometer – Flux meter – Constructional details–Core loss measurements by bridges and potentiometers.

Digital Meters

Digital Voltmeter–Successive approximation – Measurement of phase difference – Frequency –Digital frequency meter–Digital multimeter–Digital Tachometer.

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding andF.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick andW.D. Cooper, PHI, 5th Edition, 2002.
3. Electronic Instrumentation and Measurements by DA Bell, 3rd edition Oxford Higher Education

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai&Co.
Publications.
2. Electrical and Electronic Measurements and instrumentation by R.K.Rajput,S.Chand.
3. Electrical Measurements – by Buckingham and Price, Prentice – Hall
4. Electrical Measurements by Forest K. Harris. John Wiley and Sons

Course Outcomes:

Students will be

1. Able to choose right type of instrument for measurement of voltage and current for ac and dc.
2. Able to choose right type of instrument for measurement of power and energy –
3. Able to calibrate energy meter by suitable method.
4. Able to calibrate ammeter and potentiometer.
5. Able to select suitable bridge for measurement of electrical parameters
6. Able to use the ballistic galvanometer and flux meter for magnetic measuringinstruments.

B.Tech- VI Semester **COURSE CODE: UR20PCEE603** **L T P C**
3 0 0 3

POWER SYSTEM ANALYSIS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To development the impedance diagram (p.u) and formation of Y bus
2. To study the different load flow methods.
3. To study the concept of the Z bus building algorithm.
4. To study short circuit calculation for symmetrical faults
5. To study the effect of unsymmetrical faults and their effects.
6. To study the rotor angle stability of power systems.

UNIT –I:
Per Unit Representation & Topology Per Unit Quantities–Single line diagram–Impedance diagram of a power system–Graphtheory definition – Formation of element node incidence and bus incidence matrices –Primitive network representation – Formation of Y–bus matrix by singular transformationand direct inspection methods.

UNIT –II:
Power Flow Studies
Necessity of power flow studies – Derivation of static power flow equations – Power flowsolution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polarcoordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach –Problems on 3–bus system only.

UNIT –III:
Z–Bus formulation
Formation of Z–Bus: Partial network– Algorithm for the Modification of Z bus Matrix foraddition element for the following cases: Addition of element from a new bus to reference–Addition of element from a new bus to an old bus.(Problems).

UNIT – IV:
Symmetrical Fault Analysis
Transients on a Transmission line-Short circuit of synchronous machine(on no-load) - 3–Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations .

Symmetrical Components & Fault analysis
Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances – Synchronous generator – Transmission line and transformers – Sequence networks – Various types of faults LG– LL– LLG and LLL on unloaded alternator–unsymmetrical faults on power system.

UNIT – V:

Power System Stability Analysis

Elementary concepts of Steady state– Dynamic and Transient Stabilities–Power Angle Curve and Determination of Steady State Stability –Derivation of Swing Equation– Determination of Transient Stability by Equal Area Criterion–Applications of Equal Area Criterion–Methods to improve steady state and transient stability.

TEXT BOOKS:

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.

REFERENCE BOOKS:

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by HadiSaadat – TMH Edition.
3. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J.Overbye – CengageLearning publications.

Course Outcomes:

Students will be able to

1. Draw impedance diagram for a power system network and to understand per unit quantities.
2. Form a Y bus and Z bus for a power system networks.
3. Understand the load flow solution of a power system using different methods.
4. Find the fault currents for all types faults to provide data for the design of protective devices.
5. Find the sequence components of currents for unbalanced power system network.
6. Analyze the steady state, transient and dynamic stability concepts of a power system

B.Tech- VI Semester **COURSE CODE: UR20PEEE604A** **L T P C**
3 0 0 3

SIGNALS & SYSTEMS
(Professional Elective-II)

Internal Marks: 30
External Marks: 70

Course Objectives:
The main objectives of this course are given below:

1. To introduce the terminology of signals and systems.
2. To introduce Fourier tools through the analogy between vectors and signals.
3. To introduce the concept of sampling and reconstruction of signals.
4. To analyze the linear systems in time and frequency domains.
5. To study z-transform as mathematical tool to analyze discrete-time signals and systems.

UNIT- I: INTRODUCTION:
Definition of Signals and Systems, Classification of Signals, Classification of Systems, Operations on signals: time-shifting, time-scaling, amplitude-shifting, amplitude-scaling. Problems on classification and characteristics of Signals and Systems. Complex exponential and sinusoidal signals, Singularity functions and related functions: impulse function, step function signum function and ramp function.

UNIT –II: FOURIER SERIES AND FOURIER TRANSFORM:
Fourier series representation of continuous time periodic signals, properties of Fourier series, Dirichlet's conditions. Deriving Fourier transform from Fourier series, Fourier transform ofarbitrary signal, Fourier transform of standard signals, Fourier transform of periodic signals,properties of Fourier transforms, Fourier transforms involving impulse function and Signum function. Application of Fourier series and Fourier transforms.

UNIT –III: SAMPLING THEOREM:
Graphical and analytical proof for Band LimitedSignals, impulse sampling, Natural and Flat top Sampling, Reconstruction of signal from itssamples, effect of under sampling.

UNIT-IV: ANALYSIS OF LINEAR SYSTEMS:
Linear system, impulse response,Response of a linear system, Linear time invariant (LTI) system, Linear time variant (LTV)system, Concept of convolution in time domain and frequency domain, Transfer function of a LTI system. Filter characteristics oflinear systems. Signal bandwidth, systembandwidth, Ideal LPF, HPF and BPF characteristics,

Energydensity spectrum, Parseval's theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function. Extraction of signal from noise by filtering.

UNIT –V: LAPLACE TRANSFORMS :

Review of Laplace transforms, Partial fractionexpansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplacetransforms, constraints on ROC for various classes of signals, Properties of L.T's, Relationbetween L.T's, and F.T. of a signal. Laplace transform of certain signals using waveformsynthesis- Applications

Z–TRANSFORMS :

Fundamental difference between continuous-time anddiscrete-time signals, discrete time signal representation using complex exponential andsinusoidal components, Periodicity of discrete time using complex exponential signal,Concept of Z- Transform of a discrete sequence. Distinction between Laplace, Fourier and Ztransforms. Region of convergence in Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms.

TEXT BOOKS:

1. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.

REFERENCE BOOKS:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Signals and Systems – K Raja Rajeswari, B VisweswaraRao, PHI, 2009
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition,
2008.
4. Signals and Systems – T K Rawat , Oxford University press, 2011

Course Outcomes:

Students will be able to

1. Characterize the signals and systems and principles of vector spaces, Concept of orthgonality.
2. Analyze the continuous-time signals and continuous-time systems using Fourier series, Fourier transform and Laplace transform.
3. Apply sampling theorem to convert continuous-time signals to discrete-time signal and
   reconstruct back.
4. Understand the relationships among the various representations of LTI systems
5. Understand the Concepts of convolution, correlation, Energy and Power density spectrum and
their relationships.
6. Apply z-transform to analyze discrete-time signals and systems.

B.Tech- VI Semester **COURSE CODE: UR20PEEE604B** **L T P C**
3 0 0 3

ELECTRICAL DRIVES
(Professional Elective-II)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn the fundamentals of electric drive and different electric braking methods.
2. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. To discuss the converter control of dc motors in various quadrants.
4. To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. To learn the principles of static rotor resistance control and various slip power recovery schemes.
6. To understand the speed control mechanism of synchronous motors

UNIT–I

Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.- selection of motor ratings-closed loop operation of drive-AC drives and DC drives

UNIT–II

Controlled Converter Fed DC Motor Drives

1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics.- closed loop operation of DC motor

UNIT–III

DC–DC Converters Fed DC Motor Drives

Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics – Four quadrant operation –closed loop operation chopper controlled DC excited drives below and above rated speeds

UNIT–IV

Stator side control of 3-phase Induction motor Drive

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – closed loop operation of induction motor drive.

UNIT–V

Rotor side control of 3-phase Induction motor Drive

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Speed torque characteristics.

Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives.

TEXT BOOKS:

1. Fundamentals of Electric Drives – by G K DubeyNarosa Publications

2. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

REFERENCE BOOKS:

1.Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.

2.Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.

3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI

Course Outcomes:

studentswill be able to:

1. Understand the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
3. Understand the converter control of dc motors in various quadrants of operation
4. Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. Differentiate the stator side control and rotor side control of three phase induction motor.
6. Understand the speed control mechanism of synchronous motors

B.Tech- VI Semester **COURSE CODE: UR20PEEE604C**

L	T	P	C
3	0	0	3

ADVANCED CONTROL SYSTEMS
(Professional Elective-II)

Internal Marks: 30
External Marks: 70

Course objectives

1. To introduce the concepts of open loop and closed loop systems, mathematical models of
Mechanicaland electrical systems, and concepts of feedback
2. To study the characteristics of the given system in terms of the transfer function and
introducing variousapproaches to reduce the overall system for necessary analysis
3. To develop the acquaintance in analyzing the system response in time-domain and frequency
domain interms of various performance indices
4. To analyze the system in terms of absolute stability and relative stability by different Approaches

UNIT – I:
State space analysis
State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms –Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

UNIT – II:
Controllability, observability and design of pole placement
Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controllability and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability

UNIT – III:
Multi Input Multi Output(MIMO) system
Models of MIMO system, matrix representation, transfer function representation, poles and zeros, decoupling, introduction to multi variable Nyquist plot and singular values analysis

UNIT – IV:
Describing function analysis
Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase-plane analysis.

UNIT-V:

Stability analysis

Stability in the sense of Liapunov, Lyapunov's stability and Lypanov's instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

Optimal control

Linear quadratic optimal regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by continuous time algebraic riccatti equation (CARE) - Optimal controller design using LQG framework..

Text Book

1.I.J.Nagarath and M.Gopal, " **Control System Engineering,"** New Age International Publishers, FifthEdition

Reference Books

1. Katsuhiko Ogata, "Modern Control Engineering," Pearson, Fifth Edition
2. S. Salivahanan, R. Rengaraj, and G. R. Venkata Krishnan, " Control Systems Engineering," Pearson,First Impression
3. Benjamin C. Kuo, FraridGolnaraghi, " Automatic Control Systems," Wiley Student Edition, EigthEdition
4. PadmaRaju and Reddy , " Instrumentation and Control Systems ", McGrawHill Education ,2016

Course Outcomes

Students will be

1. This course introduces the concepts of feedback and its advantages to various control systems
2. The performance metrics to design the control system in time-domain and frequency domain
   Are introduced.
3. Control systems for various applications can be designed using time-domain and frequency
   Domain analysis.
4. In addition to the conventional approach, the state space approach for the analysis of control
   systems is also introduced.
5. To design different control systems for different applications as per given specifications
6. To introduce the concepts of state variable analysis, design and also the concepts of controllability andObservability

B.Tech- VI Semester COURSE CODE: UR20PEEE604D

L	T	P	C
3	0	0	3

SWITCH GEAR AND PROTECTION
(Professional Elective-II)

Internal Marks: 30
External Marks: 70

CourseObjectives:
1• To provide the basic principles and operation of various types of circuit breakers.
2• To study the classification, operation and application of different types of electromagnetic protective relays.
3• To explain protective schemes, for generator and transformers.
4• To impart knowledge of various protective schemes used for feeders and bus bars.
5• To explain the principle and operation of different types of static relays.
6• To study different types of over voltages in a power system and principles of different
protective schemes for insulation co–ordination.

UNIT–I:
Circuit Breakers
Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– RestrikingVoltage and Recovery voltages– Restriking phenomenon - RRRV– Average and Max.RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers–Description and operation of Air Blast– Vacuum and SF6 circuit breakers– CB ratings andspecifications– Concept of Auto reclosing.

UNIT–II:
Electromagnetic Protection
Relay connection – Balanced beam type attracted armature relay - induction disc andinduction cup relays–Torque equation - Relays classification–Instantaneous– DMT andIDMT types– Applications of relays**:** Over current and under voltage relays– Directionalrelays– Differential relays and percentage differential relays– Universal torque equation–Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics ofdistance relays and comparison.

UNIT–III:
Generator Protection
Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples.
Transformer Protection
Protection of transformers**:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.

UNIT–IV:

Feeder and Bus bar Protection

Protection of lines**:** Over currentProtection schemes – PSM,TMS - Numerical examples -Carrier current and three zone distance relay using impedance relays–Protection of bus barsby using Differential protection.

Static and Digital Relays

Static relays**:** Static relay components– Static over current relays– Static distance relay–Micro processor based digital relays

UNIT–V:

Protection against over voltage and grounding

Generation of over voltages in power systems– Protection against lightning over voltages–Valve type and zinc oxide lighting arresters– Insulation coordination– BIL–impulse ratio–Standard impulse test wave– volt-time characteristics– Grounded and ungrounded neutralsystems–Effects of ungrounded neutral on system performance–Methods of neutralgrounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Text Books:

1. Power System Protection and Switchgear by Badari Ram and D.N Viswakarma, TMH Publications
2. Power system protection- Static Relays with microprocessor applications.by T.S.MadhavaRao,TMH

Reference Books:

1.Fundamentals of Power System Protection by Paithankar andS.R.Bhide.,PHI, 2003.
2. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.
3. Protection and SwitchGear by BhaveshBhalja, R.P. Maheshwari,NileshG.Chothani, Oxford University Press, 2013

Course Outcomes:

Students will be

1. Able to understand the principles of arc interruption for application to high voltagecircuit breakers of air, oil, vacuum, SF6 gas type.
2. Ability to understand the working principle and operation of different types ofelectromagnetic protective relays.
3. Students acquire knowledge of faults and protective schemes for high powergenerator and transformers.
4. Improves the ability to understand various types of protective schemes used for feeders and bus bar protection.
5. Able to understand different types of static relays and their applications.
6. Able to understand different types of over voltages and protective schemes requiredfor insulation co–ordination.

B.Tech- VI Semester **COURSE CODE: UR20PEEE604E** **L T P C**
3 0 0 3

BIG DATA ANALYTICS
(Professional Elective-II)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES :

1. Understand the Big Data Platform and its Use cases
2. Provide an overview of Apache Hadoop
3. Provide HDFS Concepts and Interfacing with HDFS
4. Understand Map Reduce Jobs
5. Provide hands on Hodoop Eco System

UNIT I :**INTRODUCTION TO BIG DATA AND HADOOP**

Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop, Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming, Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.

UNIT II **: HDFS(Hadoop Distributed File System)**

The Design of HDFS, HDFS Concepts, Command Line Interface, Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives, Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures.

UNIT III :

Map Reduce Anatomy of a Map Reduce Job Run, Failures, Job Scheduling, Shuffle and Sort, Task Execution, Map Reduce Types and Formats, Map Reduce Features.

Unit IV :

Hadoop Eco System Pig : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators. Hive : Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions. Hbase :HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction

UNIT V :**Data Analytics with R Machine Learning** :

Introduction, Supervised Learning, Unsupervised Learning, Collaborative Filtering. Big Data Analytics with BigR.

Text Books:

1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012.
2. Seema Acharya, SubhasiniChellappan, "Big Data Analytics" Wiley 2015.

Reference Books:

1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007.
2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013)
3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press.
4. Anand Rajaraman and Jefrey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012

COURSE OUTCOMES:

The students will be able to

1. Identify Big Data and its Business Implications.
2. List the components of Hadoop and Hadoop Eco-System
3. Access and Process Data on Distributed File System
4. Manage Job Execution in Hadoop Environment
5. Develop Big Data Solutions using Hadoop Eco System
6. Analyze Infosphere BigInsights Big Data Recommendations.

B.Tech- VI Semester **COURSE CODE:** **L T P C**
3 0 0 3

OPEN ELECTIVE-II

Internal Marks: 30
External Marks: 70

The student can choose any one open elective -II (OE-II) subject offered by other branches. The list of OEs are available in course structure.

B.Tech- VI Semester **COURSE CODE: UR20PCEE611** **L T P C**
0 0 3 1.5

ELECTRICAL MEASUREMENTS AND INSTRUMENTATION LAB

Internal Marks: 15
External Marks: 35

Course Objectives:

1. To understand the correct function of electrical parameters and calibration of voltage,current, single phase and three phase power and energy, and measurement of electrical characteristics of resistance, inductance and capacitance of a circuits through appropriate methods.
2. To understand testing of transformer oil.

List of Experiments

1. Calibration and Testing of single phase energy Meter
2. Calibration of dynamometer wattmeter using phantom loading
3. Calibration of PMMC ammeter and voltmeter using Crompton D.C. Potentiometer
4. Measurement of resistance and Determination of Tolerance using Kelvin's double Bridge.
5. Capacitance Measurement using Schering bridge.
6. Inductance Measurement using Anderson bridge.
7. Measurement of 3 phase reactive power with single phase wattmeter for balanced loading.
8. Calibration of LPF wattmeter by direct loading.
9. Measurement of 3 phase power with two watt meters
10. Dielectric oil testing using H.T test Kit.
11. Measurement of choke parameters.
12. Measurement of Power by 3 Voltmeter method and by 3 Ammeter method.
13. Testing of C.T. using mutual inductance method.
14. Testing of P.T. using absolute null method.

Course Outcomes:

1. Student can able to measure the electrical parameters voltage, current, power, energy and
   electrical characteristics of resistance, inductance and capacitance.
2. Student can able to test transformer oil for its effectiveness.
3. Student can able to measure the parameters of inductive coil.
4. Students can able to measure choke parameter.
5. Students can able to measure power.
6. Students can able to calibrate p.f meter.

Note:

Minimum 12 experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

B.Tech- VI Semester **COURSE CODE: UR20PCEE612** **L T P C**
0 0 3 1.5

MICROPROCESSOR AND MICROCONTROLLER LAB

Internal Marks: 15
External Marks: 35

Course Objectives:

1. To study programming based on 8086 microprocessor and 8051microcontroller.
2. To study 8056 microprocessor based ALP using arithmetic, logical and shift operations.
3. To study modular and Dos/Bios programming using 8086 micro processor.
4. To study to interface 8086 with I/O and other devices.
5. To study parallel and serial communication using 8051 micro controller.

List of Experiments

I. Microprocessor 8086:

Introduction to MASM/TASM.

1. Arithmetic operation – Multi byte addition and subtraction,multiplication and division –
Signed and unsigned arithmeticoperation, ASCII – Arithmetic operation.
2. Logic operations – Shift and rotate – Converting packed BCD tounpacked BCD, BCD to
ASCII conversion.
3. By using string operation and Instruction prefix**:** Move block,Reverse string Sorting, Inserting, Deleting, Length of the string,String comparison.
4. Modular Program: Procedure, Near and Far implementation,Recursion.
5. Dos/BIOS programming: Reading keyboard (Buffered with andwithout echo) – Display
characters, Strings.
6. Interfacing 8255–PPI
7. Programs using special instructions like swap, bit/byte, set/reset etc.
8. Programs based on short, page, absolute addressing.
9. Interfacing 8259 – Interrupt Controller.
10. Interfacing 8279 – Keyboard Display.
11. Stepper motor control using 8253/8255.

II.Microcontroller 8051

12. Reading and Writing on a parallel port.
13. Timer in different modes.
14. Serial communication implementation.
15. Understanding three memory areas of 00 – FF (Programs usingabove areas).

Using external interrupts.

Course Outcomes:

1.Will be able to write assembly language program using 8086 microbased on arithmetic,
logical, and shift operations.
2.Will be able to do modular and Dos/Bios programming using 8086micro processor.

3.Will be able to interface 8086 with I/O and other devices.
4.Will be able to do parallel and serial communication using 8051micro controllers.

Note:

Minimum 12 experiments (10 from part-I and 2 from part-II) of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

B.Tech- VI Semester **COURSE CODE: UR20PCEE613** **L T P C**
0 0 3 1.5

POWER SYSTEMS AND SIMULATION LAB

Internal Marks: 15
External Marks: 35

Course Objective:

1. To impart the practical knowledge of functioning of various power system components and determination of various parameters and simulation of load flows, transient stability, LFC and Economic dispatch.

List of Experiments

PART-A: POWER SYSTEMS

1. Sequence impedances of 3 phase Transformer.
2. Sequence impedances of 3 phase Alternator by Fault Analysis.
3. Sequence impedances of 3 phase Alternator by Direct method.
4. ABCD parameters of Transmission network.
5. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
6. Dielectric strength of Transformer oil.
7. Calibration of Tong Tester.
8. Load flow studies any two methods.
10. Transient Stability Analysis
11. Load frequency control without control
12. Load frequency control with control
13. Economic load dispatch without losses
14. Economic load dispatch with losses.

PART-B: SIMULATION

1. Simulation of transient response of RLC circuits
    a. Response to pulse input
    b. Response to step input
    c. Response to sinusoidal input
2. Analysis of three phase circuit representing the generator transmission line and load. Plot three phase currents & neutral current.
3. Simulation of single–phase full converter using RLE loads and single phase AC voltage controller using RL loads.
4. Plotting of Bode plots, root locus and nyquist plots for the transfer functions of systems up to 5th order.
5. Power system load flow using Newton–Raphson technique.
6. Simulation of Boost and Buck converters.
7. Integrator & Differentiator circuits using op–amp.
8. Simulation of D.C separately excited motor using transfer function approach.

Course Outcome:

1.The student is able to determine the parameters of various power system components which are frequently occur in power system studies and he can execute energy management systems functions at load dispatch centre.

Note:

Minimum 12 experiments (Each part 6 Experiments should be done) of duration 3 periods must be completed for the eligibility to appear for the semester end examinations. In case if the student fails to get eligibility for semester end exams in the current semester, he/she has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

B.Tech- VI Semester **COURSE CODE: UR20SOEE614** **L T P C**
2 0 0 2

SKILL ORIENTED COURSE
MACHINE LEARNING WITH PYTHON

Internal Marks: 0
External Marks: 50

Course Objectives:

1. Identify problems that are amenable to solution by ANN methods, and which ML methods may be suited to solving a given problem.
2. Formalize a given problem in the language/framework of different ANN methods (e.g., as a search problem, as a constraint satisfaction problem, as a planning problem, as a Markov decision process, etc).

Unit I:
Introduction- Artificial Intelligence, Machine Learning, Deep learning, Types of Machine Learning Systems, Main Challenges of Machine Learning.
Statistical Learning: Introduction, Supervised and Unsupervised Learning, Training and Test Loss, Tradeoffs in Statistical Learning, Estimating Risk Statistics, Sampling distribution of an estimator, Empirical Risk Minimization.

Unit II:
Supervised Learning(Regression/Classification):Basic Methods: Distance based Methods, Nearest Neighbours, Decision Trees, Naive Bayes, **Linear Models:** Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, **Binary Classification:** Multiclass/Structured outputs, MNIST, Ranking.

Unit III:
Ensemble Learning and Random Forests: Introduction, Voting Classifiers, Bagging and Pasting,Random Forests, Boosting, Stacking.
Support Vector Machine: Linear SVM Classification, Nonlinear SVM Classification SVM Regression, Naïve Bayes Classifiers.
.
Unit IV:
Unsupervised Learning Techniques: Clustering, K-Means, Limits of K-Means, Using Clustering for Image Segmentation, Using Clustering for Preprocessing, Using Clustering for Semi-Supervised Learning, DBSCAN, Gaussian Mixtures, Dimensionality Reduction: The Curse of Dimensionality, Main Approaches for Dimensionality Reduction, PCA, Using Scikit-Learn, Randomized PCA, Kernel PCA.

Unit V:

Neural Networks and Deep Learning: Introduction to Artificial Neural Networks with Keras, Implementing MLPs with Keras, Installing TensorFlow 2, Loading and Preprocessing Data with TensorFlow.

Text Book

1. Machine learning AI, by Stuart J. Russel and Peter Norvig, Naro publication.

Reference Book

1. Python machine learning, by Sebastian Raschka and Vahid Mirjalili, Packt publication.

Course Outcomes:

Students will be able to

1. Understand problems that are to be solution by ANN methods.,
2. Understand ML methods may be suited to solving a given problem.
3. Understand a given problem in the language/framework of different ANN methods.
4. Understand a search problem, as a constraint satisfaction problem,
5. Understand planning problem, as a Markov decision process.
6. Understand unsupervised learning technique.

Note:

Skill courses may be registered at the college or at any external agency. Student shall submit a report/ record on the list of skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of semester for 50 marks (record :15M and viva-voce:35M) along with laboratory end examinations in the presence of external examiner (appointed by the principal) and internal examiner (course instructor or mentor). there are no internal for skill courses

B.Tech- VI Semester **COURSE CODE: UR20MC600B** **L T P C**
0 0 0 0

CONSTITUTION OF INDIA

Internal Marks: 30
External Marks: 00
Semester End Exam Marks: 70

Course Objectives:

1.To Enable the student to understand the importance ofconstitution
2. To understand the structure of executive, legislature andjudiciary
3.To understand philosophy of fundamental rights andduties

UNIT – I Introduction to Indian Constitution: Constitution' meaning of the term, Indian Constitution - Sources and constitutional history, Features - Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy.

UNIT – II Union Government and its Administration Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, CabinetandCentralSecretariat,LokSabha,RajyaSabha,TheSupremeCourtandHighCourt: PowersandFunctions.

UNIT – III State Government and its Administration Governor - Role and Position -CM and Council of ministers, State Secretariat: Organisation, Structure and Functions

UNIT – IV A.Local Administration - District's Administration Head - Role and Importance, Municipalities - Mayor and role of Elected Representative - CEO of Municipal Corporation PachayatiRaj: Functions PRI: Zila Panchayat, Elected officials and their roles, CEO Zila Panchayat: Block level Organizational Hierarchy - (Different departments), Village level - Role of Elected and Appointed officials - Importance of grass root democracy.

UNIT – V Election Commission: Election Commission- Role of Chief Election Commissioner and Election Commissionerate State Election Commission:, Functions of Commissions for the welfare of SC/ST/OBC and women.

TEXT BOOKS:

1.Subash Kashyap, Indian Constitution, National Book Trust
2.J.A. Siwach, Dynamics of Indian Government & Politics

REFERENCE BOOKS:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd.. New Delhi 2.D.C. Gupta, Indian Government and Politics
3.H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
4.J.C. Johari, Indian Government and Politics Hans
5.J. Raj Indian Government and Politics
6.M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd.. New Delhi
7.Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press2012.

Course Outcomes:

Students will be able to

1.Explain the concept of Indian constitution and Evaluate Preamble Fundamental Rights and Duties
2. Judge the structure of Indian government, Differentiate between the state and central government.
3. Explain the role of President and Prime Minister and Know the Structure of Supreme Court and High court.
4. Analyze the role Governor and Chief Minister and explain the role of state Secretariat
5. Explain local levelorganization
6. Identify the roles of Election Commission apply knowledge and Evaluate various commissions of viz SC/ST/OBC andwomen.

B.Tech- VII Semester **COURSE CODE: UR20PEEE701A** **L T P C**
3 0 0 3

DIGITAL SIGNAL PROCESSING
(Professional Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives:
The course objectives are:
1. To provide background and fundamental concepts for the analysis and processing of digital signals.
2. To understand the fast computation of DFS and DFT.
3. To design digital filters and their realization structures.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects.

UNIT I
Introduction: Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.
Realization of Digital Filters: Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

UNIT II
Discrete Fourier series: Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of FT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.
Fast Fourier Transforms: Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

UNIT III
IIR Digital Filters: Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

UNIT IV
FIR Digital Filters: Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

UNIT V
Multirate Digital Signal Processing: Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

Finite Word Length Effects: Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

TEXT BOOKS

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

REFERENCE BOOKS

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – K. Deergha Rao and M. N. S. Swamy, Springer, 2018.
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2nd Edition, Pearson Education, 2009

Course Outcomes:

Upon completing this course, the student will be able to:

1. Understand the LTI-DT systems, their frequency domain representation and realization.
2. Distinguish DFTS, DFS, DFT and FFT.
3. Explain the concept of IIR Digital Filters.
4. Design IIR digital filters from prototype approximations.
5. Identify FIR digital filters from prototype approximations.
6. Demonstrate the importance of Multirate signal processing and finite word length effects in DSP applications.

B.Tech- VII Semester **COURSE CODE: UR20PEEE701B** **L T P C**
3 0 0 3

Renewable and Distributed Energy Technologies
(Professional Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives:
1. To studyglobal energy scenario.
2. To understand the fast of Indian power system
3. To design SPV.

UNIT-I

General Introduction

Discuss about in general electric power system, Global energy scenario and Indian Power system.National solar mission, Renewable energy for Rural, Urban, Industrial, Commercial applications.

Introduction to SG, MG, DG, DER
Discuss about SmartGrid, MicroGrid, Distributed Generation, Distributed Energy Resources

UNIT-II
Renewable Energy sources

Solar radiation & Geometry- Solar PV- Solar Thermal- Wind energy- Ocean thermal energy conversion- Wave energy-Tidal Power- Fuel Cell.

UNIT-III
SPV system design

System design of stand alone and grid connected Solar PV system will be covered.

Solar PV system types- Typical load types & characteristics- Maximum power point operation- Grid-Connected PV system sizing- Stand-Alone PV System sizing- PV-Powered Water pumping system sizing.

UNIT-IV
Energy Systems Operation

Effect of Renewable generator on system Voltage, Frequency, Inertia and reserve requirement

—Energy System –Energy Vectors, AC Power System, System Operation Issues caused by penetration of DGs, Load flow study, —Demand Side participation, Distribution Tariff.

Unit-V

Energy Economics

Concept of Time value of money, Net present value with Numerical Examples

Text Books:

1.“Renewable and efficient electric power systems”, By G.M. Masters, John Wiley & S ons

2. “Microgrids and Active Distribution Networks’, By P. Crossley, S.P. Chowdhury, IET Publication

3. “Distributed Generation” By N. Jenkins, G. Strbac, J.C. Ekanayake, IET Publication,

4.Embedded Generation”, By Nick Jenkins, Ron Allan, Peter Crossley, David Kirschen and Goran Strbac, The University Press, Cambridge, 2000

Reference Books:

1. “Advanced Renewable energy sources”, By G.N.Tiwari, R.K.Mishra, RSC Publishing, 2 012 2. “Renewable energy y , , resources” By J. Twidell, T. Weir, Tay , lor & Francis, 2007

3.“Renewable energy engineering’, By N. Jenkins, Janaka Ekanayake, The University Press, Cambridge, 2017

4.“Design of Smart power grid renewable energy systems” By Ali Keyhani, John Wiley & Sons, 2011

Course Outcomes:

Students will be able to

1. Understand global energy scenario.
2. Understand the fast of Indian power system
3. Design Solar Photovoltaic.
4. Understand various energy system operation
5. Understand energy economic methods.
6. Understand net present value on energy process.

B.Tech- VII Semester **COURSE CODE: UR20PEEE701C** **L T P C**
3 0 0 3

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS
(Professional Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn the basics of power flow control in transmission lines using FACTS controllers
2. To explain operation and control of voltage source converter.
3. To understand compensation methods to improve stability and reduce power oscillations of a power system.
4. To learn the method of shunt compensation using static VAR compensators.
5. To learn the methods of compensation using series compensators
6. To explain operation of Unified Power Flow Controller (UPFC).

Unit–I:
Introduction to FACTS
Power flow in an AC System – Loading capability limits – Dynamic stability considerations– Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

Unit–II:
Voltage source and Current source converters
Concept of voltage source converter(VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three–phase full wave bridge converter– Three–phase current source converter – Comparison of current source converter with voltage source converter.

Unit–III:
Shunt Compensators–1
Objectives of shunt compensation – Mid–point voltage regulation for line segmentation –End of line voltage support to prevent voltage instability – Improvement of transient stability– Power oscillation damping.

Unit–IV:
Shunt Compensators–2
Thyristor Switched Capacitor(TSC)–Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator(SVC) and Static Compensator(STATCOM)**:**
The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

Unit V:

Series Compensators

Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

Text Books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.

Reference Books:

1. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
2. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv k.Varma, Wiley

Course Outcomes:

The student should be able to

1. Understandpower flow control in transmission lines using FACTS controllers.
2. Explain operation and control of voltage source converter.
3. Analyze compensation methods to improve stability and reduce power oscillations in the transmission lines.
4. Explain the method of shunt compensation using static VAR compensators.
5. Understand the methods of compensations using series compensators.
6. Explain operation of Unified Power Flow Controller.

B.Tech- VII Semester **COURSE CODE: UR20PEEE701D** **L T P C**
3 0 0 3

POWER SYSTEM REFORMS
(Professional Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives

1. To study fundamentals of power system deregulation and restructuring.
2. To study available transfer capability.
3. To study congestion management
4. To study various electricity pricing.
5. To study operation of power system in deregulated environment.
6. To study importance of Ancillary services management.

UNIT–I
Over view of key issues in electric utilities : Introduction – Restructuring models – Independent system operator (ISO) – Power Exchange – Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion.

UNIT–II
OASIS: Open Access Same–Time Information System : Structure of OASIS – Processing of Information – Transfer capability on OASIS – Definitions Transfer Capability Issues – ATC – TTC – TRM – CBM calculations – Methodologies to calculate ATC.

UNIT–III
Congestion Management : Introduction to congestion management – Methods to relieve congestion.

UNIT–IV
Electricity Pricing: Introduction – Electricity price volatility electricity price indexes – Challenges to electricity pricing – Construction of forward price curves – Short–time price forecasting.

UNIT–V
Power system operation in competitive environment: Introduction – Operational planning activities of ISO – The ISO in pool markets – The ISO in bilateral markets – Operational planning activities of a Genco.

Text Books:

1. Kankar Bhattacharya, Math H.J. Boller, Jaap E.Daalder, 'Operation of Restructured Power System' Klum,er Academic Publisher – 2001
2. Mohammad Shahidehpour, and Muwaffaqalomoush, – "Restructured electrical Power systems" Marcel Dekker, Inc. 2001

Reference Books:

1.Loi Lei Lai; "Power system Restructuring and Deregulation", Jhon Wiley & Sons Ltd., England.

2 .Electrical Power Distribution Case studies from Distribution reform, upgrades and Management (DRUM) Program, by USAID/India, TMH.

Course Outcomes:

Students will be able to

1. Understand importance of power system deregulation and restructuring.
2. Compute ATC.
3. Understand transmission congestion management.
4. Compute electricity pricing in deregulated environment.
5. Understand power system operation in deregulated environment.
6. Understand importance of ancillary services.

B.Tech- VII Semester **COURSE CODE: UR20PEEE701E** **L T P C**
3 0 0 3

Data Base Management Systems
(Professional Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. Train in the fundamental concepts of database management systems, database modeling and design, SQL, PL/SQL, and System implementation techniques.
2. Enable students to model ER diagram for any customized applications
3. Provide knowledge on concurrency techniques
4. Understand normalization theory and apply such knowledge to the normalization of a database.
5. To learn the principles of systematically designing and using large scale Database Management Systems for various applications.

UNIT-I:

An Overview of Database Management: Introduction- Importance of Database System, Data IndependenceRelation Systems and Others- Summary, Database system architecture, Introduction- The Three Levels of Architecture-The External Level- the Conceptual Level- the Internal Level- Mapping- the Database Administrator-The Database Management Systems- Client/Server Architecture.

UNIT-II:

The E/R Models: The Relational Model, Relational Calculus, Introduction to Database Design, Database Design and ER Diagrams-Entities Attributes, and Entity Sets-Relationship and Relationship Sets-Conceptual Design with the ER Models, The Relational Model: Integrity Constraints Over Relations- Key Constraints –Foreign Key ConstraintsGeneral Constraints, Relational Algebra and Calculus, Relational Algebra-Selection and Projection- Set Operation, Renaming – Joins- Division- More Examples of Queries, Relational Calculus - Tuple Relational Calculus, Domain Relational Calculus.

UNIT-III:

Queries, Constraints, Triggers: The Form of Basic SQL Query, Union, Intersect, and Except, Nested Queries, Aggregate Operators, Null Values, Complex Integrity Constraints in SQL, Triggers and Active Database. Schema Refinement (Normalization) : Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency(1NF, 2NF and3 NF), concept of surrogate key, Boyce-Codd normal form(BCNF), Lossless join and dependency preserving decomposition, Fourth normal form(4NF).

UNIT-IV:

Transaction Management and Concurrency Control: Transaction, properties of transactions, transaction log, and transaction management with SQL using commit rollback and save point, Concurrency control for lost updates, uncommitted data, inconsistent retrievals and the Scheduler. Concurrency control with locking methods : lock granularity, lock types, two phase locking for ensuring serializability, deadlocks,

Concurrency control with time stamp ordering : Wait/Die and Wound/Wait Schemes, Database Recovery management : Transaction recovery.

UNIT-V:

Overview of Storages and Indexing: Data on External Storage- File Organization and Indexing – Clustered Indexing – Primary and Secondary Indexes, Index Data Structures, Hash-Based Indexing – Tree- Based Indexing, Comparison of File Organization.

Text Books:

1. Introduction to Database Systems, CJ Date, Pearson
2. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGraw Hill 3rd Edition

References Books:

1. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
2. Fundamentals of Database Systems, ElmasriNavrate Pearson Education
3. Database Systems - The Complete Book, H G Molina, J D Ullman, J Widom Pearson
4. Data base System Concepts,5/e, Silberschatz, Korth, TMH

Course Outcomes:

Students will be able to

1. Understand File System Vs Databases.
2. Understand the usage of Key Constraints on Database.
3. Create, maintain and manipulate a relational database using SQL
4. Describe ER model and normalization for database design.
5. Understand efficient data storage and retrieval mechanism, recovery techniques
6. Understand primary data structure.

B.Tech- VII Semester **COURSE CODE: UR20PEEE702A** **L T P C**
3 0 0 3

HYBRID ELECTRIC VEHICLES

(Professional Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objective:

1. To present a comprehensive overview of Electric and Hybrid Electric Vehicles.

Unit -I INTRODUCTION TO ELECTRIC VEHICLE

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

Unit –II HYBRID ELECTRIC VEHICLES

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

UNIT –III ELECTRIC PROPULSION

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives

UNIT –IV ENERGY STORAGE SYSTEM

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT-V DRIVE SYSTEM

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology,

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design – Mehrdad Ehsani, Uimin Gao and Ali Emadi – Second Edition – CRC Press, 2010.
2. Electric Vehicle Technology Explained – James Larminie, John Lowry – John Wiley & Sons Ltd, – 2003.
3. Electric Vehicle Battery Systems – Sandeep Dhameja – Newnes – New Delhi – 2002.

REFERENCE BOOKS:

1. Hybrid electric Vehicles Principles and applications With practical perspectives - Chris Mi, Dearborn – M. Abul Masrur, David Wenzhong Gao – A John Wiley & Sons, Ltd., – 2011.
2. Electric & Hybrid Vehicles – Design Fundamentals – Iqbal Hussain, Second Edition, CRC Press, 2011.

Course Outcomes:

The students will be able to

1. Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources
2. Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
3. Choose proper energy storage systems for vehicle applications.
4. Identify various communication protocols and technologies used in vehicle networks.
5. understand the concept of Electric Propulsion.
6. understand driving system(operation) of electric vehicle

B.Tech- VII Semester **COURSE CODE: UR20PEEE702B** **L T P C**
3 0 0 3

HIGH VOLTAGE ENGINEERING
(Professional Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objectives:
1.To electric field distribution and computation in different configuration of electrode systems.
2.To HV breakdown phenomena in gases, liquids and solids dielectrics.
3. To know principle of operation and design of HVDC, AC and impulse voltages and currents.

UNIT–I:
Introduction to High Voltage Technology
Electric Field Stresses – Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT–II:
Break down phenomenon in gaseous, liquid and solid insulation
Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases – Paschen's law – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown –Breakdown of solid dielectrics, composite dielectrics used in practice.

UNIT–III:
Generation of High voltages and High currents
Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents – Tripping and control of impulse generators.

UNIT–IV:
Measurement of high voltages and High currents
Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse.

UNIT–V:
Non–destructive testing of material and electrical apparatus

Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial
discharge measurements.

High voltage testing of electrical apparatus
Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of
cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Text Books:
1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.
2. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:
1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
3. High Voltage Insulation Engineering by RavindraArora, Wolfgang Mosch, New Age International (P)Limited,1995.

Course Outcomes:
The students will be able
1. To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
2. To be able to understand theory of breakdown and withstand phenomena of all types
of dielectric materials.
3. To acquaint with the techniques of generation of AC,DC and Impulse voltages.
4. To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
5. To be in a position to measure dielectric property of material used for HV equipment.
6.To know the techniques of testing various equipment's used in HV engineering.

B.Tech- VII Semester **COURSE CODE: UR20PEEE702C** **L T P C**
3 0 0 3

PROGRAMMABLE LOGIC CONTROLLERS
(Professional Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To have knowledge on PLC.
2. To acquire the knowledge on programming of PLC.
3. To understand different PLC registers and their description.
4. To have knowledge on data handling functions of PLC.

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

Unit II:
PLC Programming
PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Digital logic gates, programming in the Boolean algebra system, conversion examples. Ladder diagrams and sequence listings, ladder diagram construction.

Unit III:
Programmable Timers and Counters
Timer instructions – On delay time instruction – Off delay timer instruction – Retentive timer – Counter instructions – Up counter – Down counter - Cascading counters – Incremental encoder – Counter applications – Combining counter and timer functions.

Unit IV:
Program Control Instructions
Master control reset instruction – Jump instructions and sub routines – Immediate input and output instructions.

Unit V:
Other Instructions
Data manipulation – Data transfer operation – Data compare instruction – Data manipulation programs – Numerical data I/O interfaces – Math instructions – Addition, subtraction,multiplication & division instruction – Sequential instructions – Sequence programs – Shift registers – Word shift registers.

Applications
Control of water level indicator – Alarm monitor - Conveyor motor control – Parking garage– Ladder diagram for process control – PID controller.

Text Books:

1. Programmable logic controllers by Frank D.Petruzella- McGraw Hill – 3rd Edition.
2. Programmable Logic Controllers – Principle and Applications by John W. Webb and Ronald A. Reiss, Fifth Edition, PHI

Reference Books:

1. Programmable Logic Controllers – Programming Method and Applications by JR. Hackworth and F.D Hackworth Jr. – Pearson, 2004.
2. Introduction to Programmable Logic Controllers- Gary Dunning-Cengage Learning.
3. Programmable Logic Controllers –W.Bolton-Elsevier publisher

Course Outcomes:

Students are able to:

1. Understand the PLCs and their I/O modules.
2. Develop control algorithms to PLC using ladder logic.
3. Manage PLC registers for effective utilization in different applications.
4. Design PID controller with PLC.
5. Know how to handle analog signal and converting of A/D in PLC.
6. Understand word shift registers.

B.Tech- VII Semester **COURSE CODE: UR20PEEE702D** **L T P C**
3 0 0 3

Cloud Computing with AWS
(Professional Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objective:
1.Cloud Computing is a large scale distributed computing paradigm which has become a driving force for information technology over the past several years.
2.This course introduce cloud computing technology to undergraduate engineering students, so they can learn, apply and use this technology in their future careers.

UNIT-I:
Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing.

UNIT-II:
Cloud Computing Fundamentals: Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud Computing, Cloud Computing is a Service, Cloud Computing is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT-III:
Cloud Computing Architecture and Management: Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud Application, Migrating Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT-IV:
Cloud Service Models: Infrastructure as a Service, Characteristics of IaaS. Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platformas a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers, Other Cloud Service Models.

UNIT-V:
Cloud Providers and Applications: EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue service, Microsoft, Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM, Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rackspace, VMware, Manjra soft, Aneka Platform

Text Book:

1. Essentials of Cloud Computing, K. Chandrasekhran, CRC press.

Reference Books:

1. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg and Andrzej M. Goscinski, Wiley.
2. Distributed and Cloud Computing, Kai Hwang, Geoffery C. Fox, Jack J. Dongarra, Elsevier.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, SubraKumaraswamy, ShahedLatif, O'Reilly.

Course Outcomes:

Student will be able to:

1. Understand and analyze different computing paradigms
2. Understand the basics of cloud computing and different cloud deployment models.
3. Understand different cloud implementation and management strategies.
4. Understand and evaluate different cloud service models.
5. Identify, analyze and use different cloud services/applications/tools available from key cloud providers.
6. Understand Microsoft assessment and planning

B.Tech- VII Semester **COURSE CODE: UR20PEEE702E** **L T P C**
3 0 0 3

DEEP LEARNING TECHNIQUES
(Professional Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objectives:
1.To know basic introduction of deep learning.
2. To present various optimization techniques in deep learning.

UnitI: **Introduction to Deep Learning**- Bayesian Learning- Decision Surfaces- Linear Classifiers- Linear Machines with Hinge Loss.

Unit-II: Optimization Techniques- Gradient Descent- Batch Optimization - Introduction to Neural Network- Multilayer Perceptron- Back Propagation Learning - Unsupervised Learning with Deep Network- Autoencoders

Unit-III: Convolutional Neural Network- Building blocks of CNN- Transfer Learning Revisiting Gradient Descent- Momentum Optimizer- RMSProp- AdamEffective training in Deep Net- early stopping- Dropout- Batch Normalization- Instance Normalization- Group Normalization

Unit-IV: Recent Trends in Deep Learning Architectures- Residual Network- Skip Connection Network- Fully Connected CNN etc.Classical Supervised Tasks with Deep Learning- Image Denoising-Semanticd Segmentation- Object Detection etc.

Unit-V: LSTM Networks
Generative Modeling with DL- Variational Autoencoder- Generative Adversarial Network Revisiting Gradient Descent- Momentum Optimizer- RMSProp- Adam

Text Book:
1.Deep Learning- Ian Goodfelllow, YoshuaBenjio, Aaron Courville, The MIT Press.

Reference Book:
1.Pattern Classification- Richard O. Duda, Peter E. Hart, David G. Stork, John Wiley & Sons Inc.

Course Outcomes:
Students will be able to
1.Understand basic introduction of deep learning.
2. Understand various optimization techniques in deep learning.
3. Understand Back Propagation Learning.
4. Understand concept of NN
5. Understand trends in deep learning
6. Understand network techniques

B.Tech- VII Semester **COURSE CODE: UR20PEEE703A** **L T P C**
3 0 0 3

POWER SYSTEM OPERATION AND CONTROL
(Professional Elective-V)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To understand optimal dispatch of generation with and without losses.
2. To study the optimal scheduling of hydro thermal systems.
3. To study the optimal unit commitment problem.
4. To study the load frequency control for single area system with and without controllers
5. To study the load frequency control for two area system with and without controllers
6. To understand the reactive power control and compensation of transmission lines.

UNIT–I:
Economic Operation of Power Systems
Optimal operation of Generators in Thermal power stations, – Heat rate curve – Cost Curve – Incremental fuel and Production costs – Input–output characteristics – Optimum generation allocation with line losses neglected – Optimum generation allocation including the effect of transmission line losses – Loss Coefficients – General transmission line loss formula.

UNIT–II:
Hydrothermal Scheduling
Optimal scheduling of Hydrothermal System**:** Hydroelectric power plant models – Scheduling problems – Short term hydrothermal scheduling problem.

UNIT–III:
Unit Commitment
Optimal unit commitment problem – Need for unit commitment – Constraints in unitcommitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT–IV:
Load Frequency Control-I
Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling of Hydro turbine –Necessity of keeping frequency constant – Definitions of Control area – Single area control system – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case.

Proportional plus Integral control of single area and its block diagram representation – Steady state response.

UNIT–V:

Load Frequency Control-II

Block diagram development of Load Frequency Control of two area system uncontrolledcase and controlled case. Tie-line bias control. Load Frequency Control and Economicdispatch control.

Reactive Power Control

Overview of Reactive Power control – Reactive Power compensation in transmission systems– Advantages and disadvantages of different types of compensating equipment for transmission systems – Load compensation –

Text Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw Hill Publishing Company Ltd, 2nd edition.

Reference Books:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma.,Thompson, 3rdEdition.
2. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.
4. Power System stability & control, PrabhaKundur,TMH

Course Outcomes:

Students will be

1. Able to compute optimal scheduling of Generators.
2. Able to understand hydrothermal scheduling.
3. Understand the unit commitment problem.
4. Able to understand importance of the frequency.
5. Understand importance of PID controllers in single area and two area systems.
6. Will understand reactive power control and compensation for transmission line.

B.Tech- VII Semester **COURSE CODE: UR20PEEE703B** **L T P C**
3 0 0 3

SWITCHING MODE POWER CONVERSION
(Professional Elective-V)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To understand various modes of operation of DC-DC Converter
2. To analyze control aspects of converter
3. To design various Switched Mode Power Supply components
4. To get awareness on EMI, Protection of converter system

UNIT – I: **Basic Converter Circuits**:Buck Regulator, Buck- Boost Regulator, Boost Regulator, Cuk Converters and Resonant Converters. Choice of switching frequency.

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

UNIT – III: **Control Aspects**:PWM Controllers, Isolation in feedback loop, Power Supplies with multiple output. Stability analysis using Bode Diagrams.

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

UNIT – V: **Electro Magnetic Interference (EMI)**:EMI Filter Components, Conducted EMI suppression,Radiated EMI suppression, Measurement. Protection: Over current protection, over voltage protection, Inrush current protection. Thermal Model: Thermal Resistance, Cooling Considerations, Selection of Heat sinks, Simple Heat sink calculations.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

Course Outcomes:

Student will be able to

1. Analyze various modes of operation of Dc-Dc converter
2. Design different controllers for converter
3. Design various components of dc-dc converter
4. Analyze dc-dc converter in view of EMI and thermal considerations
5. Understand PWM controller.
6. Understand thermal model.

B.Tech- VII Semester **COURSE CODE: UR20PEEE703C** **L T P C**
3 0 0 3

AI Applications to Electrical Engineering
(Professional Elective-V)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn basics of Artificial Intelligence system, ANN architectures and learning strategies.
2. To learn rules and algorithms
3. To know properties, operations and relations of fuzzy sets.
4. To learn fuzzification and defuzzification methods to develops fuzzy logic system.
5. To know applications of AI in electrical engineering such as Load frequency control.

UNIT - I: **Introduction to AI techniques** Introduction of AI system, Historical Developments, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Characteristics of ANN.

UNIT - II: **ANN paradigm** McCulloch-Pitts Model, Learning Rules, Generalized Delta Rule, Single-layer feed-forward networks: – Perceptron, learning algorithm for perceptron- limitations of Perceptron model, Multi-layer feed-forward network (based on Back propagation algorithm)– Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Radial-basisfunction networks- Recurrent networks (Hopfield networks).

UNIT - III: **Classical & Fuzzy Sets** Introduction to classical sets – operations, properties and relations of Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - IV**: Components of Fuzzy Logic System** Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT - V: **Applications of AI Techniques** Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area and two area power system, Small Signal Stability, Reactive power control, speed control of DC and AC Motors

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH,2006

Reference Books:

1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002. Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India
Pvt. Ltd., New Delhi, 2008.
2. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.
3. Driankov, Hellendroonb, "Introduction to fuzzy control", Narosa Publishers, 2001.
4. Neural Networks – Simon Hakins , Pearson Education
5. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
6. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

Course Outcomes:

The students should be able to:

1.Understand about the Artificial Neuron Models, ANN architectures and learning strategies
2.Acquire knowledge on various learning algorithm of ANN.
3.Understand differentiate classical and fuzzy sets.
4.Apply the Fuzzification and defuzzification methods to design a Fuzzy logic controller.
5.Apply of AI Technique to Electrical engineering applications such as Load frequency control.
6. Understand economic load dispatch, stability and speed control of DC motor etc.

B.Tech- VII Semester **COURSE CODE: UR20PEEE703D** **L T P C**
3 0 0 3

DATA SCIENCE
(Professional Elective-V)

Internal Marks: 30
External Marks: 70

Course Objective:
1.To explore the fundamental concepts of data analytics.
2.To learn the principles and methods of statistical analysis
3.Discover interesting patterns, analyze supervised and unsupervised models and estimate the accuracy of the algorithms.
4.To understand the various search methods and visualization techniques

UNIT-I**Data Management**:
Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality(noise, outliers, missing values, duplicate data) and Data Processing & Processing.

UNIT-II**Data Analytics**:
Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

UNIT-III**Regression**:
Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building.

Logistic Regression: Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

UNIYT-IV**Object Segmentation**:
Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc. Time Series Methods: Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy and Analyze for prediction

UNIT-V**Data Visualization**:
Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

Text Book:
1.Data Mining Concepts and Techniques, Han, Kamber, 3rd Edition, Morgan Kaufmann Publishers.

Reference Book:

1. Data Mining, Tan, Steinbach and Kumar, AddisionWisley, 2006.

Course Outcomes:

Students will be able to

1.Understand the impact of data analytics for business decisions
2. Understand strategy Carry out data analysis/statistical analysis.
3.Understand data visualization and formal inference procedures
4.Design Data Architecture
5.Understand various Data Sources
6.Understand data relation

B.Tech- VII Semester **COURSE CODE: UR20PEEE703E** **L T P C**
3 0 0 3

MEAN STACK TECHNOLOGIES
(Professional Elective-V)

Internal Marks: 30
External Marks: 70

Course Objective:

1. To know basic process of MEAN
2. To gain technique of HTML, CSS, Python usage in MEAN.

UNIT-I HTML

Introduction to HTML-Browsers and HTML -Editor's Offline and Online- Tags, Attribute and Elements - Doctype Element- Comments- Headings, Paragraphs, and Formatting Text- Lists and Links- Images and Tables

UNIT-II CSS LANGUAGE

Introduction CSS- Applying CSS to HTML -Selectors, Properties and Values -CSS Colors and Backgrounds- CSS Box Model -CSS Margins, Padding, and Borders -CSS Text and Font Properties -CSS General Topics

UNIYT-III JAVA SCRIPT

Introduction to JavaScript- Applying JavaScript (internal and external)- Understanding JS Syntax - Introduction to Document and Window Object- Variables and Operators- Data Types and Num Type Conversion- Math and String Manipulation- Objects and Arrays- Date and Time- Conditional Statements -Switch Case -Looping in JS- Functions

UNIT-IV MANGO DB

SQL and NoSql Concepts- Create and Manage MongoDB -Migration of Data into MongoDB -MongoDB with PHP -MongoDB with NodeJS- Services Offered by MongoDB

UNIT-V PYTHON

Python Installation & Configuration- Developing a Python Application -Connect MongoDB with Python

Text Book:

1. MEAN development by Greg Lim, EA publication.

Reference Book

1. MEAN Stack development by EladElrom, Apress publication, 2nd edition.

Course Outcomes:

Students will be able to

1. Understand basic process of MEAN
2. Understand technique of HTML, CSS, Python usage in MEAN.
3. Understand combination of HTML and CSS technique.
4. Understand background Java script in MEAN.
5. Understand logics used in MEAN with Python.
6. Understand concept of MangoDB in MEAN.

B.Tech- VII Semester **COURSE CODE:** **L T P C**
3 0 0 3

OPEN ELECTIVE-III

Internal Marks: 30
External Marks: 70

The student can choose any one open elective -III (OE-III) subject offered by other branches. The list of OEs are available in course structure.

B.Tech- VII Semester **COURSE CODE:** **L T P C**
3 0 0 3

OPEN ELECTIVE-IV

Internal Marks: 30
External Marks: 70

The student can choose any one open elective -IV (OE-IV) subject offered by other branches. The list of OEs are available in course structure.

B.Tech- VII Semester **COURSE CODE: UR20HS706** **L T P C**
3 0 0 3

UNIVERSAL HUMAN VALUES-2: UNDERSTANDING HARMONY

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To Development of a holistic perspective based on self-exploration about themselves(human being), family, society and nature/existence.
2. To Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

Unit-I:
Need, Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I - Self-Exploration– what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration - Continuous Happiness and Prosperity- A look at basic Human Aspirations - Right understanding, Relationship and Physical Facility- the basic requirements forfulfilment of aspirations of every human being with their correct priority - Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario - Method to fulfil the above human aspirations: understanding and living in harmonyat various levels

Unit-II:
Understanding Harmony in the Human Being - Harmony in Myself! Understanding human being as a co-existence of the sentient 'I' and the material'Body' - Understanding the needs of Self ('I') and 'Body' - happiness and physical facility - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) - Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail - Programs to ensure Sanyam and Health

Unit-III: Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Orderfrom family to world family.

Unit-IV: Understanding Harmony in the Nature and Existence - Whole existence as Coexistence Understanding the harmony in the Nature - Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence.

Unit-V: Implications of the above Holistic Understanding of Harmony on Professional Ethics Natural acceptance of human values - Definitiveness of Ethical Human Conduct Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations.

TEXT BOOKS:

1. R R Gaur, R Asthana, G P Bagaria, "A Foundation Course in Human Values andProfessional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
2. R R Gaur, R Asthana, G P Bagaria, "Teachers' Manual for A Foundation Course in Human Values and Professional Ethics", 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034- 53-2

REFERENCES BOOKS:

1. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2. A. N. Tripathi, "Human Values", New Age Intl. Publishers, New Delhi, 2004.
3. The Story of Stuff (Book).
4. Mohandas Karamchand Gandhi "The Story of My Experiments with Truth"
5. E. FSchumacher. "Small is Beautiful"
6. Mohandas K. Gandhi, "Hind Swaraj or Indian Home Rule"
7. India Wins Freedom - Maulana Abdul Kalam Azad
8. Vivekananda - Romain Rolland(English) xiii. Gandhi - Romain Rolland (English)

Course Outcomes:

Students will be able to

1. Become more aware of themselves, and their surroundings(family, society, nature)
2. Become more responsible in life, and in handling problems withsustainable solutions, while keeping human relationships and human nature in mind.
3. Would have better critical ability.
4. Become sensitive to their commitment towards what they have understood
5. 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.
6. Understand human values, human relationship and human society.

B.Tech- VII Semester **COURSE CODE: UR20SOEE711** **L T P C**
0 0 4 2

SKILL ADVANCED COURSE:MACHINE LEARNING WITH PYTHON LAB

Internal Marks: 30
External Marks: 70

Course Objectives:
This course will enable students to learn and understand different Data sets in implementing the machine learning algorithms.

Requirements: Develop the following program using Anaconda/ Jupiter/ Spider and evaluate ML models.

Experiment-1:
Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

Experiment-2:
For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

Experiment-3:
Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.

Experiment-4:
Exercises to solve the real-world problems using the following machine learning methods: a) Linear Regression b) Logistic Regression c) Binary Classifier

Experiment-5: Develop a program for Bias, Variance, Remove duplicates , Cross Validation
Experiment-6: Write a program to implement Categorical Encoding, One-hot Encoding

Experiment-7:
Build an Artificial Neural Network by implementing the Back propagation algorithm and test the same using appropriate data sets.

Experiment-8:
Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print both correct and wrong predictions.

Experiment-9: Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Experiment-10:
Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set.

Experiment-11: Apply EM algorithm to cluster a Heart Disease Data Set. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

Experiment-12: Exploratory Data Analysis for Classification using Pandas or Matplotlib.

Experiment-13:
Write a Python program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set

Experiment-14:
Write a program to Implement Support Vector Machines and Principle Component Analysis

Experiment-15:
Write a program to Implement Principle Component Analysis

Note: Minimum 90% prescribed experiments of duration 3 periods must be completed for the eligibility to appear for the semester end examinations.

In case if the student fails to get eligibility for semester end exams in the current semester, he has to take the permission of HOD and complete the required number of experiments and appear for semester end exam as and when conducted.

Course Outcomes : At the end of the course, student will be able to
1: Implement procedures for the machine learning algorithms
2: Design and Develop Python programs for various Learning algorithms
3: Apply appropriate data sets to the Machine Learning algorithms
4: Develop Machine Learning algorithms to solve real world problems.

Note:

Skill courses may be registered at the college or at any external agency. Student shall submit a report/ record on the list of skills learned. If the student completes job-oriented skill course at external agency, a certificate from the agency shall be included in the report. The course will be evaluated at the end of semester for 50 marks (record :15M and viva-voce:35M) along with laboratory end examinations in the presence of external examiner (appointed by the principal) and internal examiner (course instructor or mentor). there are no internal for skill courses

B.Tech- VII Semester **COURSE CODE: UR20PREE712** **L T P C**

0 0 0 3

INDUSTRIAL / RESEARCH INTERNSHIP

Internal Marks: 00
External Marks: 50

The candidate shall submit the comprehensive report to the department. The report will be evaluated for 50 marks by the Review Committee consisting of Head of the department, Program Coordinator and Industry Institute Interaction Coordinator.

B.Tech- VIII Semester **COURSE CODE: UR20MC700B** **L T P C**
0 0 0 0

RESEARCH METHODOLOGY

Internal Marks: 30
External Marks:00
Semester End Exam Marks: 70

Course Objectives:

1.To motivate towards research

2.To know data collection and analyse

UNIT I –**RESEARCH FORMULATION AND DESIGN**:

Motivation and objectives – Research methods vs. Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical, concept of applied and basic research process, criteria of good research. Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review-primary and secondary sources, reviews, monograph, patents, research databases, web as a source, searching the web, critical literature review, identifying gap areas from literature and research database, development of working hypothesis.

UNIT II – **DATA COLLECTION AND ANALYSIS** :

Accepts of method validation, observation and collection of data, methods of data collection, sampling methods, data processing and analysis strategies and tools,data analysis with statically package (Sigma STAT,SPSS for student t-test, ANOVA, etc.), hypothesis testing.

UNIT III – **SOFT COMPUTING**:

Computer and its role in research, Use of statistical software SPSS, GRETL in research. Introduction to evolutionary algorithms - Fundamentals of Genetic algorithms, Simulated Annealing, Neural Network based optimization, Optimization of fuzzy systems.

UNIT IV –**RESEARCH ETHICS, IPR AND SCHOLARY PUBLISHING**:

Ethics-ethical issues, ethical committees (human & animal); IPR- intellectual property rights and patent law, commercialization, copy right, royalty, trade related aspects of intellectual property rights (TRIPS); scholarly publishing- IMRAD concept and design of research paper, citation and acknowledgement, plagiarism, reproducibility and accountability.

UNIT V –**INTERPRETATION AND REPORT WRITING**:

Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Significance of Report Writing, Different Steps in Writing Report, Layout of the Research Report, Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports, Conclusions

TEXT BOOKS:

1. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.

2. Kothari, C.R., 1990. Research Methodology: Methods and Techniques. New Age International. 418p.

3. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Publications. 2 volumes.

REFERENCE BOOKS:

1. Trochim, W.M.K., 2005. Research Methods: the concise knowledge base, Atomic Dog Publishing. 270p.

2. Wadehra, B.L. 2000. Law relating to patents, trade marks, copyright designs and geographical indications. Universal Law Publishing.

Course Outcomes:

Students will be able to

1.Understand concept of research
2.Understand data collection
3.Understand soft computing
4.Know research ethics.
5.Understand problem identification and solution
6.Know report writing

B.Tech- VIII Semester **COURSE CODE: UR20PREE801** **L T P C**
0 0 0 12

PROJECT WORK, SEMINAR AND INTERNSHIP IN INDUSTRY
(6 MONTHS)

Internal Marks: 60
External Marks: 140

Syllabus Contents:
The project topic should be selected / chosen to ensure the satisfaction of the urgent need to establish a direct link between education, national development and productivity and thus reduce the gap between the world of work and the world of study. The project should have the following
1. Relevance to social needs of society
2. Relevance to value addition to existing facilities in the institute
3. Relevance to industry need
4. Problems of national importance
5. Research and development in various domain

The student should complete the following:
The project is based on a report prepared by the students on project topic allotted to them. It may be based on:
1. Experimental verification / Proof of concept.
2. Design, fabrication, testing of Communication System.
3. The viva-voce examination will be based on the above report and work.

Guidelines for Project
1. As per the AICTE directives following points need.
2. The project may be carried out preferably in-house i.e. department's laboratories and centers OR in industry allotted through department's T & P coordinator.
3. After multiple interactions with guide and based on comprehensive literature survey, the student shall identify the domain and define project objectives. The referred literature should preferably include IEEE/IET/IETE/Springer/Science Direct/ACM journals in the areas of Computing and Processing (Hardware and Software), Circuits-Devices and Systems, Communication-Networking and Security, Robotics and Control Systems, Signal Processing and Analysis and any other related domain. In case of Industry sponsored projects, the relevant application notes, while papers, product catalogues should be referred and reported.
4. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and stage wise work distribution, and submit the proposal within a month from the date of registration.
7. student is expected to exert on design, development and testing of the proposed work as per the schedule. Accomplished results/contributions/innovations should be published in terms of research papers in reputed journals and reviewed focused conferences OR IP/Patents.
8. Deliverables: A project report as per the specified format, developed system in the form of hardware and/or software, a record of continuous progress.
9. Evaluation: Guide along with appointed external examiner shall assess the progress/performance of the student based on report, presentation and Q &A. In case

of unsatisfactory performance, committee may recommend for extension or repeating the work.

Course Outcomes:

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

1. Synthesize knowledge and skills previously gained.
2. Apply an in-depth study and execution of new technical problem.
3. Select from different methodologies, methods.
4. Form analysis to produce a suitable research design, and justify their design.
5. Present the findings of their technical solution in a written report.
6. Present the work in International/ National conference or reputed journals.

LIST OF OPEN ELECTIVES OFFERED BY EEE DEPARTMENT

B.Tech - V Semester	**COURSE CODE: UR20OEEE505A**	**L T P C**
		3 0 0 3

RENEWABLE ENERGY SOURCES

(Open Elective-I)

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To study the solar radiation data, extraterrestrial radiation, radiation on earth's surface.
2. To study solar thermal collectors.
3. To study solar photo voltaic systems.
4. To study wind energy conversion systems, Betz coefficient, tip speed ratio.
5. To study basic principle and working of hydro, biomass and fuel cells

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UNIT–I: **Fundamentals of Energy Systems:** Energy conservation principle – Energy scenario (world and India) **–** energy audit- Energy index-Cost Index-cost of energy-Various forms of renewable energy (Basic outline) - Solar radiation: Outside earth's atmosphere – Earth surface

UNIT–II:Solar Thermal Systems: Liquid flat plate collectors: Performance analysis– Introduction to solar air heaters – Concentrating collectors, solar pond and solar still – solar thermal plants.

UNIT–III:Solar Photovoltaic Systems: Solar photovoltaic cell, module, array – construction – Efficiency of solar cells – Cell I-V characteristics – Equivalent circuit of solar cell – Applications– Balance of system components - storage sizing – Maximum power point techniques: Perturb and observe (P&O) technique

UNIT–IV: Wind Energy: Sources of wind energy - Wind patterns – Types of turbines – Horizontal axis and vertical axis machines - wind power – Betz limit – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) –Speed drives– wind farms.

UNIT–V:Hydro, Biomass and Fuel Cell

Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines

Biomass Energy: Photosynthesis and origin of biomass-biomass resources- Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

Fuel cell: Classification of fuel for fuel cells – Fuel cell voltage– Efficiency – V-I characteristics

TEXT BOOKS:

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak,
TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis .

REFERENCE BOOKS:

1. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford
University Press.
2. Renewable Energy- Edited by Godfrey Boyle-oxford university.press,3rd edition,2013.
3. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific.
4. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
5. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki,
PHI publications.

Course Outcomes:

Student will be able to

1. Analyze solar radiation data, extraterrestrial radiation, and radiation on earth's surface.
2. Design solar thermal collectors, solar thermal plants.
3. Design solar photo voltaic systems.
4. Develop maximum power point techniques in solar PV and wind energy systems.
5. Understand wind energy conversion systems, wind generators, power generation.
6. Understand basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

B.Tech - V Semester **COURSE CODE: UR20OEEE505B**

L	T	P	C
3	0	0	3

CONCEPTS OF OPTIMIZATION TECHNIQUES
(Open Elective-I)

Internal Marks: 30
External Marks: 70

Course Objective:

1. To know concept of operation research.
2. To gain graphical solution methods.

Unit-I

Introduction to Operation Research:
Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.

Unit-II

Linear Programming (LP): Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

Unit-III

Transportation & Assignment Problems: Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems.

Unit-IV

Sequencing: Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines.
Inventory Model: Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.

Unit-V

Queuing Models: Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.
Replacement & Maintenance Models: Replacement of items, subject to deterioration of items subject to random failure group vs. individual replacement policies.

Test Books:

1. J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.
2. N D Vohra, Quantitative Techniques in management, Tata McGraw Hill.

Reference Book:

1. Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.

Course Outcomes:

Students will be able to

1. Understand concept of operation research.
2. Understand the linear programming different solutions.
3. Understand transportation problems.
4. Understand the N jobs machine concept.
5. Understand elements of queuing model.
6. Understand subject to random failure group.

B.Tech -V Semester **COURSE CODE: UR20OEEE505C**

L	T	P	C
3	0	0	3

CONCEPTS OF CONTROL SYSTEMS
(Open Elective-I)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function.
2. To analyze the time response of first and second order systems and improvement of performance by proportional plus derivative and proportional plus integral controllers.
3. To investigate the stability of closed loop systems using Routh's stability criterion and the analysis by root locus method.
4. To present the Frequency Response approaches for the analysis of linear time invariant (LTI) systems using Bode plots, polar plots and Nyquist stability criterion.
5. To discuss basic aspects of design and compensation of linear control systems using Bode plots.
6. Ability to formulate state models and analyze the systems. To present the concepts of Controllability and Observability.

UNIT – I
MATHEMATICAL MODELING OF CONTROL SYSTEMS

Open Loop and closed loop control systems and their differences,Classification of control systems, transferfunction of linear system, Differential equations of electrical networks,Translational and Rotational mechanical systems, Blockdiagram algebra – Signal flow graph - Reduction usingMason's gain formula.

UNIT-II
TIME RESPONSE ANALYSIS

Standard test signals - Time response of first order systems –Time responseof second order systems - Time domain specifications - Steady state errorsand error constants – Feed-Back Characteristics, PID controllers.

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UNIT – III
STABILITY AND ROOTLOCUS TECHNIQUE

The concept of stability – Routh's stability criterion –limitations of Routh'sstability – The root locus concepts and numerical problems.

UNIT–IV
FREQUENCY RESPONSE ANALYSIS

Introduction, Frequency domain specifications-Bode diagrams- transferfunction from the Bode Diagram-Phase margin and Gain margin-StabilityAnalysis from Bode Plots, Polar Plots, Nyquist Stability criterion.

UNIT–V

CLASSICAL CONTROL DESIGN TECHNIQUES

Lag, Lead, Lag-Lead compensators

STATE SPACE ANALYSIS OF CONTINUOUS SYSTEMS

Concepts of state, state variables and state model, state space representation of transfer function, Diagonalization- Solving the Time invariant stateEquations- State Transition Matrix and it's Properties – Concepts ofControllability and Observability.

TEXT BOOKS:

1. Modern Control Engineering, Kotsuhiko Ogata, 4th edition, Prentice Hall ofIndia.
2. Automatic control systems, Benjamin C.Kuo, Prentice Hall of India,2nd Edition.
3. Control Systems Engineering, Norman S.Nise, 6th edition, Wiley publication.

REFERENCE BOOKS:

1. Control Systems, ManikDhanesh N, 3rd edition, Cengagepublications .
2. Control Systems principles and design, M.Gopal, Tata McGraw Hilleducation Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, 4th edition, Tata McGraw HillPublications.

Course Outcomes:

Students will be able to

1. Ability to represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.
2. Ability to derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.
3. Capability to determine time response specifications of second order systems and to determine error constants.
4. Acquires the skill to analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method.
5. Capable to analyze the stability of LTI systems using frequency response methods.
6. Able to design Lag, Lead, Lag-Lead compensators to improve system performance from Bode diagrams.

B.Tech- VI Semester **COURSE CODE: UR20OEEE605A** **L T P C**
3 0 0 3

BATTERY MANAGEMENT SYSTEMS AND CHARGING STATIONS
(Open Elective-II)

Internal Marks: 30
External Marks: 70

Course Objectives
1. To introduce battery management system.
2. To study the characteristics of battery charging and discharging.

Unit-I
Introduction: Introduction to Battery Management System, Cells & Batteries, Nominal voltage and capacity, C rate, Energy and power, Cells connected in series, Cells connected in parallel, Electrochemical and lithium-ion cells, Rechargeable cell, Charging and Discharging Process, Overcharge and Undercharge, Modes of Charging.

Unit-II
Battery Management System Requirement: Introduction and BMS functionality, Battery pack topology, BMS Functionality, Voltage Sensing, Temperature Sensing, Current Sensing, BMS Functionality, High-voltage contactor control, Isolation sensing, Thermal control, Protection, Communication Interface, Range estimation, State-ofcharge estimation, Cell total energy and cell total power.

Unit-III
Battery State of Charge and State of Health Estimation, Cell Balancing: Battery state of charge estimation (SOC), voltage-based methods to estimate SOC, Model-based state estimation, Battery Health Estimation, Lithium-ion aging: Negative electrode, Lithium ion aging: Positive electrode, Cell Balancing, Causes of imbalance, Circuits for balancing.

Unit-IV
Modelling and Simulation: Equivalent-circuit models (ECMs), Physics-based models (PBMs), Empirical modelling approach, Physics-based modelling approach, Simulating an electric vehicle, Vehicle range calculations, Simulating constant power and voltage, Simulating battery packs.

Unit-V
Design of battery BMS: Design principles of battery BMS, Effect of distance, load, and force on battery life and BMS, energy balancing with multi-battery system

Text Books:

1. Plett, Gregory L. Battery management systems, Volume I: Battery modeling. Artech House, 2015.
2. Plett, Gregory L. Battery management systems, Volume II: Equivalent-circuit methods. Artech House, 2015.

Reference Books:

1. Bergveld, H.J., Kruijt, W.S., Notten, P.H.L "Battery Management Systems -Design by Modelling" Philips Research Book Series 2002.
2. Davide Andrea," Battery Management Systems for Large Lithium-ion Battery Packs" Artech House, 2010
3. Pop, Valer, et al. Battery management systems: Accurate state-of-charge indication for battery-powered applications. Vol. 9. Springer Science & Business Media, 2008.

Course Outcomes:

Students will be able to
1.Understand basic concept of battery management system.
2.Understand battery charging and discharging.
3.Understand battery SOE.
4.Understand modeling and simulation.
5.Understand battery life and BMS.
6.Understand protection and communication interface.

B.Tech- VI Semester COURSE CODE: UR20OEEE605B **L T P C**
3 0 0 3

FUNDAMENTALS OF UTILIZATION OF ELECTRICAL ENERGY
(Open Elective-II)

Internal Marks: 30
External Marks: 70

CourseObjectives:

1. To understand the operating principles and characteristics of traction motors with

respect to speed, temperature, loading conditions.

2. To acquaint with the different types of heating and welding techniques.
3. To study the basic principles of illumination and its measurement.
4. To understand different types of lightning system including design.
5. To understand the basic principle of electric traction including speed–time curves of different traction services.

UNIT – I:
Selection of Motors
Choice of motor, type of electric drives, starting and running characteristics–Speed control–Temperature rise–Applications of electric drives–Types of industrial loads–continuous–Intermittent and variable loads–Load equalization.

UNIT – II:
Electric Heating

Principle of heating – modes of heat transferAdvantages and methods of electric heating–Resistance heating induction heating and dielectric heating – Arc furnaces – Direct and indirect arc furnaces

Electric Welding
Principles of welding – types of welding- Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – III:
Illumination fundamentals
Introduction, terms used in illumination–Laws of illumination–Polar curves–Integrating
sphere–Lux meter–Discharge lamps, MV and SV lamps – Lumen or flux method of calculation - Sources of light.

UNIT – IV:
Various Illumination Methods
Comparison between tungsten filament lamps and fluorescent tubes–Basic principles of light control– Lighting systems – indoor / outdoor lighting Electrical lamps – discharge / arc lamps Sodium Vapour – High Pressure Mercury Vapour lamps Neon

lamps – Fluorescent tubes-Design of lighting and flood lighting–LED lighting Conservation of energy.- illumination calculations.

UNIT – V:

Electric Traction – I

System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement– Speed– time curves for different services – Trapezoidal and quadrilateral speed time curves-High speed transportation trains.Modern traction motors.

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

Reference Books:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1997.

Course Outcomes:

Students will be

1. Able to identify a suitable motor for electric drives and industrial applications
2. Able to identify most appropriate heating or welding techniques for suitable applications.
3. Able to understand various level of illuminosity produced by different illuminating sources.
4. Able to estimate the illumination levels produced by various sources and recommend
5. The most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view.
6. Able to determine the speed/time characteristics of different types of traction motors.

B.Tech- VI Semester **COURSE CODE: UR20OEEE605C**

L	T	P	C
3	0	0	3

INDIAN ELECTRICITY ACT
(Open Elective-II)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. National policy and plan and the joint responsibilities of state and central governments
2. Licensing and the provisions related to transmission and distribution of electricity
3. Regulatory commissions

UNIT - I:
National electricity policy and plan, generation of electricity Electricity Act: commencement, definitions, comments; national policy on standalone systems, nonconventional energy systems, electrification and local distribution for rural areas; joint responsibilities of state and central governments in rural electrification, requirement for setting up of generating station, hydro-electric generation, captive generation; duties of generating companies.

UNIT - II: Licensing, transmission and distribution of electricity Licensing: powers, procedures, conditions, amendments, revocation, provisions, directions, suspension and sale; inter-state and intra-state transmission; other provisions relating to transmission; provisions with respect to distribution licenses, electricity traders, supply -consumer protection: standard performance

UNIT - III: Tariff, works, CEA and Regulatory commissions Works of licenses, provisions relating to overhead lines; Constitution and functions of Central Electricity Authority (CEA), directions and certain powers; Constitution, powers and functions of state and central commissions, other provisions, proceedings and powers of appropriate commission, Grants, Fund, Accounts Audit and Report

UNIT - IV: Appellate Tribunal, Reorganisation of boards, offences and penalty Appellate Tribunal for electricity; investigation and assessment; reorganisation of boards; Offences and penalties.

UNIT - V: Special courts, Dispute resolution, other provisions and Miscellaneous Constitution of special courts, procedures, powers, appeal, revision; arbitration; protective clauses; miscellaneous and enactments.

Text Book:

1. The Electricity Act, 2003 {Act 36 of 2003, dt.2-6-2003, w.e.f. 10-6-2003 vide S.O. No. 669(E), dt. 10- 6-2003 published by Commercial Law Publishers (I) Pvt. Ltd.

Course Outcomes:

The students will be able to

1. Understand about national policy and plan and the joint responsibilities of state and central governments.
2. Get knowledge on licensing and the provisions related to transmission and distribution of electricity
3. Understand regulatory commissions.
4. Understand appellate tribunal for electricity
5. Understand special courts and dispute resolution.
6. Understand miscellaneous and enactments.

B.Tech- VII Semester COURSE CODE: UR20OEEE704A

L	T	P	C
3	0	0	3

CONCEPTS OF MICROPROCESSORS AND MICROCONTROLLERS
(Open Elective-III)

Internal Marks: 30
External Marks: 70

CourseObjectives:

1. To understand the organization and architecture of Micro Processor
2. To understand addressing modes to access memory
3. To understand 8051 micro controller architecture
4. To understand the programming principles for 8086 and 8051

UNIT–I:
Introduction to Microprocessor Architecture
Introduction and evolution of Microprocessors– Architecture of 8086– Register Organization of 8086–Memory organization of 8086– General bus operation of 8086– Introduction to 80286–80386 and 80486 and Pentium.

UNIT–II:
Minimum and Maximum Mode Operations
Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycletiming diagrams.

UNIT–III:
Assembly Language Programming
Assembly Directives–Macro's– Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE Features–Addressing modes and Instruction set of 8051– Assembly language programming of 8051– Development systems and tools.

UNIT–IV:
I/O Interface
8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255–Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086– DMA controller (8257)– Architecture–Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259).

UNIT–V:
Introduction to 8051 Micro Controller
Overview of 8051 Micro Controller– Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

Cyber physical systems and industrial applications of 8051
Applications of Micro Controllers– Interfacing 8051 to LED's–Push button– Relay's and Latch Connections– Interfacing Seven Segment Display–ADC and DAC Interfacing.

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V Hall, Mc–Graw Hill, 2nd Edition.
2. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
3. Ray and Burchandi, "Advanced Micro Processors and Interfacing", Tata McGraw–Hill.

REFERENCE BOOKS:

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw–Hill Companies –2005.
3. Ajit Pal, "Microcontrollers – Principles and Applications", PHI Learning Pvt Ltd, 2011.

Course Outcomes:

Students will be able to

1. Understand the microprocessor capability in general and explore the evalution of microprocessors.
2. Understand the addressing modes of microprocessors
3. Understand the micro controller capability
4. Program mp and mc
5. Interface mp and mc with other electronic devices
6. Develop cyber physical systems

B.Tech- VII Semester COURSE CODE: UR20OEEE704B

L	T	P	C
3	0	0	3

FUNDAMENTALS OF ELECTRIC VEHICLES

(Open Elective-III)

Internal Marks: 30
External Marks: 70

Course Objective:

1.To present a comprehensive overview of Electric and Hybrid Electric Vehicles.

UNIT -I INTRODUCTION TO ELECTRIC VEHICLE

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

UNIT –IIDRIVE SYSTEM

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology.

UNIT –III ELECTRIC PROPULSION

Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives

UNIT –IV ENERGY STORAGE SYSTEM

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT-V

HYBRID ELECTRIC VEHICLES

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

TEXT BOOKS:

1. Modern Electric, Hybrid Electric and Fuel Cell Vehicles – Fundamentals, Theory and Design – Mehrdad Ehsani, Uimin Gao and Ali Emadi – Second Edition – CRC Press, 2010.
2. Electric Vehicle Technology Explained – James Larminie, John Lowry – John Wiley & Sons Ltd, – 2003.
3. Electric Vehicle Battery Systems – Sandeep Dhameja – Newnes – New Delhi – 2002.

REFERENCE BOOKS:

1. Hybrid electric Vehicles Principles and applications With practical perspectives -Chris Mi, Dearborn – M. Abul Masrur, David Wenzhong Gao – A John Wiley & Sons, Ltd., – 2011.
2. Electric & Hybrid Vehicles – Design Fundamentals – Iqbal Hussain, Second Edition, CRC Press, 2011

Course Outcomes:

The students will be able to

1. Choose a suitable drive scheme for developing an electric hybrid vehicle depending on resources
2. Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
3. Choose proper energy storage systems for vehicle applications.
4. Identify various communication protocols and technologies used in vehicle networks.
5. Student understands the concept of Electric Propulsion.
6. Student understands driving system(operation) of electric vehicle

B.Tech- VII Semester **COURSE CODE: UR20OEEE704C** **L T P C**
3 0 0 3

Concepts of Internet of Things
(Open Elective-III)

Internal Marks: 30
External Marks: 70

Course Objectives:

The objectives of this course is to acquire knowledge on

1. Architecture and various technologies of Internet of Things.

2. Communication technologies used in the Internet of Things.

3. Connectivity of devices using web and internet in the IoT environment.

4. Various data acquisition methods and data handling using cloud for IoT applications.

5. IoT implementation for Smart Home, Smart city, etc.

UNIT - I:

The Internet of Things: An Overview of Internet of Things (IoT) – IoT framework – Architecture – Technology behind IoT – Sources of the IoT – M2M Communication – Examples ofIoT.

UNIT – II:

Design Principles for Connected Devices: Introduction –IoT/M2M systems, Layers and Designs Standardization – Communication Technologies – Data Enrichment, Consolidation and Device Management at Gateway – Ease of designing and affordability.

UNIT – III:

Design Principles for the Web Connectivity: Introduction – Web Communication protocols for Connected Devices - Message Communication protocols for Connected Devices – Web Connectivity for connected devices network. Introduction to Internet Connectivity Principles, Internet connectivity, Internet based communication – IP addressing in the IoT – Application Layer Protocols: HTTP, HTTPS, FTP, Telnet, WAP (Wireless Application Protocol).

UNIT–IV:

Data Acquiring, Organizing, Processing and Analytics: Introduction – Data Acquiring and Storage – Organizing the Data – Analytics. Data Collection, Storage and Computing Using a Cloud Platform: Introduction – Cloud computing paradigm for data collection, storage and computing – IoTas a service and Cloud Service Models - IoT cloudbased services using the Xively (Pachube/COSM), Nimbits and other platforms.

UNIT– V:

Sensor technology: Actuator, Sensor data communication protocols, Radio Frequency Identification technology, Wireless Sensor Network Technology. IoT application case studies: Smart Home, Smart Cities, Environment monitoring and Agriculture practices

TEXT BOOK:

1. Internet of Things: Architecture, Design Principles, Raj Kamal, McGraw Hill Education (India) Pvt. Limited, 2017.

REFERENCE BOOKS:

1. Designing the Internet of Things, Adrian McEwen and Hakim Cassimally, Wiley, First edition, 2013.

2. Getting Started with the Internet of Things, CunoPfister, O'reilly, 2011.

3. Internet of Things: A Hands-on Approach, ArshdeepBahga, and Vijay Madisetti, 2014

Course Outcomes:

The students should be able to

1. Know the various fundamentals, architectures and technologies of Internet of Things.
2. Discuss about various communication technologies used in the Internet of Things.
3. Acquire knowledge on the various device connectivity methods using web and internet in the IoT environment.
4. Explore various data acquisition methods, data handling using cloud for IoT applications.
5. Apply IoT to design Smart Home, Smart city, agriculture practices etc.
6. Data collection methods.

B.Tech- VII Semester **COURSE CODE: UR200EEE705A** **L T P C**
3 0 0 3

Concepts of Power System Engineering
(Open Elective-IV)

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To study the principle of operation of different components of a thermal power stations.
2. To study the principle of operation of different components of a Nuclear power stations.
3. To study the concepts of DC/AC distribution systems and voltage drop calculations.
4. To study the constructional and operation of different components of an Air and Gas Insulated substations.
5. To study the constructional details of different types of cables.
6. To study different types of load curves and tariffs applicable to consumers.

UNIT-I

Thermal Power Stations

Selection of site, general layout of a thermal power plant showing paths of coal, steam, water, air, ash and flue gasses, ash handling system, Brief description of components: Boilers, Super heaters, Economizers, electrostatic precipitators steam Turbines turbo alternators, Condensers, feed water circuit, Cooling towers and Chimney.

UNIT-II

Nuclear Power Stations

Location of nuclear power plant, working principle, nuclear fission, nuclear fuels, nuclear chain reaction, nuclear reactor Components: Moderators, Control rods, Reflectors and Coolants. Types of Nuclear reactors and brief description of PWR, BWR and FBR.
Radiation: Radiation hazards and Shielding, nuclear waste disposal.

UNIT-III
Renewable power plants:
Solar power generation: Photovoltaic and solar, concentrators.
Types of wind mills, wind generators, tidal, biomass, geothermal and micro. hydel power plants, fuel cells.

UNIT-IV

Substation:

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

Gas insulated substations (GIS) – Advantages, different types, single line diagram, Bus bar arrangement, construction aspects of GIS, Substation automation.

UNIT-V

Economic Aspects - Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor and plant use factor, Base and peak load plants.

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

TEXT BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagarand
A. Chakrabarti, DhanpatRai 5th edition & Co. Pvt. Ltd.
2. Generation, Distribution and Utilization of Electric Energy by C.L.Wadhawa, 4th edition,
New ageInternational (P) Limited, Publishers.

REFERENCE BOOKS:

1. Electrical Power Distribution Systems by - V. Kamaraju, TataMcGraw Hill, NewDelhi.
2. Elements of Electrical Power Station Design by – M V Deshpande, PHI, New Delhi.

Course Outcomes:

Students will be able to

1. Identify the different components of thermal power plants.
2. Identify the different components of nuclear Power plants.
3. Distinguish between AC/DC distribution systems and also estimate voltage drops of distribution systems.
4. Identifythe different components of air and gas insulated substations.
5. Identifyingle core and multi core cables with different insulating materials.
6. Analyzethe different economic factors of power generation and tariffs.

B.Tech- VII Semester **COURSE CODE: UR20OEEE705B** **L T P C**
3 0 0 3

CONCEPTS OF SMART GRID TECHNOLOGIES
(Open Elective-IV)

Internal Marks: 30
External Marks: 70

COURSE OBJECTIVES:

1.Smart Grid technologies, different smart meters and advanced metering infrastructure.
2.The power quality management issues in Smart Grid.
3.The high performance computing for Smart Grid applications.

UNIT I
INTRODUCTION TO SMART GRID
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid.

UNIT II
SMART GRID TECHNOLOGIES
Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plugin Hybrid Electric Vehicles(PHEV).

UNIT-III
SMART METERS AND ADVANCED METERING INFRASTRUCTURE
IntroductiontoSmartMeters,AdvancedMeteringinfrastructure(AMI)driversandbenefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices(IED)&their application for monitoring & protection.

UNIT IV
POWER QUALITY MANAGEMENT IN SMART GRID
Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNIT V
HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS
Local Area Network(LAN),House Area Network(HAN), Wide Area Network(WAN), Broad band over Power line(BPL),IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TEXT BOOKS:

1. Stuart Borlase “Smart Grid: Infrastructure, Technology and Solutions”,CRCPress2012.
2. JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama, “Smart Grid: TechnologyandApplications”,Wiley2012.

REFERENCE BOOKS

1. VehbiC. Güngör ,DilanSahin, Taskin Kocak, Salih Ergüt, ConcettinaBuccella, Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication Technologies and Standards” IEEE Transactions On Industrial Informatics, Vol.7,No.4, November2011.
2. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang“SmartGrid –The New and Improved Power Grid: A Survey” ,IEEE Transaction on Smart Grids,vol.14,2012.
3. James Momohe “Smart Grid: Fundamentals of Design and Analysis,”, Wiley-IEEE Press, 2012.

COURSE OUTCOMES:

Students will be able to
1.Develop more understanding on the concepts of Smart Grid and its present developments.
2.Study about different Smart Grid technologies.
3.Acquire knowledge about different smart meters and advanced metering infrastructure.
4.Have knowledge on power quality management in Smart Grids.
5.Develop more understanding on LAN,
6.Understand WAN and Cloud Computing for Smart Grid applications.

B Tech-V Semester **COURSE CODE: UR20MDEE03** **L T P C**
3 1 0 4

ANALYSIS OF LINEAR SYSTEMS

Internal Marks: 30
External Marks: 70

Pre- requisites:

Basics of electrical circuits and few mathematical concepts.

Course Objectives

1. To develop ability to analyze linear systems and signals
2. To develop critical understanding of mathematical methods to analyze linear systems and signals

UNIT-I: Basic signals and systems: Continuous and discrete time signals, Signal manipulation, Basic system properties.

Linear time invariant (LTI) systems:Discrete time convolution, Continuous time convolution, Relationship of generic system properties to the impulse response for an LTI system, Use of differential and difference equations as models for LTI systems.

UNIT-II Continuous time Fourier transform (CTFT): Definition and derivation of the CTFT, Fourier transform representation of periodic signals using the CTFT, Properties of the CTFT, Convolution-multiplication duality and the CTFT.

UNIT-III Discrete time Fourier transform (DTFT): Definition and derivation of the DTFT, Fourier transform representation of periodic signals using the DTFT, Properties of the DTFT, Convolution-multiplication duality and the DTFT.

UNIT-IV Sampling: Derivation and application of the Sampling Theorem for bandlimited signals, Derivation and application of bandlimited (sinc) interpolation, Aliasing.

UNIT IV: The Laplace transform: Definition and relationship of Laplace transform to CTFT, Region of convergence, Inverse Laplace transform via partial fraction expansion method, Geometry evaluation of the CTFT via the pole zero plot, Properties of the Laplace transform, Relationship of causality and stability to structure in the Laplace s plane.

UNIT V: Z transform: Derivation of Z transform from Laplace assuming ideal, delta function sampling, Relationship of Z transform to DTFT, Region of convergence, Inverse Z transform via partial fraction expansion method.

Text Books:

1. “B. P. Lathi”, “Signals, Systems and Communications”, BS Publications 2003.
2. “Umesh Sinha” “Network Analysis and Synthesis”, Satya Prakashan Publications, 2013.

Reference Books:

1. “A. N. Tripathi”, “Linear System Analysis”, New Age International, 2nd Edition 1987.
2. “D. Roy Chowdhary”, “Network and Systems”, New Age International, 2005.
3. “Gopal G Bhise, Prem R. Chadha”, Engineering Network Analysis and Filter Design, Umesh Publications 2009.
4. “A. Cheng”, linear system analysis, Oxford publishers, 1999

Course Outcomes:

students will be able to:

1. Understand the use of mathematical modeling tools to represent linear systems.
2. Understand the use mathematical modeling tools to analyze linear systems.
3. Understand the concept of DTFTfor solving problems.
4. Understand the concept of sampling.
5. Understand Laplace transforms and pole zero.
6. Understand Z transforms for solving digital problems.

B Tech-V Semester **COURSE CODE: UR20MDEE04** **L T P C**
3 1 0 4

ENERGY AUDITING, CONSERAVATION AND MANAGEMENT

Internal Marks: 30

External Marks: 70

Course Objectives:

1. To understand energy efficiency, scope, conservation and technologies.
2. To design energy efficient lighting systems.
3. To estimate/calculate power factor of systems and propose suitable compensation techniques.
4. To understand energy conservation in HVAC systems.
5. To calculate life cycle costing analysis and return on investment on energy efficient technologies.

Unit–I:

Basic Principles of Energy Audit and management

Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Piecharts –Sankey diagrams — Energy conservation schemes– Principles of energy management – Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions .

Unit–II:

Lighting

Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – types of lightning systems-indoor / outdoor lighting- Electrical lamps – discharge / arc lamps, Sodium Vapour – High Pressure Mercury Vapourlamps ,Neon lamps – Fluorescent tubes-Design of lighting and flood lighting, Conservation of energy.- illumination calculations.

Electric lighting fittings (luminaries)–Energy conservation measures.

Unit–III:

Power Factor and energy instruments

Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. EnergyInstruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

Unit–IV:

Space Heating and Ventilation

Ventilation – Air–Conditioning (HVAC) and Water Heating**:**Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning –Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

Unit–V

Economic Aspects and Financial Analysis

Understanding energy cost - Economics Analysis – Depreciation Methods – Time value of money – Cost benefit risk analysis- Present worth method – Replacement analysis – Life cycle costing analysis –Applications of life cycle costing analysis

Text Books:

1. Hand Book of Energy Audit by Sonal Desai- Tata McGraw hill
2. Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books:

1. Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevierpublications. 2012
2. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hillpublishing company Ltd. New Delhi.
3. Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
4. Energy management hand book by W.C.Turner, John wiley and sons.
5. Energy management and conservation –k v Sharma and pvenkataseshaiah-I KInternational Publishing House pvt.ltd,2011.

Course Outcomes:

Student will be able to

1. Understand energy efficiency, conservation and various technologies.
2. Design energy efficient lighting systems.
3. Calculate power factor of systems and propose suitable compensation techniques.
4. Understand energy conservation in HVAC systems.
5. Calculate life cycle costing analysis and return on investment on energy efficient technologies.
6. Understand cost benefit risk analysis.

B Tech-VI Semester **COURSE CODE: UR20MDEE05** **L T P C**
3 1 0 4

EVOLUTIONARY ALGORITHMS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To develop the understanding of evolutionary algorithms and multi-objective evolutionary optimization algorithms.
2. To develop the understanding of cloud computing, grid computing, internet of things, internet of vehicles, and others.
3. To learn the application of evolutionary algorithms for solving optimization problems in context of logistic and routing problems, Internet of vehicles, and others.

UNIT-I: Evolutionary Computation Computational Intelligence, Evolutionary Algorithms, Genetic Algorithm, Genetic Representations-Initial Population, Fitness Function, Genetic Operators-Selection, Crossover, Mutation and Repair, Variants of Genetic Operators; Artificial Immune Systems, Quantum Genetic Algorithm, Other Algorithms-Firefly Algorithm, Differential Evolution, and others.

UNIT-II: Multi-objective Evolutionary Computation Multi-objective Optimization, Pareto-optimality, Pareto Epsilon Model, Performance Indicators-Generational Distance, Generational Distance Plus, Inverted Generational Distance, Inverted Generational Distance Plus, Hypervolume; Multi-objective evolutionary algorithms Multi-objective Genetic Algorithm, Non-dominated Sorting Genetic Algorithm-II (NSGA-II), Strength Pareto Evolutionary Algorithm-II (SPEA-II) and others.

UNIT-III: NP-completeness and Optimization Problems NP-Completeness: Polynomial-time solvable problems, NP-complete problems, NP-hard problems; Optimization Problems-Scheduling Problem, Travelling salesman problem (TSP).

UNIT IV: Vehicle routing problem (VRP); Variants of VRP- Capacitated VRP, Open VRP, Dynamic VRP, Multi-depot VRP, Periodic VRP, VRP with time windows, VRP with simultaneous pickup and Delivery, VRP with stochastic demands and stochastic travel times, VRP with fuzzy demands, VRP with split deliveries; An integer programming formulation of VRP, Multi-depot VRP and VRP with split deliveries.

UNIT-V: Computing Paradigms Cluster Computing, Grid Computing, Cloud Computing: Service and Deployment Models, Internet of Things, Fog Computing, Internet of vehicles, Mobility, Performance, Computation offloading, Authentication and Trust Issues, Security Issues, Scalability and elasticity, energy consumption and other quality of service (QoS) parameters.

Text Book

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, Introduction to Algorithms, 3rd Edition, The MIT Press, 3rd Edition.

Reference Books:

1.P. Toth, D. Vigo, Vehicle Routing: Problems, Methods, and Applications, Second Edition, MOS-SIAM Series on Optimization.
2. P. Toth (Editor), D. Vigo (Editor), The Vehicle Routing Problem Discrete Math, SIAM, 1st Edition

Course Outcomes:

Students will be able to

1.Understand the details of evolutionary algorithms such as GA, NSGA-II.
2. Understand the concept of SPEA-II and other related algorithms.
3. Understand various evolutionary algorithms for solving optimization problems.
4. Understand problems such as vehicle routing problem and its variants.
5.Understand to propose and develop innovative evolutionary algorithms-based solutions for realworld problems.
6. Understand the context of logistic and routing problems, Internet of vehicles.

B Tech-VI Semester COURSE CODE: UR20MDEE06 **L T P C**
3 1 0 4

FUNDAMENTALS OF POWER ELECTRONICS

Internal Marks: 30

External Marks: 70

Pre- requisites:

Basic electronics.

Course Objectives:

1. To study the characteristics of various power semiconductor devices and to design firing
   circuits for SCR.
2. To understand the operation of single phase full–wave converters and analyze harmonics in the input current.
3. To study the operation of three phase full–wave converters.
4. To understand the operation of different types of DC-DC converters.
5. To understand the operation of inverters and application of PWM techniques for voltage
   control and harmonic mitigation.
6. To analyze the operation of AC-AC regulators.

UNIT–I:

Power Semi-Conductor Devices

Thyristors–Silicon controlled rectifiers (SCR's) –Basic theory of operation of SCR–Static characteristics– Turn on and turn off\ methods–Dynamic characteristics of SCR–Static V-I characteristics of TRIAC and modes of operation-Characteristics of power MOSFET and power IGBT– Snubber circuit design.

UNIT–II:

AC-DC Single-Phase Converters

Single phase diode bridge rectifier with capacitor filter-1-phase half wave controlled rectifiers – R load and RL load with and without freewheeling diode – 1-phase full wave controlled rectifiers (single phase fully controlled rectifier and single phase semi controlled rectifier) –bridge configuration – analysis with R load and RL load– continuous and discontinuous conduction

UNIT–III:

AC-DC 3-Phase Converters

3-phase half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled rectifier with R and RL load – 3-phase fully controlled rectifier with R and RL load – 3-phase semi controlled rectifier with R and RL load.

UNIT–IV:

DC–DC Converters

Analysis of Buck, boost and buck, buck-boost converters in ContinuousConduction Mode (CCM) and Discontinuous Conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM –design consideration of DC-DC converters in continuous conduction mode.

UNIT – V:
DC–AC Converters
Single phase full bridge inverters with R and RL loads – bipolar and unipolar PWM techniques- 3-phase square wave inverters – 120^0 conduction and 180^0 conduction modes of operation – PWM inverters – Quasi-square wave PWM – Sinusoidal pulse width modulation –third harmonic PWM- Space vector PWM.

AC – AC Regulators.

1-phase AC-AC regulator phase angle control with R and RL load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R load .

Text Books:
1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: Essentials & Applications by L.Umanand, Wiley, Pvt. Limited, India, 2009

Reference Books:
1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics: converters, applications & design -by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
5. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

Course Outcomes:
Student will be able to
1. Understand the characteristics of various power semiconductor devices and analyze the
   static and dynamic characteristics of SCR's.
2. Design firing circuits for SCR.
3. Understand the operation of single phase full–wave converters and analyze harmonics in
   the input current.
4. Understand operation of three phase full–wave converters.
5. Analyze the operation of different types of DC-DC converters.
6. Understand the operation of inverters and application of PWM techniques.

B Tech-VII Semester **COURSE CODE: UR20MDEE07** **L T P C**
3 1 0 4

NEURAL NETWORKS AND FUZZY LOGIC

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn basics of Artificial Intelligence system, ANN architectures and learning strategies.
2. To learn rules and algorithms
3. To know properties, operations and relations of fuzzy sets.
4. To learn fuzzification and defuzzification methods to develops fuzzy logic system.
5. To know applications of AI in electrical engineering such as Load frequency control.

UNIT - I: **Introduction to ANN:** Introduction of AI system, Historical Developments, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Characteristics of ANN.

UNIT - II: **ANN paradigm** McCulloch-Pitts Model, Learning Rules, Generalized Delta Rule, Single-layer feed-forward networks: – Perceptron, learning algorithm for perceptron- limitations of Perceptron model, Multi-layer feed-forward network (based on Back propagation algorithm)– Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Radial-basisfunction networks- Recurrent networks (Hopfield networks).

UNIT - III: **Classical & Fuzzy Sets** Introduction to classical sets – operations, properties and relations of Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT - IV**: Components of Fuzzy Logic System** Fuzzification, Membership value assignment, development of rule base and decision making system, Defuzzification to crisp sets, Defuzzification methods.

UNIT - V: **Applications of AI Techniques** Load forecasting, Load flow studies, Economic load dispatch, Load frequency control, Single area and two area power system, Small Signal Stability, Reactive power control, speed control of DC and AC Motors

Text Books:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by Rajasekharan and Pai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH,2006

Reference Books:

1. Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co., Boston, 2002. Klir G.J. &Folger T.A., "Fuzzy sets, Uncertainty and Information", Prentice –Hall of India
Pvt. Ltd., New Delhi, 2008.
2. Zimmerman H.J., "Fuzzy set theory and its Applications", Kluwer Academic Publishers Dordrecht, 2001.
3. Driankov, Hellendroonb, "Introduction to fuzzy control", Narosa Publishers, 2001.
4. Neural Networks – Simon Hakins , Pearson Education
5. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
6. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

Course Outcomes:

The students should be able to:

1.Understand about the Artificial Neuron Models, ANN architectures and learning strategies
2.Acquire knowledge on various learning algorithm of ANN.
3.Understand differentiate classical and fuzzy sets.
4.Apply the Fuzzification and defuzzification methods to design a Fuzzy logic controller.
5.Apply of AI Technique to Electrical engineering applications such as Load frequency control.
6. Understand economic load dispatch, stability and speed control of DC motor etc.

B Tech-VII Semester **COURSE CODE: UR20MDEE08** **L T P C**
3 1 0 4

CONCEPTS OF ELECTRICAL DRIVES AND IT'S APPLICATIONS

Internal Marks: 30
External Marks: 70

Course Objectives:

1. To learn the fundamentals of electric drive and different electric braking methods.
2. To analyze the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.
3. To discuss the converter control of dc motors in various quadrants.
4. To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. To learn the principles of static rotor resistance control and various slip power recovery schemes.
6. To understand the speed control mechanism of synchronous motors

UNIT–I

Fundamentals of Electric Drives

Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques– Four quadrant operation of drive (hoist control) – Braking methods: Dynamic – Plugging – Regenerative methods.-selection of motor ratings-closed loop operation of drive-AC drives and DC drives

UNIT–II

Controlled Converter Fed DC Motor Drives

1-phase half and fully controlled converter fed separately and self-excited DC motor drive – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics.-closed loop operation of DC motor

UNIT–III

DC–DC Converters Fed DC Motor Drives

Single quadrant – Two quadrant and four quadrant DC-DC converter fed separately excited and self-excited DC motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics – Four quadrant operation –closed loop operation chopper controlled DC excited drives below and above rated speeds

UNIT–IV

Stator side control of 3-phase Induction motor Drive

Stator voltage control using 3-phase AC voltage regulators – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by PWM voltage source inverter – closed loop operation of induction motor drive.

UNIT–V

Rotor side control of 3-phase Induction motor Drive

Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Speed torque characteristics.

Control of Synchronous Motor Drives

Separate control & self-control of synchronous motors – Operation of self-controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives.

TEXT BOOKS:

1. Fundamentals of Electric Drives – by G K DubeyNarosa Publications

2. Power Semiconductor Drives, by S.B.Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

REFERENCE BOOKS:

1.Electric Motors and Drives Fundamentals, Types and Applications, by Austin Hughes and Bill Drury, Newnes.

2.Thyristor Control of Electric drives – VedamSubramanyam Tata McGraw Hill Publications.

3. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI

Course Outcomes:

studentswill be able to:

1. Understand the fundamentals of electric drive and different electric braking methods.
2. Analyze the operation of three phase converter fed dc motors and four quadrant operations of dc motors using dual converters.
3. Understand the converter control of dc motors in various quadrants of operation
4. Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
5. Differentiate the stator side control and rotor side control of three phase induction motor.
6. Understand the speed control mechanism of synchronous motors