K. S. R. M. College of Engineering - KADAPA

(AUTONOMOUS)

Detailed Syllabus for B. Tech. (Regular) (R18)

Department of Electrical & Electronics Engineering

B. Tech – VI Semester (Theory - 5, Lab - 3)

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1824601	Management Science	HSMC	3	0	0	30	70	3
2	1802602	Power Semiconductor Drives	PCC	3	0	0	30	70	3
3	1802603	Switchgear & Protection	PCC	3	0	0	30	70	3
4		**Professional Elective -II (PE - II)**							
	1802604	Power System Deregulation	PEC	3	0	0	30	70	3
	1802605	High Voltage DC Transmission	PEC	3	0	0	30	70	3
	1802606	PLC & its Applications	PEC	3	0	0	30	70	3
	1802607	Signals & Systems	PEC	3	0	0	30	70	3
	1802608	Electric & Hybrid Vehicles	PEC	3	0	0	30	70	3
5	--	**Open Elective - I (OE-I)**	OEC	3	0	0	30	70	3
6	1802609	Power Electronics & Simulation ab	PCC	0	0	3	50	50	1.5
7	1802610	Power Systems - I Lab	PCC	0	0	3	50	50	1.5
8	1802611	Internet of Things Lab	PCC	0	0	4	50	50	2
9	1802612	Internship	PROJ	0	0	0	100	00	2

10	18996M2	Constitution of India	MC	2	0	0	30	--	--
Total				17	00	10	430	500	22

B. Tech., VI Semester

Course Title	**Management Science**					**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1802601	**Humanities & Social Sciences (HSMC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration : 2Hrs						**End Exam Duration : 3Hrs**		

Course Objectives: The objective of the course is to learn basic understanding of management science including analytical problem solving and communications skills, Prepare for practice in a field that sees rapid changes in tools, problems and opportunities, Prepare for graduate study and self-development over an entire career, Provide ability to use the techniques, skills and modern engineering tools necessary for engineering practices, The broad education necessary to understand the impact of engineering solutions in a global and societal context, Background necessary for admission to top professional graduate engineering or business programs.

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

CO 1	**Know** the principles and functions of management
CO 2	**Understand** the various concepts, approaches and theories of management in the real situation.
CO 3	**Compare and contrast** organization structure designs and charts diligently with theoretical learning concepts
CO 4	**To be aware** of the role, functions and functioning of human resource department of the organizations
CO 5	**Understand and Analyze** the latest and contemporary developments in the field of management.
CO 6	**Analyze** the concept of strategic planning and implementation and apply on the decisions in strategic management.

UNIT I

Introduction to Management: Concept of Management: Administration – Organization - Functions of Management - Evolution of Management Thought (Henry Fayol, FW Taylor, Maslow's Theory, Theory X and Theory Y and Contingency Theory). Organization: Principles of Organization – Types (Line, Line and Staff, Functional,

Matrix (or) Project, Committee and Departments Organizations) - Organization charts-managerial objectives and Social responsibilities of Management.

UNIT II

Strategic Management: Corporate Planning-mission, objectives and programmes-SWOT Analysis- Strategy Formulation and Implementation.-Plant location and Plant Layout concepts.

UNIT III

HRM and Inventory Management: Human Resource Management –Basic functions of HRM, Manpower Planning Job Evaluation and Merit Rating - Incentive plans.

Inventory Management: Need for Inventory Control; EOQ, ABC Analysis, Purchase Procedure, Maintenance of Store Records.

UNIT IV

Operations Management: Productivity- Job, Batch and Mass Production-Work Study-Basic procedure involved in Method Study and Work Measurement. Statistical Quality Control : c - chart, p - chart, R – chart - Acceptance sampling - Deming's contribution to Quality.

UNIT V

Contemporary Management Practices: Management Information System (MIS) – Enterprise Resource Planning (ERP) – Materials Resource Planning (MRP) – Just In Time (JIT) – Capabilities Maturity Model (CMM) – Supply Chain Management – Performance Management – Business Process Re-Engineering – Bench Mark – Balanced Scorecard.

Reference Books:

1. Koontz& Weihrich: Essentials of Management,6/e,TMH,2005
2. Kanishka Bedi: Production and Operations Management, Oxford University Press,2004
3. Parnell: Strategic Management, Biztantra, 2003.

Course Title	Power Semiconductor Drives					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1802602	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Mid Exam Duration : 2Hrs						End Exam Duration : 3Hrs		
Course Objectives: The objective of the course is to learn various speed control methods of AC & DC drives fed from power converters, single and multi quadrant operation of drives, conservation of energy in electrical drives.								
Course Outcomes: On successful completion of this course, the students will be able to								

CO 1	Understand block diagram and dynamics of electrical drives
CO 2	Analyze single and multi quadrant operation of DC drives and their speed control methods
CO 3	Analyze the operation of stator and rotor side speed control methods of induction motor by various power converters
CO 4	Analyze the operation of synchronous motor drives and brushless DC motor drives
CO 5	Understand energy conservation in electrical drives with the usage of efficient motors and converters

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

Induction Motor Drives – Speed control – stator voltage control – A.C. Voltage controllers, Variable frequency and variable voltage control from inverter- Rotor Side Control of Induction Motor, Elementary Concepts of Vector Control and direct torque control.

UNIT – IV

Synchronous Motor Drives – Torque Expression – open loop VSI fed drive – self control Brushless DC motor Drives – 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		
1802603	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Mid Exam Duration : 2Hrs						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 Busbars 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 arrestors(valve type),ratings of Lightning arrestors, 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 a 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, Buchholtz 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 Ozq, TMH, 2010.

<table>
<tr><td>Course Title</td><td colspan="4">Power System Deregulation (PE-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">1802604</td><td rowspan="2">Professional Elective (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>30</td><td>70</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 main objective of the course is to learn the basic concept of restructuring of the electricity market, need behind requirement for deregulation of the electricity market and understand the money, power & information flow in a deregulated power system.</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 various types of regulations in power systems.</td></tr>
<tr><td>CO 2</td><td colspan="7">Identify the need for regulation and deregulation.</td></tr>
<tr><td>CO 3</td><td colspan="7">Analyze the technical and Non-technical issues in the Deregulated Power Industry.</td></tr>
<tr><td>CO 4</td><td colspan="7">Identify and give examples of existing electricity markets.</td></tr>
<tr><td>CO 5</td><td colspan="7">Classify different market mechanisms and summarize the role of various entities in the market</td></tr>
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UNIT I

Deregulation of Electric Utilities: Introduction – Traditional central utility model, reform motivations, separation of ownership and operation, competition and direct access in the electricity market, independent system operator (ISO), retail electric providers, different experiences.

UNIT II

Competitive Wholesale Electricity Markets & Transmission Open Access: Introduction, ISO, wholesale electricity market characteristics, market model, challenges, trading arrangements, the pool and bilateral trades, multilateral trades.

UNIT III

Transmission Cost Allocation Methods: Introduction - Postage Stamp Rate Method - Contract Path Method - MW-Mile Method – Unused Transmission Capacity Method - MVA-Mile method – Comparison of cost allocation methods.

UNIT IV

Market Power & Ancillary Services Management: Introduction - Different types of market Power – Mitigation of Market Power – Examples - Introduction – Reactive Power as an Ancillary Service – a Review – Synchronous Generators as Ancillary Service Providers.

UNIT V

Available Transfer Capability (ATC) : Transfer Capability Issues – ATC – TTC – TRM – CBM Calculations – Calculation of ATC based on power flow - Introduction – Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting.

Text Books:

1. Power System Restructuring and Deregulation, Loi Lei Lai, John Wiley & Sons Ltd., England, 2001.
2. Operation of Restructured Power System, Kankar Bhattacharya, Math H.J. Boller and Jaap E. Daalder Kulwer Academic Publishers, 2001.
3. Restructured Electrical Power Systems, Mohammad Shahidehpour and Muwaffaq alomoush, Marcel Dekker, Inc., 2001.

Course Title	**High Voltage DC Transmission (PE-II)**					**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1802605	**Professional Elective (PEC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration : 2Hrs						**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

D. C. 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	**Programmable Logic Controller (PLC) & its Applications (PE-II)**				**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**	
1802606	**Professional Elective**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**

	(PEC)	**3**	**0**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration : 2Hrs						**End Exam Duration : 3Hrs**		
Course Objectives: The main objective of the course is to learn PLC basics, architecture, programming, about digital logic gates, PLC registers, functions and Analog PLC operations and various applications to PLC.								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understand PLC and its basics, architecture, connecting devices and programming							
CO 2	Apply Ladder logic for various Industrial Applications							
CO 3	Analyze PLC logical and arithmetic operations							
CO 4	Design Control Circuits for various Applications							

UNIT-I

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.

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT-II

Digital Logic Gates: Programming in the Boolean algebra system, conversion examples. Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.

UNIT-III

PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, Output Registers.

PLC Functions: Timer functions & Industrial applications, counter function & industrial applications, Arithmetic functions, Number comparison functions, number conversion functions.

UNIT-IV

Data Handling Functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two-axis & three axis Robots with PLC, Matrix functions.

UNIT -V

Analog PLC Operation: Types of PLC Analog Modules and Systems, PLC Analog Signal Processing, BCD or Multibit Data Processing, Analog output application examples, PID Modules, PID Tuning, Typical PID Functions, PLC Installation, Troubleshooting and Maintenance.

Text Books:

1. Programmable Logic Controllers by W. Bolton, 5th Edition, Newnes, Elsevier, 2010.
2. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI.

Reference Books:

1. Programmable Logic Controllers- Programming Method and Applications –JR. Hackworth &F.D Hackworth Jr. - Pearson, 2004.
2. Programmable Logic Controllers: An Emphasis on Design & Application, Kelvin T. Erickson, Dogwood Valley Press, 2011.

Course Title	Signals & Systems (PE-II)					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
1802607	Professional Elective (PEC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		3	0	0	3	30	70	100
Mid Exam Duration : 2Hrs						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.

Course Title	**Electric & Hybrid Vehicles (PE-II)**				**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1802608	**Professional Elective (PEC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		3	**0**	**0**	**3**	**30**	**70**	**100**
Mid Exam Duration : 2Hrs						**End Exam Duration : 3Hrs**		
Course Objectives: The main objective of the course is to learn upcoming technology of hybrid systems, different aspects of drives application & electric traction.								
Course Outcomes: On successful completion of this course, the students will be able to								
CO 1	Understand electric drive in vehicles / traction							
CO 2	Acquire knowledge about fundamental concepts, principles of hybrid and electric vehicles							
CO 3	Analyze and design of hybrid and electric vehicles							

UNIT - I

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics and mathematical models to describe vehicle performance.

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.

UNIT - II

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 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, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switched Reluctance Motor drives, drive system efficiency.

UNIT - IV

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, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices.

UNIT - V

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies.

Text Books

1. Hybrid Electric Vehicles: Principles and applications with Practical Perspectives by C. Mi, M. A. Masrur and D. W. Gao, John Wiley & Sons, 2011.
2. Hybrid Electric Vehicles: Energy Management Strategies by S. Onori, L. Serrao and G. Rizzoni, Springer, 2015.

Reference Books

1. Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design by Ehsani, Gao, Gay, Emadi, 2005 by CRC Press.
2. Electric and Hybrid Vehicles by T. Denton, Routledge, 2016.

Course Title	**Power Electronics & Simulation Lab**				**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1802612	**Professional Core (PCC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		0	**0**	**3**	**1.5**	**50**	**50**	**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 SCR, MOSFET & IGBT
2. Gate firing circuits for SCR
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, and Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cyclo converter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase Half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase Dual converter with RL loads
14. MATLAB simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE Loads
15. MATLAB simulation of resonant pulse commutation circuit and BUCK chopper
16. MATLAB simulation of single phase inverter with PWM control

Course Title	**Power System – I Lab**					**B. Tech. VI Semester**		
Course Code	**Category**	**Hours/Week**			**Credits**	**Maximum Marks**		
1802613	**Professional Core (PCC)**	**L**	**T**	**P**	**C**	**Continuous Internal Assessment**	**End Exam**	**Total**
		0	**0**	**3**	**1.5**	**50**	**50**	**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 un-loaded Synchronous Generators.
CO 3	Analyse 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 Lab**			**B. Tech. VI Semester**
Course Code	**Category**	**Hours/Week**	**Credits**	**Maximum Marks**

1802614	Professional Core (PCC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		0	0	4	2	50	50	100
						End Exam Duration : 3Hrs		

Course Objectives: The main 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 an 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 Colours.
5. To interface IR Sensor with Arduino / Raspberry Pi and write a program to turn ON LED when sensor detect an object.
6. To interface 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 thing speak 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">Internship</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>redits</td><td colspan="3">Maximum Marks</td></tr>
<tr><td rowspan="2">1802615</td><td rowspan="2">Project (Proj)</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>0</td><td>0</td><td>0</td><td>2</td><td>100</td><td>00</td><td>100</td></tr>
<tr><td colspan="5"></td><td colspan="3">End Exam Duration : 3Hrs</td></tr>
<tr><td colspan="9">Course Objectives: The main objective of the course is to learn
• Develop and improve business skills in communication, technology, quantitative reasoning, and teamwork
• Observe and participate in business operations and decision-making
• Meet professional role models and potential mentors who can provide guidance, feedback, and support</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">Assess interests and abilities in their field of study and Integrate theory and practice</td></tr>
<tr><td>CO 2</td><td colspan="8">Develop communication, interpersonal and other critical skills in the job interview process</td></tr>
<tr><td>CO 3</td><td colspan="8">Acquire employment contacts leading directly to a full-time job following graduation from college</td></tr>
<tr><td>CO 4</td><td colspan="8">Identify and carry out performance objectives related to their job assignment</td></tr>
</table>

Course Title	Constitution of India					B. Tech. VI Semester		
Course Code	Category	Hours/Week			Credits	Maximum Marks		
18996M2	Mandatory Course (MC)	L	T	P	C	Continuous Internal Assessment	End Exam	Total
		2	0	0	0	30	00	30
Mid Exam Duration : 2Hrs								

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.

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

CO 1	Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
CO 2	Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
CO 3	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.
CO 4	Discuss the passage of the Hindu Code Bill of 1956.

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. Pachayati raj: Introduction, PRI: Zila Panchayat., Elected officials and their roles, CEO Zila Pachayat: 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.