K.S.R.M. College of Engineering, Kadapa.

(AUTONOMOUS)

Department of Electrical and Electronics Engineering

V Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2002501	Linear Digital IC Applications	PCC	3	0	0	40	60	3
2	2002502	Power System - II	PCC	3	0	0	40	60	3
3	2002503	Power Electronics	PCC	3	0	0	40	60	3
4	20OExxx	Open Elective - I (OE - I)	OEC	3	0	0	40	60	3
5		Professional Elective Course - I (PEC-I)							
	2002504	Internet of Things	PEC	3	0	0	40	60	3
	2002505	Modern Control Theory	PEC	3	0	0	40	60	3
	2002506	Energy Conversion Systems	PEC	3	0	0	40	60	3
6	2002507	Power Systems - I Lab	PCC	0	0	3	40	60	1.5
7	2002508	Internet of Things Lab	PCC	0	0	3	40	60	1.5
8	2025509	Soft Skill Oriented Course	SC	1	0	2	40	60	2.0
9	2002510	Community Service Project	PROJ	0	0	0	100	00	1.5
10	20MC512	Constitution of India	MC	2	0	0	40	00	00
Total				18	00	08	60	480	21.5

VI Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	2002601	Microprocessor & Microcontrollers	PCC	3	0	0	40	60	3
2	2002602	Fundamentals of Electric Drives	PCC	3	0	0	40	60	3
3	2002603	Switchgear & Protection	PCC	3	0	0	40	60	3
4	20OExxx	Open Elective Course –II (OEC- II)	OEC	3	0	0	40	60	3
5		Professional Elective Course - II (PEC-II)							
	2002604	Power System Operation & Control	PEC	3	0	0	40	60	3
	2002605	HVDC Transmission	PEC	3	0	0	40	60	3
	2002606	Signals & Systems	PEC	3	0	0	40	60	3
6	2002607	Power Electronics Lab	PCC	0	0	3	40	60	1.5
7	2002608	Power System- II Lab	PCC	0	0	3	40	60	1.5
8	2004609	Advanced Programming Lab	ESC	0	0	3	40	60	1.5
9	2002610	Skill Advanced Course	SC	1	0	2	40	60	2.0
10	20MC612	Management Organizational Behavior	MC	2	0	0	40	00	00
Total				18	00	08	60	480	21.5

B. Tech., V Semester

Course Title	Linear and Digital IC Applications					B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2002501	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 2Hrs						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn the Op-Amps, Timers and PLLs, applications of Op-Amps, Introduce **Verilog** and its language elements to design digital systems, Design of different combinational and sequential digital circuits.

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

CO 1	Understand the operation and characteristics of OP-AMPs
CO 2	Analyze multivibrator circuits and 555 timers using OP-AMPs
CO 3	Apply PLL in various Communication applications
CO 4	Compare various digital logic families
CO 5	Simulate digital logic circuits using Verilog HDL

UNIT-I

Op-Amp & its Characteristics : Integrated circuits -types, classification, package types and temperature ranges, power supplies, OP-Amp Block diagram, ideal and practical OP-Amp specifications, DC and AC characteristics, 741 OP-Amp and its features, Inverting and non-inverting amplifier.

UNIT-II

Op-Amp Applications: Integrator and differentiator, difference and instrumentation amplifier, AC amplifier, V-I, I-V converters, comparators, Multivibrators, Triangular and square wave generators, Log and antilog amplifiers, precision rectifiers.

UNIT-III

Timers & Phase Locked Loops: Introduction to 555 Timer, functional diagram, Monostable and Astable operations, Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks, 565 PLL, applications.

UNIT–IV

Unipolar & Bipolar Logic Families: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic state electrical behavior, CMOS logic families, Bipolar logic, transistor logic, TTL families, CMOS/TTL interfacing, ECL, Comparison of logic families.

UNIT–V

Verilog HDL & Design Examples: HDL based Design flow, Program Structure, Logic system, Nets, Variables and Constants, Vectors and Operators, Arrays, Logical Operators and Expressions. Structural design elements, data flow design elements, behavioral design elements (procedural code). Design using basic gates, Decoders, Encoders, Multiplexers and Demultiplexers, Adders, Subtractors, SSI Latches and Flip-Flops, Counters, Design of Counters and Shift Registers .**Verilog** Modules for the above ICs.

Text Books

1. Ramakanth A. Gayakwad, “Op-Amps & Linear ICs”, 4th edition, PHI, 1987.
2. John F. Wakerly, “Digital Design Principles & Practices” PHI/Pearson Education Asia, 4th Edition, 2008.
3. J. Bhasker, “A Verilog HDL Primer”, Star Galaxy Publishing; 3rd edition (January 31, 2005)

References

1. D. Roy Chowdhury, “Linear Integrated Circuits”, New Age International (P) Ltd, 2nd Edition, 2003.
2. James M.Fiore, “Operational Amplifiers & Linear integrated circuits & applications”, Cengage 2009.
3. Fundamentals of Digital Logic with Verilog Design – Stephen Brown, Zvonko Vranesic, TMH, 3rd Edition, 2014

<table>
<tr><td>Course Title</td><td colspan="5">Power Systems - II</td><td colspan="3">B. Tech. V Semester (EEE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002502</td><td rowspan="2">Professional Core (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 2Hrs</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn transmission line performance, per unit system, fault analysis on transmission and iterative methods.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand various transmission lines, the formulation of impedance and admittance bus matrices for a power system network, symmetrical and unsymmetrical faults, importance of power flow studies.</td></tr>
<tr><td>CO 2</td><td colspan="8">Evaluate the performances of transmission lines and Y_{bus} for a given power system network</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze per unit quantities and fault calculations for various types of faults</td></tr>
<tr><td>CO 4</td><td colspan="8">Investigate the load flow studies using different iterative techniques</td></tr>
</table>

UNIT - I

Performance of Transmission Lines: Classification of transmission lines – short, medium and long line and their model representation – estimation of regulation and efficiency by nominal T, nominal π and rigorous methods - problems. equivalent T and π, surge impedance loading, Ferranti effect.

UNIT - II

System Modeling: Representation of power system components– per unit representations and advantages – single line diagram representation – impedance and reactance diagram – changing the base of per unit quantities.

UNIT - III

Symmetrical Fault Studies: Introduction to symmetrical fault analysis – short circuit capacity of a bus – the short circuit currents and the reactance of synchronous machines – internal voltages of loaded machines under transient conditions – expressions for fault MVA in terms of per unit and percentage quantities – need for current limiting reactors and their location.

UNIT - IV

Unsymmetrical Fault Studies: Symmetrical components – phase shift of symmetrical components in star-delta transformer banks – power in terms of symmetrical components –sequence impedances and sequence networks of synchronous machines, transmission lines, transformers – zero sequence networks of 3 Φ loads and 3 Φ transformer banks – unsymmetrical fault analysis on unloaded generator and on power systems with and without fault impedance.

UNIT - V

Load Flow Studies: Need for load flow studies in a power system – formation of bus admittance matrix – classification of types of buses in a power system – formulation of load flow equations – gauss-seidel iterative method for load flow studies – treatment of pv bus – acceleration factors – problems (sample one iteration only), newton - raphson method in rectangular and polar coordinates – formulation of load flow solution with or without pv buses – derivation of jacobian elements, algorithm and flowchart.

Text Books:

1. Elements of power system analysis, William. D. Stevenson, 4th Edition Jr., MGH
2. Modern Power System Analysis by I. J. Nagarath & D. P. Kothari, TMH, 2nd Edition.
3. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U. S. Bhatnagar, Chakrabarti, Dhanpat Rai & Co Pvt. Ltd., 2003.

Reference Books:

1. Electrical power systems by C. L. Wadhwa, New Age International publications.
2. A course in Power Systems by J. B. Gupta, S. K. Kataria & Sons, 11th Edition, 2013.

Course Title	Power Electronics					B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2002503	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 2Hrs						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn the basic concepts of power semiconductor devices, converters, choppers and inverters and their analysis.

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

CO 1	Understand the basic operation of power semiconductor devices and passive components
CO 2	Analyze the performance of different power converters subjected to various loads
CO 3	Design static and dynamic equalizing circuits, Snubber circuits
CO 4	Evaluate the number of SCRs required for desired series /parallel operation, Electrical parameters and different variables of various power electronic circuits

UNIT - I

Silicon Controlled Rectifier: SCR – static characteristics –turn on and off mechanism – gate characteristics – dynamic characteristics – series and parallel operation of scr's – static and dynamic equalization circuits – design of snubber circuit – line commutation and forced commutation circuits, MOSFET, IGBT, GTO Characteristics.

UNIT - II

Phase controlled Rectifiers: Phase controlled rectifiers – single phase half and fully controlled converters – midpoint and bridge connections with R and RL loads – effect of source inductance- single phase and three phase half and fully controlled converters with R load - single phase and three phase dual converters with R and RL loads-numerical problems.

UNIT - III

AC Voltage Controllers: AC voltage controllers- single phase ac voltage controllers with SCR and triac for R and RL load –cyclo converters – single phase cyclo converters (mid-point and bridge configuration) with R and RL loads.

UNIT - IV

Choppers: Choppers – principle of operation – control strategies- types of chopper circuits – type A, type B, type C, type D and type E chopper circuits - multiphase chopper circuits – buck converter, boost converter, buck -boost converter, problems.

UNIT - V

Inverters: Inverters – single phase inverter – basic series inverter – basic parallel capacitor inverter – bridge inverter– current source inverter - forced commutation circuits for bridge inverters – output voltage control techniques- PWM techniques- space vector modulation - harmonic reduction techniques.

Text Books

1. Power Electronics – By M.D Singh & K.B. Kanchandhani, Tata McGraw Hill Publishing Company, 1998.
2. Power Electronics - Circuits, Devices and Applications – by M.H. Rashid, Prentice Hall of India, 2nd Edition 1998.
3. Power Electronics- by PS Bimbhra, Khanna Publications.

Reference Books

1. Power Electronics – By Vedam Subramanyam, New Age Information Limited, 3rd Edition.
2. Power Electronics – By V.R. Murthy, Oxford University Press, 1st Edition – 2005
3. Power Electronics – By P.C Sen, Tata Mc Graw Hill Publishing.
4. Thyristorised Power Controllers – By G.K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age Informational(p) Limited Publishing 1996.

<table>
<tr><td>Course Title</td><td colspan="5">Internet of Things (PEC- I)</td><td colspan="3">B. Tech. V Semester (EEE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002504</td><td rowspan="2">Professional Elective Course (PEC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 2Hrs</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="8">Course Objectives: The objective of the course is to learn the basic concepts of Internet of Things and its applications.</td></tr>
<tr><td colspan="8">Course Outcomes: On successful completion of this course, the students will be able to:</td></tr>
<tr><td>CO 1</td><td colspan="7">Understanding IoT technology</td></tr>
<tr><td>CO 2</td><td colspan="7">Learning basic IoT Elements</td></tr>
<tr><td>CO 3</td><td colspan="7">Understanding basics of python programming</td></tr>
<tr><td>CO 4</td><td colspan="7">Working with Arduino and Raspberry pi board</td></tr>
</table>

UNIT-I

Introduction to Internet of Things: Definition and Characteristics of IoT, Physical Design of IoT-Things in IoT, IoT Protocols, Logic Design of IoT-Functional Blocks, Communication Models ,IoT Enabled Technologies-Wireless Sensor Networks, Communication protocols, Embedded Systems, IoT Levels and Templates

UNIT-II

Elements of IoT: What is an IOT Device, Basic Building blocks of an IT Device, Sensors, Actuators, Details of Arduino-About Board Peripherals, Details of Raspberry Pi-About Board Peripherals.

UNIT-III

Logic Design: Introduction to Python, Python Data Types-Numbers, Strings ,Lists, Tuples, Dictionaries, Type Conversions, Control Flow, Functions, Modules

UNIT-IV

IoT Application Development: Programming Arduino- Controlling LED, Interfacing an LED and Switch ,Interfacing a Light Sensor. Programming Raspberry Pi- Controlling LED, Interfacing an LED and Switch, Interfacing a Light Sensor.

UNIT-V

Case Studies of IoT: Smart Lighting, Smart Irrigation, Weather Monitoring System, Smart Parking

Text Books:

1. "INTERNET OF THINGS a Hand on Approach" by Arshdeep Bahga,Vijay Madisetti, Universities Press.
2. "Getting Started with the Internet of Things" by Cuno Pfister,o' REYLLY.

Course Title	Modern Control Theory (PEC - I)				B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2002505	Professional Elective Course (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 2Hrs					End Exam Duration : 3Hrs		

Course Objectives: Students are able to learn the State Space, Describing function, phase plane and stability analysis including controllability and observability.

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

CO 1	Understand the concept of Compensators, Controllers and State—Space techniques
CO 2	Analyze the stability of linear and nonlinear Systems
CO 3	Construct the state model of linear time invariant systems and Lyapunov functions for nonlinear systems
CO 4	Determine Eigen values, state transition matrix examine the controllability and observability of linear time invariant systems
CO 5	Design compensators controllers state feedback controller and observer

UNIT – I

Linear System Design: Introduction of compensating networks – Lead, Lag, lead – lag cascade compensation in time domain- PI, PD and PID controllers, design using bode plot and root locus techniques.

UNIT – II

State variable descriptions: Concepts of state, state variables, state vector, state space model, representation in state variable form, phase variable representation – solution of state equations – state transition matrix.

UNIT – III

Controllability and Observability: Definition of controllability – controllability tests for continuous linear time invariant systems – Definition of observability – observability tests for continuous linear time invariant systems, Diagonalization – canonical variable representation.

UNIT – IV

Design of Control Systems: Introduction, Pole placement by state feedback, Full order and reduced order observers,

UNIT – V

Stability: Introduction, equilibrium points – stability concepts and definitions – stability in the sense of liapunov stability of linear system – methods of constructing liapunov functions for non – linear system – krasovskii's method – variable gradient method.

Text Books

1. Modern Control System Theory by M. Gopal, New Age International Publishers, 2nd edition, 1996.
2. Control System Engineering by I. J. Nagarath and M. Gopal, New Age International (P) Ltd.

Reference Books

1. Modern Control Engineering by K. Ogata, Prentice Hall of India, 3rd Edition, 1998.
2. Systems and Control by Stainslaw, H. Zak, Oxford Press, 2003.
3. Digital Control and State Variable Methods by M. Gopal, TMH, 1997.

Course Title	Energy Conversion Systems				B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2002506	Professional Elective Course (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 2Hrs					End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn about energy conversion techniques, sources of electrical energy production and impact of energy conversion systems on the environment.

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

CO 1	Understand the principles and applications of various non-conventional energy systems and energy storage
CO 2	Analyze the properties and characteristics of wind, turbines and generators used in tidal power
CO 3	Analyze the solar cell operation and its test specifications
CO 4	Analyze the impact of energy conversion systems on the environment and remedial measures

UNIT I

Photovoltaic Power Generation: Spectral distribution of energy in solar radiation, solar cell configurations, voltage developed by solar cell, photo current and load current, practical solar cell performance, test specifications for PV systems.

UNIT II

Wind Energy Conversion: Power from wind, properties of air and wind, types of wind Turbines, operating characteristics.

UNIT III

Tidal Power Station: Tides and tidal power stations, modes of operation, tidal project examples, turbines and generators for tidal power generation.

Ocean Energy Conversion: Types of ocean thermal energy conversion systems, Application of OTEC systems examples.

UNIT IV

Miscellaneous Energy Conversion Systems: biomass conversion, geothermal energy, thermoelectric energy conversion, principles of EMF generation, description of fuel cells**.** Types of fuel cells, H_2-O_2 Fuel cells, Application of fuel cells – Batteries, Description of batteries, Battery application for large power.

UNIT V

Environmental Effects: Environmental Effects of energy conversion systems, pollution from coal and preventive measures, steam stations and pollution, acid rain, pollution free energy systems and nuclear power station pollution.

Text Books

1. "Energy conversion systems" by Rakosh das Begamudre, New age international Private Ltd., publishers, 1st Edition, 2000.
2. "Renewable Energy Resources" by John Twidell and Tony Weir, CRC Press (Taylor & Francis).

Course Title	Power Systems - I Lab				B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2002507	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	3	40	60	100
						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to determine the sequence impedances of alternators and transformers, study the faults on an unloaded synchronous machine, characteristics of relays and simulate the power flows

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

CO 1	Evaluate sequence Impedances of 3 Phase Alternator and Transformers.
CO 2	Compare the fault Currents for different faults on unloaded Synchronous Generators.
CO 3	Analyze the Characteristics of Relays
CO 4	Estimate the line parameters of a transmission line

List of experiments (Any Eight)

1. Power Angle Curve of a synchronous Generator
2. Determination of sequence reactance of 3-Φ Alternator
3. Determination of sequence impedance of 3-Φ Transformer
4. Operating Characteristics of Over Current-Relay
5. Operating Characteristics of Over/Under Voltage-Relay
6. Operating Characteristics of Differential Relay
7. Ferranti effect, Surge impedance loading and ABCD parameters of 220kV transmission line
8. Symmetrical Fault Analysis at the Terminals of an Unloaded 3-Φ Alternator
9. Single Line to Ground Fault and Line to Line Fault with and without impedance at the Terminals of an Unloaded 3-Φ Alternator
10. Double line to Ground Fault with and without impedance at the Terminals of an Unloaded 3-Φ Alternator

Course Title	Internet of Things (IoT) Lab				B. Tech. V Semester (EEE)		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2002508	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn the basics of Arduino/ Raspberry Pi, Sensors, Actuators and design applications relevant to the IoT Technologies

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

CO 1	Understand the Concepts of IoT
CO 2	Understand Software and Hardware skills of Arduino / Raspberry Pi
CO 3	Able to Develop the C/Python Programming on Arduino / Raspberry Pi
CO 4	Design Simple Applications of IoT

List of Experiments (Any Eight)

1. To interface LED,s with Arduino / Raspberry Pi and write a program to build a Binary Counter.
2. To interface Push button with Arduino / Raspberry Pi and write a program to turn ON/OFF LED when push button is pressed .
3. To interface Potentiometer with Arduino / Raspberry Pi and write a program to Create Dimmable LED.
4. To interface LDR with Arduino / Raspberry Pi and write a program to turn ON RGBLED to get Mixing Primary Colors.
5. To interface IR Sensor with Arduino / Raspberry Pi and write a program to turn ON LED when sensor detects an object.
6. To interface an Ultrasonic Sensor with Arduino / Raspberry Pi and write a program to Measure how much is the distance of the object from the Sensor on LCD Display.
7. To interface a Servo motor with Arduino / Raspberry Pi and write a program to rotate the Servo motor.
8. To interface OLED with Arduino / Raspberry Pi and write a program to print LED ON/OFF.
9. To interface BULB using relay with Arduino / Raspberry Pi and write a program to turn ON/OFF the Bulb.
10. To interface a DHT11 sensor with Arduino / Raspberry Pi and write a program to print temperature and humidity readings.
11. To interface Bluetooth with Arduino / Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from a smartphone using Bluetooth.
12. Write a program on Arduino / Raspberry Pi to upload temperature and humidity data to ThingSpeak cloud.

Reference Books

1. Dr. SRN Reddy, Rachit Thukral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi
3. Adrian McEwen, "Designing the Internet of Things", Wiley
4. Cuno Pfister, "Getting Started with the Internet of Things", O Reilly Media

<table>
<tr><td>Course Title</td><td colspan="5">Soft Skill Oriented Course
(Advanced English Communication Skills)</td><td colspan="3">B. Tech. V Semester (EEE)</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002509</td><td rowspan="2">Skill Course (SC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>1</td><td>--</td><td>2</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objectives of this course is to make the students interpret using language effectively in Group Discussions, develop the required skills for facing interviews and public speaking, analyze improving of language proficiency, build confidence by exposing to various situations and contexts for their successful professional career and develop them industry – ready</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Interpret using language effectively in Group Discussions</td></tr>
<tr><td>CO 2</td><td colspan="8">Develop the required skills for facing interviews and public speaking</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze improving of language proficiency</td></tr>
<tr><td>CO 4</td><td colspan="8">Build confidence by exposing to various situations and contexts for their successful professional career</td></tr>
<tr><td>CO 5</td><td colspan="8">Develop them industry - ready</td></tr>
</table>

Introduction

A course on Advanced English Communication Skills (AECS) is considered essential at the third year level of B.Tech course. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

A. Syllabus:

The following course content is prescribed for the Advanced English Communication Skills:

1.Functional English -- Starting & Responding to a Conversation-- Social Etiquette, Formal and informal Conversation -- Role play – Body language in conversation—departing phrases.

2.Technical Report Writing --- Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis, sample report.

3.Resume' Writing --- Structure, format and style, planning, defining the career, objective, projecting one's strengths and skills, creative self-marketing, cover letter.

4.Group Discussion--- Communicating views and opinions, discussing, intervening.Providing solutions on any given topic across a cross-section of individuals, (keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

5. Interview Skills --- Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing.

B. Minimum Requirements

The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P.A System, a TV, A digital stereo-audio and video system, Camcorder etc.

System Requirements (Hardware Components):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-Van Solutions.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. Technical writing and professional communication, Huckin and Olsen Tata McGraw-Hil 2009.
2. Speaking about Science, A Manual for Creating Clear Presentations by Scott Morgan and Barrett Whitener, Cambridge University press, 2006.
3. Handbook for Technical Writing by David A McMurrey& Joanne Buckely CENGAGE Learomg 2008.
4. Technical Communication by Meenakshi Raman &Sangeeta Sharma, Oxford University Press 2009.
5. The ACE of Soft Skills by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010.
6. Cambridge English for Job-Hunting by ColmDownes, Cambridge Unicversity Press, 2008.
7. Resume's and Interviews by M. Ashraf Rizvi, Tata McGraw-Hill, 2008.
8. From Campus to Corporate by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010.
9. English Language Communication: A Reader cum Lab ManualDr A Ramakrishna Rao, Dr G Natanam& Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.

Course Title	Community Service Project				B. Tech. V Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2002510	PROJ	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		--	--	3	1.5	100	--	100
Course Objective: The objective of the project is to enable the student to take up investigative study for social relevance.								
On successful completion of this course, the students will be able to								
CO 1	Understand core concepts and research findings relative to human development, socialization, group dynamics and life course processes.							
CO 2	Identify and transfer existing ideas into new contexts and applications							
CO 3	Apply and transfer academic knowledge into the real-world.							
CO 4	Design a component or a product applying all the relevant standards and with realistic constraints							

The following are the rules and regulation for **Community Service Projects:**

1. The student has to spend 50 to 60 Hrs in the semester on any project (Social Relevance) and submit a report for evaluation.
2. The project is evaluated for 100 marks in the semester by a committee consisting of head of the department, project mentor and one senior faculty member of the department.
3. A student shall acquire 1.5 credits assigned, when he/she secures 50% or more marks from the total of 100 marks.
4. In case, if a student fails, he/she shall resubmit the report.
5. There is no external evaluation for the socially relevant project.

<table>
<tr><td>Course Title</td><td colspan="5">Constitution of India</td><td colspan="3">B. Tech. V Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20MC512</td><td rowspan="2">Mandatory Course (MC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td><td>40</td><td>00</td><td>30</td></tr>
<tr><td colspan="6">Mid Exam Duration : 1Hr30M</td><td colspan="3"></td></tr>
<tr><td colspan="9">Course Objectives: The main objective of the course is to learn
1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik.
4. Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="8">Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.</td></tr>
<tr><td>CO 2</td><td colspan="8">Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.</td></tr>
<tr><td>CO 3</td><td colspan="8">Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.</td></tr>
<tr><td>CO 4</td><td colspan="8">Discuss the passage of the Hindu Code Bill of 1956.</td></tr>
</table>

UNIT - I

History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working), Philosophy of the Indian Constitution: Preamble Salient Features.

UNIT - II

Contours of Constitutional Rights & Duties: Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.

UNIT - III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.

UNIT - IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayati raj: Introduction, PRI: Zila Panchayat., Elected officials and their roles, CEO Zilla Panchayat: Position and role.

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 and Functioning. Chief Election Commissioner and Election Commissioners.

State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

Reference Books:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.

B. Tech., VI Semester

Course Title	Microprocessors & Microcontrollers				B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2002601	Professional Core Course (PCC)	L	T	P	C	Continuous Internal Assessment	End Exams	Total
		3	--	--	3	40	60	100
Mid Exam Duration : 1Hr30M					End Exam Duration: 3Hrs			

Course Objectives: The objective of the course is to learn 8086 Microprocessor and 8051 Microcontroller Architecture, Instructions, Operating Modes and Programming, 8086 microprocessor and 8051 microcontroller for various applications and to study various peripherals for microprocessor based systems.

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

CO 1	Define various components and list out various features of microprocessor, microcontroller and peripherals.
CO 2	Describe the internal block diagram of microprocessor, microcontroller and peripherals, addressing modes, instruction set and data transfer schemes.
CO 3	Develop algorithm and assembly language programs to solve problems.
CO 4	Apply an appropriate algorithm, program and peripheral for the application.
CO 5	Design the microprocessor or microcontroller based system to solve real time problems. (Prepare a case study model to get a first prototype)

UNIT - I

Introduction to Microprocessors: 8085 Microprocessor - Architecture, Instruction set, Addressing modes, Basic Timing Diagrams, Interrupts and Simple Programs.

8086 Microprocessor - Architecture, Instruction set, Addressing modes, Interrupt system. Pin diagram, Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT - II

Assembly Language Programming: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, look-up tables, string manipulations, Macros and Delay subroutines.

Data transfer schemes and Memory Interfacing: Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Address decoding techniques, Interfacing Static RAM and ROM chips,

UNIT - III

Peripheral Interfacing: 8255 PPI and its interfacing, Programmable Communication Interface (8251 USART) and its interfacing, Programmable Interval Timer (8254) and its interfacing, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller (8257) and its interfacing, ADC and DAC Interfacing.

UNIT - IV

The 8051 microcontroller: Architecture, pin diagram, memory organization, external memory interfacing, stack, addressing modes, instruction set, Assembler directives, Assembly Language programs and Time delay Calculations, 8051 interrupt structure, 8051 counters and Timers, programming 8051 timers.

UNIT - V

Introduction to ARM: ARM Design philosophy, Registers, Program Status Register, Instruction pipeline, Interrupts and vector table, Instruction Set- Data Processing Instructions, Branch, Load-Store, Software interrupt, PSR instructions, Conditional instructions, Thumb instruction Set: Register Usage, Single-Register and Multi Register Load-Store Instructions.

Text Books:

1. Ramesh S. Gaonkar, “Microprocessor architecture, programming and its applications with 8085”, Penram International Publications, 4th Edition.
2. A. K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.

3. The 8051Microcontroller and Embedded Systems, Mazidi Muhammad Ali, Mazidi Janice Gillespie & McKinlay Rolin D, 2nd Edition, Pearson Education, 2008.
4. The 8051 microcontroller: Architecture, Programming & Applications, Kenneth J Ayala, penram publications, 2nd edition.

Reference Books:

1. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd Edition, Tata McGraw-Hill.
2. Barry B. Brey, "The Intel Microprocessors-Architecture, Programming and Interfacing", 8th Edition, PHI.
3. Y. Liu and Glenn A. Gibson, "Microcomputer Systems: 8086/8088 Family Architecture, Programming and Design", 2nd Edition, PHI.
4. Microcontrollers Architecture, Programming, Interfacing and System Design – Raj Kamal, Pearson Education, 2005.

<table>
<tr><td>Course Title</td><td colspan="5">Fundamentals of Electric Drives</td><td colspan="3">B. Tech. VI Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002602</td><td rowspan="2">Professional Core Course (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 1Hr30M</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="8">Course Objectives: The objective of the course is to learn various speed control methods of AC & DC drives fed from power converters, multi-quadrant operation of drives and conservation of energy in electrical drives</td></tr>
<tr><td colspan="8">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="7">Understand block diagram and dynamics of electrical drives</td></tr>
<tr><td>CO 2</td><td colspan="7">Acquire the knowledge of power electronic converters and their control to AC and DC machines.</td></tr>
<tr><td>CO 3</td><td colspan="7">Analyze the working operation and solution to numerical problems of the drives and machines.</td></tr>
<tr><td>CO 4</td><td colspan="7">Apply the acquired knowledge in implementation and choosing of power electronic converters to their relevant motors</td></tr>
<tr><td>CO 5</td><td colspan="7">Understand energy conservation in electrical drives with the usage of efficient motors and converters</td></tr>
</table>

UNIT – I

Electrical Drives: Introduction – Electrical Drives, Advantages of Electrical Drives, Block Diagram of Electrical drives – status of dc and ac drives.

Dynamics of Electrical Drives: Fundamental Torque Equation, Speed-Torque Convention and multi quadrant operation, loads with rotational motion, loads with translational motion, measurement of moment of inertia, components of load torques, Nature and classification of load torques.

UNIT – II

Control of Electrical DC-Drives –Modes of operation, speed control and drive classifications, closed loop control of drives.

D.C. Motor Drives: Speed control, Armature voltage control, and Controlled rectifier fed DC drives 1-Φ and 3-Φ fully controlled and half controlled converter fed separately Excited D.C. Motor (discontinuous and continuous mode), chopper controlled DC drives (separately Excited motor)- Braking Methods.

UNIT – III

Control of Induction Motor from Stator Side: Variable voltage Characteristics-Control of Induction Motor by Ac Voltage Controllers – Waveforms – speed torque characteristics. Variable frequency and Variable voltage control of induction motor by Voltage source inverter, Closed loop operation of induction motor drive (Block Diagram Only)

Control of Induction Motor from Rotor Side: Static rotor resistance control – Slip power recovery – Static Scherbius drive – Static Kramer Drive – their performance and speed torque characteristics

UNIT – IV

Synchronous Motor Drives –Cylindrical rotor wound field motor-salient pole wound filed motor- Torque Expression – self-controlled synchronous motors employing load commutated Thyristor inverter, self-controlled synchronous motors employing Cyclo converter, Brushless DC motor Drives – BLDC for servo applications.

UNIT – V

Energy Conservation in Electrical Drives – Losses in Electrical Drive System, Measures of energy conservation in Electrical drives, use of efficient Converters, Energy Efficient operation of drives, improvement of P.F.- improvement of quality of supply- maintenance of motors.

Text Books

1. Fundamentals of Electrical Drives by G. K. Dubey, Narosa Publications
2. Power Electronic Circuits, Devices and Applications by M. H. Rashid, PHI

Reference Books

1. Power Electronics by M.D. Singh and K. B. Khanchandani, TMH, 1998.

2. Modern Power Electronics and AC Drives by B. K. Bose, PHI.
3. Thyristor Control of Electric Drives by Vedam Subramanyam, TMH
4. Analysis of Thyristor Power Conditioned Motors by S. K. Pillai, Universities Press, 1st edition.

Course Title	Switchgear & Protection				B. Tech. VI Semester		
Course Code	Category	Hours/Week		Credits	Maximum Marks		
2002603	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Mid Exam Duration : 1Hr30M					End Exam Duration : 3Hrs		

Course Objectives: The main objective of the course is to learn about the different types of electromagnetic relays and microprocessor based relays, protection of Generators, Transformers, feeders and lines, Generation of over voltages and protection from over voltages, The technical aspects involved in the operation of circuit breakers.

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

CO 1	Identify the Main Components And Features Of A Protection System
CO 2	Understand Fault Clearing Phenomena And Feasibility Protection Systems Needed For Power System
CO 3	Understand Construction And Working Of Various Types Of Circuit Breakers And Relays
CO 4	Applying Conventional And Numerical Relays The Protection Of Rotating Machines Bus bars Transformers Transmission Lines And Distribution Networks

UNIT-I

Over Voltages in Power Systems: Cause of over voltages, protection against lightning over voltages, ground wires, counterpoises, surge absorbers and surge diverters ,lightning arresters(valve type),ratings of Lightning arresters, insulation coordination, neutral earthing-types.

UNIT-II

Circuit Breakers: Elementary principles of arc interruption, restriking and recovery voltages, average and maximum RRRV, numerical problems. Current chopping and resistance switching-circuit breaker ratings, auto reclosure and problems. Description and operation of minimum oil circuit breakers, air break circuit breakers, vacuum circuit breakers and sulphur hexafluoride circuit breakers.

UNIT-III

Protective Relays: Basic requirements of relays, relay terminology, types of relays, electromagnetic relays (attraction type and induction type). Construction and operation of non-directional and directional over current relays, universal torque equation, operating characteristics of impedance, reactance and admittance relays. Principle and operation of differential and percentage differential relays.

Static Relays: Advantages and Dis-advantages, amplitude comparators and phase comparators.

UNIT-IV

Protection of Generators: protection of generators against stator faults, rotor faults and abnormal running conditions, restricted earth fault protection and inter turn fault protection, numerical problems on percentage winding unprotected.

Protection of Transformers: Percentage differential protection of transformers, numerical problems on design of CT's ratio, Buchholz relay.

UNIT-V

Protection of Feeders and Lines: Protection of feeders (radial and ring main) using over current relays, protection of transmission lines by three zone protection using distance relays, carrier current protection and protection of bus-bars.

Text Books:

1. Power System Protection and Switchgear by Badriram & D. N. Vishwakarma, TMH Publishing Company Ltd., 1995.
2. Electrical Power Systems by C. L. Wadhwa, New Age International (P) Limited, 3rd Edition.

Reference Books:

1. Fundamentals of Power System Protection by Y. G. Paithanakar and S. R. Bhide, PHI, 2nd Edition.
2. Power System Protection and Switchgear by Bhuvanesh Oza, TMH, 2010.

<table>
<tr><td>Course Title</td><td colspan="5">Power System Operation & Control (PEC – II)</td><td colspan="3">B. Tech. VI Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002604</td><td rowspan="2">Professional Core (PCC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>3</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="5">Mid Exam Duration : 1Hr30M</td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="8">Course Objectives: The objective of the course is to learn steady state and transient stability analysis, economic operation of power systems, hydrothermal scheduling, modeling of governor, generator, single area and two area load frequency control.</td></tr>
<tr><td colspan="8">Course Outcomes: On successful completion of this course, the students will be able to</td></tr>
<tr><td>CO 1</td><td colspan="7">Analyze the stability of the power system under different operating conditions</td></tr>
<tr><td>CO 2</td><td colspan="7">Understand optimal operation of thermal unit, hydrothermal scheduling and modeling of power system components for LFC studies.</td></tr>
<tr><td>CO 3</td><td colspan="7">Analyze economic operation criteria of thermal unit, hydrothermal units, modeling of turbine and governor.</td></tr>
<tr><td>CO 4</td><td colspan="7">Analyze load frequency control parameters in single and two area systems.</td></tr>
<tr><td>CO 5</td><td colspan="7">Design suitable controllers to improve LFC dynamics in single and two area power systems.</td></tr>
</table>

UNIT I

Stability Studies: Classification of stability studies – the power flow equations of wound rotor and salient pole synchronous machine connected to an infinite bus through a transmission system – power angle diagrams – steady state stability and limits.

Transient Stability Analysis: General considerations and assumptions –inertia constant, derivation of swing equations, equal area criterion – application of equal area criterion to a) sudden increase in input b) sudden three phase fault on one of the lines of a transmission system – determination of critical clearing angle – clearing time- – limitations of equal area criterion, methods for improving power system stability.

UNIT II

Economic Operation: Optimal operation of thermal power units, - 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 III

Hydrothermal Scheduling: optimal scheduling of hydrothermal system: hydroelectric power plant models, scheduling problems- short term hydrothermal scheduling problem.

Modeling of Turbine: First order turbine model, block diagram representation of steam turbines and approximate linear models.

Modeling of Governor: Mathematical modeling of speed governing system , derivation of small signal transfer function – block diagram.

UNIT IV

Load Frequency Control - I: Necessity of keeping frequency constant, definitions of control area, single area control, block diagram representation of an isolated power system, steady state analysis dynamic response, uncontrolled case.

UNIT V

Load Frequency Control-II: Load frequency control of two -area system – uncontrolled case and controlled case, tie-line bias control, proportional plus integral control of two area and its block diagram representation, steady state response, load frequency control and economic dispatch control.

Text Books

1. Electrical Power Systems by C.L. Wadhwa, New Age International Publishers, 6th Edition,
2. Power System Analysis Operation and Control by A. Chakravarthy and S. Halder, 3rd Edition, PHI, 2012.

3. Modern Power System Analysis by I. J. Nagrath & D. P. Kothari, Tata Mc Graw – Hill Publishing Company Ltd, 2nd Edition, 2003.
4. Power Systems Analysis and Stability by S.S.Vadhera, Khanna Publications.

Reference Books

1. Power System Analysis and Design by J. Duncan Glover and M.S. Sharma., THOMSON, 3rd Edition, 2008.
2. Electric Power Systems by S. A. Nasar, Schaum Outline Series, Revised 1st Edition, TMH, 2005.

Course Title	High Voltage DC Transmission (PEC-II)					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2002605	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 1Hr30M						End Exam Duration : 3Hrs		

Course Objectives: The objective of the student is to student able to learn fundamental concepts of HVDC, mainly focus on converter configuration and analysis for the application of High voltage transmission systems

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

CO 1	Understand various converter and Inverter circuits
CO 2	Analyze the applications of high voltage transmission system along with types of DC links
CO 3	Apply various protection system for HVDC transmission
CO 4	Understand the use of filters for DC transmission

UNIT-I

HVDC Power Transmission Technology: Introduction- Comparison of AC & DC transmission, Converter station, Description of DC Transmission systems, Choice of voltage level, Modern trends in DC transmission.

UNIT-II

Analysis of HVDC Converters: Pulse number, Choice of converter configuration, valve rating, Transformer, Simplified analysis of graetz-circuit with and without overlap, Rectifier and Inverter waveforms, Converter bridge characteristics.

UNIT – III

Converter and HVDC System Control: Principle of DC link control, Converter control characteristics, System and control hierarchy, Firing angle control, Converter and excitation angle control, Starting and stopping of DC Link , Power Control, Higher level Controllers.

UNIT – IV

Converter Faults: Protection against over currents, over voltages in a converter station, Surge arresters, Protection against over voltages. Smoothing reactor, DC Line, Transient over voltages in DC line, Protection of DC Line, DC breakers.

UNIT – V

Reactive Power Requirements in Steady State: Sources of reactive power, Static var systems, generation of Harmonics, Design of AC filters, DC filters, Carrier frequency and RI Noise.

Text Books

1. High Voltage Direct Current Transmission by J. Arilliga 2nd edition, IEE Power and Energy Series.
2. High Voltage Direct Current Transmission by K. R. Padiyar, Wiley Eastern Ltd.,1993.
3. Direct current transmission by E. W. Kimbark, Wiley InterScience New York 1971.

Reference Books

1. EHVAC, HVDC Transmission and Distribution Engineering by S. Rao, Khanna Publishers, 2001.
2. Power Transmission by Direct Current by E. Uhlamann, Springer – Verlag, Berlin, 1975.

Course Title	Signals & Systems (PEC-II)					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
2002606	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	40	60	100
Mid Exam Duration : 1Hr30M						End Exam Duration : 3Hrs		

Course Objectives: The main objective of the course is to analyze the response of linear, time-invariant dynamic systems to standard input signals and that can be applied to the various systems for the estimation of their performance.

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

CO 1	Identify the various signals and operations on signals.
CO 2	Describe the spectral characteristics of signals.
CO 3	Illustrate signal sampling and its reconstruction.
CO 4	Apply convolution and correlation in signal processing.
CO 5	Analyze continuous and discrete time systems.

UNIT-I

Introduction: Definition and Classification of Signals, Elementary signals, Basic operations on signals.

Fourier series representation of periodic signals: Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions. Representation of function by a set of mutually orthogonal functions, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Spectrum and its significance, Amplitude and Phase spectra.

UNIT-II

Fourier transforms: Fourier transform(FT), Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals.

UNIT-III

Signal transmission through LTI systems: Systems, Classification of Systems, Linear time invariant (LTI) system, Transmission of signals through LTI systems, Transfer function of a LTI system. Distortion less transmission through LTI system, Causality & Stability.

UNIT-IV

Discrete Time Signals: Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of undersampling – Aliasing. Representation of discrete time signals, Unit impulse, step, ramp, and exponential sequences, Operations on Discrete-time signals.

Discrete Time Systems: Definition, classification, Linear Shift Invariant(LSI) system, Stability , Causality , Linear constant coefficient difference equation , Impulse response , Discrete time Fourier transform , Transfer function , System analysis using DTFT.

UNIT-V

Laplace Transform: Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standard signals.

Z–Transforms: Z-transform- definition, ROC and its properties, analysis of LTI system using z-transform, The Inverse z-transform, z-transform properties.

Text Books:

1. Simon Haykin, "Communication Systems", 2nd Edition, Wiley-Eastern, 2003.
2. Oppenheim AV and Willisky, "Signals and Systems'', 2nd Edition, Pearson Ed, 1997.
3. B.P. Lathi, "Principles of Linear systems and signals," Oxford Univ. Press, Second Edition International version, 2009.

Reference Books

1. Simon Haykin, Van Veen, and Wiley, "Signals & Systems", 2nd Edition, 2003.
2. Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press, 2011
3.

Course Title	Power Electronics Lab				B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks	
2002607	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn the characteristics of MOSFET and IGBT, force commutated circuits, output voltage of single phase half and fully controlled rectifiers, ac voltage controllers. Design and simulation of three phase half and fully controlled rectifiers, PWM inverter using MATLAB.

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

CO 1	Understand the characteristics of MOSFET and IGBT, forced commutation circuits.
CO 2	Analyze the output voltage performance of single phase half and fully controlled rectifiers with R and RL loads.
CO 3	Analyze the output voltage performance of AC voltage controller, cyclo converter with R and RL loads.
CO 4	Design and simulate the three phase rectifier and PWM inverter using MATLAB.

List of the experiments (Any Eight)

1. Study of characteristics of MOSFET & IGBT
2. Single Phase AC Voltage Controller with R and RL Loads
3. Single Phase fully controlled bridge converter with R and RL loads
4. Forced Commutation circuits (Class A, Class B, Class C, and Class D & Class E)
5. DC Jones chopper with R and RL Loads
6. Single Phase Parallel, inverter with R and RL loads
7. Single Phase Half controlled converter with R load
8. Single Phase Dual converter with RL loads
9. MATLAB simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE Loads
10. MATLAB simulation of single phase inverter with PWM control

Course Title	Power Systems – II Lab				B. Tech. VI Semester		
Course Code	Category	Hours / Week			Credits	Maximum Marks	
2002608	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to identify & formulate solutions to problems relevant to power systems using software tools.

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

CO 1	Understand the concept of MATLAB programming and ETAP in solving power systems problems.
CO 2	Acquire knowledge on formation of Bus Admittance matrix.
CO 3	Analyze the power flow using GS, NR method and DC load flow method.
CO 4	Analyze various fault studies on the power system.
CO 5	Understand power system planning and operational studies.

List of Experiments (Any Eight)

1. Modeling of a Transmission Line with Lumped Parameters
2. Formation of Y-bus for a given power system network
3. AC Load flow analysis of a simple 3-bus system using Gauss Seidel method
4. AC Load flow analysis of a simple 3-bus system using Newton Raphson method
5. Study on D C Load Flow
6. Study on Economic Load Dispatch
7. Short circuit analysis
8. Simulation of single area load frequency control system
9. Simulation of Automatic Voltage Regulator
10. Tripping characteristics of Fuse & MCB
11. Tripping sequence of protective devices
12. Characteristics of over current relay

Note: All the above experiments are simulated by using MATLAB/ETAP Software

Course Title	Advanced Programming Lab				B. Tech. VI Semester		
Course Code	Category	Hours / Week			Credits	Maximum Marks	
2004609	Engineering Science Course (ESC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	3	1.5	40	60	100
						End Exam Duration : 3Hrs		

Course Objectives: The objective of the course is to learn, write, test and debug simple LABVIEW Programs.

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

CO 1	Understand, test and debug simple Programs
CO 2	Demonstrate operations on arrays and strings
CO 3	Apply conditional statements
CO 4	Make use of Sub VI's for structuring Programs
CO 5	Make use of Read and write data from/to files

List of Programs (Any Eight)

1. Basic arithmetic operations (Add, mul, div, compound arithmetic, expression node, express formula and formula node)
2. Boolean operations (truth table verification of logic gates, Half Adder and Full Adder, convert binary to decimal value, convert BCD to Gray and Vice-Versa)
3. String operations (Length, concatenation, insert string, sub-string, replace string, reverse string, rotate string, etc)
4. Sum of 'N' numbers using feedback loop (use 'for ' loop and 'while' loop)
5. Factorial of a give number using shift register (use 'for' loop and 'while' loop)
6. Generate Fibonacci series for N iteration (use 'for' loop)
7. Create a VI to increase the tank level from 0 to 100 & decrease the value from 100 to 0 using while loop in a single process.
8. Create a VI to implement and, or & not gates(or arithmetic operations) using case structure
9. Build a VI that generates a 1D array of random numbers and sort the array in descending and ascending order and find the following:
   a) Maximum and min value of array elements
   b) Size of the array
   c) Sum and product of array elements
   d) Rotate array by 1 position
   e) Split the array after 2 elements
10. Build an array of cluster controls in which each cluster consists of a numeric control and 1D numeric array. This forms the database of students. The numeric control indicates the roll no and array indicates the test marks of 4 subjects. Build the logic to modify the mark in a particular subject of a particular student. Input the roll number, subject in which mark is to be changed and new mark. Display the database on a separate array indicator.
11. Create a VI to implement Full Adder circuit using SubVI.
12. Any application using Flat and stacked sequence

Software Used: LABVIEW Software for Windows/Linux

<table>
<tr><td>Course Title</td><td colspan="5">Skill Advanced Course
(MATLAB – SIMULINK)</td><td colspan="3">B. Tech. VI Semester</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">2002610</td><td rowspan="2">Skill Course (SC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>1</td><td>--</td><td>2</td><td>2</td><td>40</td><td>60</td><td>100</td></tr>
<tr><td colspan="6"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The objective of the course is to learn the basic features and fundamental blocks of SIMULINK and to solve electrical engineering problems.</td></tr>
<tr><td colspan="9">Course Outcomes: On successful completion of this course, the students will be able to,</td></tr>
<tr><td>CO 1</td><td colspan="8">Understand basic features of SIMULINK</td></tr>
<tr><td>CO 2</td><td colspan="8">Know various signals, operations and user defined functions</td></tr>
<tr><td>CO 3</td><td colspan="8">Analyze fundamental blocks of SIM power systems</td></tr>
<tr><td>CO 4</td><td colspan="8">Solve Electrical Engineering problems using SIMULINK</td></tr>
</table>

Module-1

Elementary features: Introduction to Simulink –Creating new Simulink file – Commonly used blocks – Continues & Discrete signals – Logic & Bit operations – Math operations – Ports & Subsystems – Sinks – Sources – User defined functions.

Module-2

SIM Power Systems: Fundamental Blocks: Electrical sources – Elements – Interface elements – Machines – Power Electronics – Control & Measurement- FACTS – Renewable Sources

Module-3

Electrical Engineering Applications – Modeling& Simulation of simple Electrical Block diagrams: Power electronics, Electrical Machines, Power & Control Systems.

Text books

1. Beginning MATLAB and Simulink from Novice to Professional by Sulaymon Eshkabilov, Apress.
2. Modeling & Simulation Using MATLAB – Simulink by Dr. Shailendra Jain, Wiley.
3. MATLAB – Simulink for Engineers by Agam Kumar Tyagi, OXFORD University press.

<table>
<tr><td>Course Title</td><td colspan="5">Management & Organizational Behavior (Mandatory Course)</td><td colspan="3">B.Tech. VI Sem</td></tr>
<tr><td>Course Code</td><td>Category</td><td colspan="3">Hours/Week</td><td>Credits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">20MC612</td><td rowspan="2">Humanities & Social Sciences (HSMC)</td><td>L</td><td>T</td><td>P</td><td>C</td><td>Continuous Internal Assessment</td><td>End Exam</td><td>Total</td></tr>
<tr><td>2</td><td>0</td><td>0</td><td>0</td><td>40</td><td>0</td><td>40</td></tr>
<tr><td colspan="6">Mid Exam Duration: 2Hrs</td><td colspan="3">External Exam Duration:</td></tr>
<tr><td colspan="9">Course Objectives: The main objective of the course is to learn
• To aid students in understanding human behavior in organizations,
• To provide students with a comprehensive exposure to organizational behavior theories, research and workplace issues.
• The course also provides an overview of the theories and practices of management in organizational contexts.</td></tr>
<tr><td colspan="9">Course Outcomes: On success Completion This course, the students will be able to</td></tr>
<tr><td>CO1</td><td colspan="8">Explain the Importance & Role of Management in the Organizations.</td></tr>
<tr><td>CO2</td><td colspan="8">Evaluate the different aspects related to Decision Making and Controlling Process</td></tr>
<tr><td>CO3</td><td colspan="8">Describe the different theories related to Individual behavior in the Organization</td></tr>
<tr><td>CO4</td><td colspan="8">Analyze Group Behavioral influence in the Organization.</td></tr>
<tr><td>CO5</td><td colspan="8">Evaluate the process and climate effects in Organization Behavior.</td></tr>
</table>

UNIT-I

Role of Management:

Concept – Significance – Functions – Principles of Management - Patterns of Management: Scientific – Behavioral – Systems – Contingency.

UNIT-II

Decision Making & Controlling – Process – Techniques. Planning – Process – Problems –– Making It Effective. Controlling - System of Controlling – Controlling Techniques – Making Controlling Effective

UNIT-III

Individual Behavior & Motivation – Understanding Individual Behaviour – Perception – Learning – Personality Types – Johari window- Transactional Analysis- Motivation – Concept of Motivation - Motivational Theories of Maslow, Herzberg, David McClelland, and Porter and Lawler

UNIT-IV

Group Behavior & Leadership: Benefits of Groups – Types of Groups – Group Formation and Development. Leadership and Organizational Culture and Climate: Leadership – Traits Theory – Managerial Grid – Transactional Vs Transformational Leadership – Qualities of good leader- Women Leadership in India.

UNIT-V

Organizational Behavior: Organizing Process – Departmentation Types – Making Organizing Effective – Organizational culture- Types of culture – Organizational Culture Vs Organizational climate - Conflict management - Change Management

Textbooks:

1. Organizational Behavior, Stephen P. Robbins, Pearson Education
2. Management and Organizational Behavior, Subbarao P, Himalaya Publishing House
3. Principles of Management, Koonz, Weihrich and Aryasri, Tata McGraw Hill.

References:

1. Organizational Behavior, S.S.Khanka, S.Chand
2. Organizational Behavior, Mishra .M.N ,Vikas
3. Management and Organizational behavior, Pierce Gordner, Cengage.
4. Behavior in Organizations, Hiriyappa.B.New Age Publications
5. Organizational Behavior, Sarma, Jaico Publications.
6. Principles of Management ,Murugesan ,Laxmi Publications