VASAVI COLLEGE OF ENGINEERING
(AUTONOMOUS)
Ibrahimbagh, Hyderabad-31
Approved by A.I.C.T.E., New Delhi and
Affiliated to Osmania University, Hyderabad-07

Sponsoredby
VASAVI ACADEMY OF EDUCATION
Hyderabad

SCHEME OF INSTRUCTION AND SYLLABI UNDER CBCS FOR B.E. (EEE) VII and VIII Semesters With effect from 2023-24 (For the batch admitted in 2020-21) (R-20)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
Phones: +91-40-23146030, 23146031
Fax: +91-40-23146090

INSTITUTE VISION

Striving for a symbiosis of technological excellence and human values.

INSTITUTE MISSION

To arm young brains with competitive technology and nurture holistic development of the individuals for a better tomorrow.

DEPARTMENT VISION

Excellence in quality education by keeping pace with rapidly changing technologies and to create man power of global standards in the field of Electrical and Electronics Engineering.

DEPARTMENT MISSION

To impart in-depth knowledge to students through inductive teaching and learning practices, so that they acquire the skill to innovate, excel and lead in their profession with values and ethics that will benefit society.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Graduates will acquire technical competence to analyze, design and solve engineering problems in the field of Electrical and Electronics engineering and use modern engineering tools, techniques and software.

PEO 2: Graduates will be able to acquire necessary skills and obtain employment and will be productive in the professional practice of Electrical and Electronics Engineering and related fields.

PEO 3: Graduates will be sensitive to professional and social contexts, committed to ethical action and engaged in lifelong learning skills.

PROGRAM SPECIFIC OUTCOMES (PSOs)

- EEE students will be able to design, analyze Power Systems & Electrical Machines to solve complex engineering problems.
- EEE students will be able to design and analyze Electrical and Power Electronic Circuits.
- EEE students will be able to use and apply modern software tools and techniques related to Electrical Engineering.

B.E. (EEE) PROGRAM OUTCOMES (PO's)	
PO1	**Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	**Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
P1O	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
P11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
P12	**Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS):: IBRAHIMBAGH, HYDERABAD – 500 031.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION (R-20):: B.E. - EEE : SEVENTH SEMESTER(2023-24)

B.E (EEE) VII Semester								
Course Code	**Name of the Course**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per Week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
THEORY								
U20PC710EE	Switchgear and Protection	3	-	-	3	60	40	3
U20PE7XXEE	Professional Elective -I	3	-	-	3	60	40	3
U20PE7XXEE	Professional Elective -II	3	-	-	3	60	40	3
U20PE7XXEE	Professional Elective –III	3	-	-	3	60	40	3
U20PE7XXEE	Professional Elective –IV	3	-	-	3	60	40	3
PRACTICALS								
U20PC711EE	Power Systems Lab	-	-	2	3	50	30	1
U20PC721EE	Digital Signal Processing Lab	-	-	2	3	50	30	1
U20PW719EE	Project Seminar	-	-	2	-	-	30	1
	Online NPTEL certification course 8 weeks/ 12 weeks	-	-	-	-	-	-	2
	Total	**15**	**-**	**6**		**400**	**290**	**20**
	Grand Total	**21**				**690**		**20**
B.E students shall complete one NPTEL Certificate equivalent Course of 8 weeks equivalent to 2 Credits by the end of VII semester								

Professional Elective – I:

1. U20PE710EE - High Voltage DC Transmission
2. U20PE720EE - Electrical Drives and Static Control
3. U20PE730EE - Mathematical Methods in Control Systems

Professional Elective – II:

1. U20PE740EE - Power System Operation and Control
2. U20PE750EE - Wind and Solar Energy Systems
3. U20PE760EE - Advanced control systems

Professional Elective – III:

1. U20PE770EE - Distributed Generation
2. U20PE780EE – Electric and Hybrid Vehicles
3. U20PE790EE – Industrial IoT

Professional Elective – IV:

1. U20PE712EE - Electrical Power Distribution Engineering
2. U20PE713EE - Power Quality
3. U20PE714EE - Programmable Logic Controllers

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Switchgear and Protection

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours/week):3:0:0	SEE Marks:60	Course Code: **U20PC710EE**
Credits : 3	CIE Marks:40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To analyze principles of operation of the different types of electromagnetic relays. 2. To comprehend principles and operation of static, microprocessor and distance relays. 3. To comprehend the different principles of protective schemes in power system and power apparatus. 4. To comprehend the principles of operation of the different types of circuit breakers. 5. To be acquainted with different lightening arrestors for the protection of the various equipments of power system.	1. Calculate parameters of relay operations, analyze the principles of operation of various electromagnetic relays, derive the characteristics and apply for protection of transmission lines. 2. Analyze the characteristics of dual input comparators, static relays and microprocessor based relays and distance relays. 3. Apply the knowledge of different principles of relays for equipment protection like alternators, transformers, bus bars etc. 4. 4. 4.Comprehend, analyze the concepts ofcircuit interruption and perform calculations on restriking voltage, recovery voltage, RRRV etc. 5. Comprehend analyze and apply the knowledge of different types of lightening arrestors, surge absorbers and design of ground wire, insulation coordination for various over voltage applications.

UNIT-I: Introduction to protective relays: Need for protection – primary protection – backup protection – zones of protection – Definitions of relays pickup, Dropout and reset values, Classification of relays, operating principles and construction of Electromagnetic and induction relays, Over current. Directional features Universal relay torque equation. Over current protection for radial feeders and ring mains, Protection of parallel lines, Relay settings for overcurrent relays, Earth fault and phase fault protection.

UNIT-II: Static phase and Amplitude comparators: Characteristics of dual input comparators. Distance protection – 3 steps distance relays, Characteristics of distance relays on RX Diagram – Static over current relay, Microprocessor based over current relaying (block diagram), need for numerical relays, advantages and functional block diagram of numerical relay.

UNIT-III: Transformer and generator protection: Differential relays – percentage differential relays – protection of generator and transformer using percentage differential relays – split phase, interturn protection, overheating, loss of excitation, protection of generators – Protection of transformers against magnetizing in rush – Buchholz relays – Protection of earthing transformers – Generator transformer unit protection, Bus Bar Protection.

UNIT- IV: Circuit breakers: Need for circuit breakers – arc properties – principles of arc quenching theories, Recovery and restriking voltages, derivations of RRRV – Maximum RRRV etc., Definitions in Circuit breakers, rated symmetrical and asymmetrical breaking current – rated making current – rated capacity, voltage and frequency of circuit breakers, Auto reclosure, Duty cycle, Current chopping – resistance switching – Circuit breaker ratings – types of circuit breakers –air, air blast, SF6 and vacuum circuit breakers, testing of circuit breakers.

UNIT – V Over voltage protection: Protection of transmission lines against direct lightening strokes – ground wires – protection angle – protection zones – height of ground wire – tower footing resistance and its effects – Equipment protection assuming rod gaps, arcing horns, different types of lightening arrestors – their construction – surge absorbers – Peterson coil – insulation co-ordination.

Learning Resources:

1. Badriram, Viswakarma, Power System Protection and Switchgear, Tata McGraw Hill, 2011.
2. C.L. Wadhwa, Electrical Power system, Wiley Eastern Ltd. 2nd Edition, 2010.
3. Sunil S.Rao, Switchgear and Protection, Khanna Publications.
4. B. Ravindranath & M.Chander, Power Systems Protection & Switchgear, New Age International, Special Indian Edition.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Power Systems Lab

SYLLABUS FOR B.E. VII – SEMESTER

L:T:P (Hours/week):0:0:2	SEE Marks:50	Course Code : **U20PC711EE**
Credits : 1	CIE Marks:30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To allow students to practically verify several concepts and procedures learned in power systems and switchgear and protection 2. To promote teamwork among students and effective communication skills.	1. Student will be able to calculate parameters related to electric transmission line, alternators and transformers 2. Student will be able to understand the a relay operation and use them 3.Students will be able to understand insulators and their properties. 4. Communicate effectively and support constructively towards team work 5. Pursue lifelong learning for career and professional growth with ethical concern for society and environment.

List of Experiments

1. Characteristics of Artificial Transmission line
(a) Regulation and
(b) Efficiency
2. Determination of A, B, C, D constants of Long Transmission line.
3. Differential protection of single-phase transformer.
4. Determination of Positive, Negative and Zero Sequence reactances of 3-phase Alternator.

5. Determination of Positive, Negative and Zero-sequence reactances of 3- phase Transformers using sequence current excitation fault calculation.
6. Dielectric test on Transformer oil
7. Determination of String efficiency of simulated string of insulators
8. Fault studies on 3 phase Alternator.
9. Simulation of transmission line using software tool (ABCD constants, Efficiency and regulation of transmission line).
10. Simulation for determination of voltage distribution and String efficiency of string of insulators using software tool.
11. Y-bus formation by Inspection method using MATLAB
12. Differential protection of single-phase Transformer using LABVIEW.
13. Zonal protection of Long transmission line using LABVIEW.

From the above experiments, each student should perform at least 10 (Ten) experiments.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Digital Signal Processing Lab

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours/week):0:0:2	SEE Marks:50	Course Code: **U20PC721EE**
Credits : 1	CIE Marks: 30	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
The laboratory is aimed to provide basics in software implementation of signal processing and programming to control electrical machines.	1. Demonstrate the use of software to perform convolution of signals and transform signals between different domains. 2. Design analog and digital filters. 3. Interface electrical machines with digital signal processor.

List of Experiments

1. Discrete waveform generation – square, triangular, ramp and trapezoidal.
2. Verification of linear and circular convolution .
3. Computation of DFT, IDFT using direct and FFT methods
4. Verification of sampling theorem.
5. Design of Butterworth and Chebyshev LP & HP filters.
6. Design of LPF using rectangular, Hamming and Kaiser Windows.
7. LED interfacing with digital signal processor.
8. Stepper motor control using digital signal processor.
9. D.C Motor speed control using digital signal processor.
10. 3 - ▪ Induction motor speed control using digital signal processor.
11. Brushless D.C motor speed control using digital signal processor.
12. Key – pad interfacing with digital signal processor.
13. Demonstration of aliasing using LabVIEW

14. Digital FIR filter using LabVIEW
15. Generation of PWM pulses for Buck Converter using code composer studio

From the above experiments, each student should perform at least 10 (Ten) experiments.

No. of Internal Tests:	01	Max. Marks for Internal Test:	12
Marks for assessment of each experiment			18
Duration of Internal Test: **3 Hours**			

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Project Seminar

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hours /week):0:0:2	SEE Marks: -	Course Code:**U20PW719EE**
Credits: 1	CIE Marks: 30	Duration of SEE: -

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for systematic independent study of stat of the art topics in broad area of his/her specialization.

Seminar topics may be chosen by the students with the advice from faculty members. Students are to be exposed to the following aspects of Seminar Presentation

- Literature survey.
- Organization of material.
- Preparation of OHP slides/PC presentation
- Technical writing

Each student is required to

1. Submit one page synopsis of the Seminar talk for display on notice board.
2. Give a 20 minutes presentation through OHP, PC, Slide projector, followed by 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from 3rd week to the last week of the Semester and any change in the schedule should be discouraged.
The sessional marks will be awarded to the students by at least two faculty members on the basis of an oral and a written presentation as well as involvement in the discussions.

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

High Voltage DC Transmission

(Professional Elective – I)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : **U20PE710EE**
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To provide the knowledge on comparison of HVAC and HVDC transmission system, the different configurations of converter and inverter circuits, desired features and combined characteristics of control rectifier and inverter circuits, protection against over voltage and over current systems, different types MTDC system and control schemes.	1. Able to classify the cost comparison of AC and DC system 2. Able to draw and explain the different configuration of converter and inverter circuits. 3. Able to draw and explain the combined characteristics, control and their applications of rectifier and inverter circuits. 4. Able to explain the protection schemes of over voltage and over current systems. 5. Able to explain the comparison between series and parallel MTDC systems.

UNIT – I: General consideration of DC and AC Transmission Systems:

Comparison of AC and DC Transmission systems. Applications of DC transmission. Economic consideration . Kinds of DC links. Components of HVDC transmission systems. Planning for HVDC Transmission. Modern Trends in DC Transmission.

UNIT – II: Converter Circuits:

Properties of Converter Circuits, converter harmonics, Different kinds of arrangements, Analysis of bridge converter with firing angle control-without overlap angle and with overlap angle, u<60^o. Equivalent circuit of rectifier - without overlap angle and with overlap angle, u < 60^o.

Inversion : operation as an inverter: equivalent circuit of inverter-without overlap angle and with overlap angle, u < 60^o

UNIT – III: Converter Control:

Introduction & basic means of control, Desired features of control, combined characteristics of rectifier and inverter. Power reversal. Individual phase control, equidistant pulse control, Basic control scheme of converters

UNIT – IV: HVDC Protection:

Converter maloperations, Short circuit current. Arc-back, Commutation failure, Bypass valves, DC reactors. DC circuit breakers. Protection against over current and over voltages, Analysis of Harmonic filters.

UNIT – V:Multi-terminal DC systems:

Application of MTDC systems, Types of MTDC systems. Comparison of series and parallel MTDC systems.

Learning Resources

1. Kimbark E.W., Direct Current Transmission Vol- I , John Wiley, 1971.
2. Padiyar K.R., HVDC Power Transmission Systems, Wiley Eastern, 1990.
3. Arrillaga J., High Voltage Direct Current Transmission, Peter Peregrinus Ltd., London, Pegramon Press, 1983

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Electrical Drives and Static Control
(Professional Elective – I)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : **U20PE720EE**
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To understand and analyze the Speed control of DC motor, Induction motor, stepper motor, Brush less DC motor& Switched Reluctance Motor by using various spower electronic converters.	1. Describe the operation and control of electrical drives 2. Analyze the speed controlof chopper Fed dc motor. 3. Analyze the speed control of phase controlled rectifierfed dc motor. 4. Choose an appropriate speed control for Inductionmotor drive to meet the requirements of applicationin Industry. 5. Select an appropriate

UNIT-I: Electrical Drives:
Definition and block diagram of electrical drive; Parts of electrical drives; Classification of drives; modes of operation; Multi quadrant operation of drives with an example; closed loop control of drives; important factors for selection of electrical drives; advantages of electrical drives.

UNIT-II: Chopper fed DC drive:
Review of dc chopper and duty ratio control, chopper fed dc motor for speed control, steady state operation of a chopper fed drive, armature current waveform and ripple. Review of motoring and generating modes operation of a separately excited dc machine, four quadrant operation of dc machine; single-quadrant, two-quadrant and four-quadrant choppers;

steady-state operation of multi-quadrant chopper fed dc drive, regenerative braking.

UNIT-III: Controlled rectifier fed DC drives:
Single phase fully controlled rectifier control of dc separately excited motor; single phase half controlled rectifier control of dc separately excited motor; three phase fully controlled rectifier control of dc separately excited motor; dual converter control of dc separately excited dc motor.

Closed-loop control of DC Drive:
Control structure of DC drive, inner current loop and outer speed loop, dynamic model of dc motor – dynamic equations and transfer functions.

UNIT-IV: Induction motor Drives:
Speed control of 3-phase induction motor with A.C voltage regulators, Voltage source inverters, Current source inverter and Cyclo-converters; v/f control ac drive; Static rotor resistance control; slip power recovery schemes: Static Krammer drive and Scherbius drive.

UNIT-V: Brushless dc (BLDC) MOTOR DRIVES: Construction and operation of BLDC motor; BLDC motor drive for servo applications; features and applications.

Stepper motors: Construction and classification of stepper motor; operation of variable reluctance stepper motor with suitable configuration; Calculation of step angle; operation of Permanent magnet stepper motor; features and applications.

Switched reluctance motor: Construction and operation of switched reluctance motor; converter circuits; Features and applications.

Learning Resources:
1. Gopal K. Dubey, Fundamentals of Electrical Drives, Narosa Public House, Delhi, 2007.
2. Bimal.K.Bose, Modern Power Electronics and AC Drives, Pearson Education Asia, 2002.
3. S.K.Pillai, A First Course in Electrical Drives, New Age International, 2000.
4. V.Subramaniam, Thyristor control of electrical drives, TMH edition

2010
5. M.H. Rashid, Power Electronics circuits drives and applications, Pearson education, India 2018

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Mathematical Methods in Control Systems
(Professional Elective-I)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code :U20PE730EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To give the students an understanding of foundational concepts in linear algebra and random processes for use in control systems 2. To understand Probability, Random variables.	1. Apply matrix properties and functions to a given problem 2. Use eigen values and eigen vectors 3. Find out responses of linear systems to any given input signal

Unit – I:
Linear Spaces – Vectors and Matrices Transformations, Norms Matrix Factorization

Unit – II:
Eigen value, Eigenvectors and Applications SVD and Applications Projections and Least Square Solutions

Unit – III:
Probability, Random variables Probability distribution and density functions, Joint density and conditional distribution Functions of random variables and random vectors

Unit – IV:
Characteristic functions and correlation matrices

Unit – V:
Random Processes and properties

Learning Resources:
1. G. Strang, "Introduction to Linear Algebra", 4 th Edition, Wellesley-Cambridge Press, 2009
2. Papoulis & Pillai, "Probability, random variable and stochastic processes", Mcgraw Hill, 2002
3. H. Stark & J.W. Woods, "Probability and random processes with application to signal processing", Pearson Education Asia, 2002
4. J A Gubner: "Probability and Random processes for Electrical and Computer engineers", Cambridge Univ. Press. 2006

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Industrial Internet of Things

(Professional Elective-I)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE790EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
• To introduce the terminology, technology and its applications • To introduce the concept of M2M (machine to machine) with necessary protocols • To introduce the Python Scripting Language which is used in many IoT devices • To introduce the Raspberry PI platform, that is widely used in IoT applications • To introduce the implementation of web-based services on IoT devices	• Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved. • Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, and sensing modules • Market forecast for IoT devices with a focus on sensors • Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi

UNIT-I:

Introduction to IOT, What is IIOT, IOT Vs. IIOT, History of IIOT, Components of IIOT - Sensors, Interface, Networks, People &Process, Hype cycle, IOT Market, Trends& future Real life examples, Key terms – IOT Platform, Interfaces, API, clouds, Data Management Analytics,

UNIT-II:

Overview of IOT components ;Various Architectures of IOT and IIOT, Advantages & disadvantages, Industrial Internet - Reference Architecture;

IIOT System components: Sensors, Gateways, Routers, Modem, Cloud brokers, servers and its integration, WSN.

UNIT-III:

IoT Physical Devices and Endpoints- Introduction to Arduino and Raspberry Pi- Installation, Interfaces (serial, SPI, I2C), Programming – Python program with Raspberry PI with focus on interfacing external gadgets, controlling output, reading input from pins.

UNIT-IV:

Controlling Hardware- Connecting LED, Buzzer, Switching High Power devices with transistors, Controlling AC Power devices with Relays, Controlling servo motor, speed control of DC Motor, Light sensor, temperature sensor with thermistor, voltage sensor, Temperature and Humidity Sensor DHT11, Motion Detection Sensors, Level Sensors, USB Sensors, Distance Measurement with ultrasound sensor

UNIT-V:

IoT Physical Servers and Cloud Offerings– Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API

Learning Resources:

1. Internet of Things - A Hands-on Approach, Arshdeep Bahga and Vijay Madisetti, Universities Press, 2015, ISBN: 9788173719547

2. Getting Started with Raspberry Pi, Matt Richardson & Shawn Wallace, O'Reilly (SPD), 2014, ISBN: 9789350239759 3. Raspberry Pi Cookbook, Software and Hardware Problems and solutions, Simon Monk, O'Reilly (SPD), 2016, ISBN 7989352133895

3.Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

4. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3- 642-19156-5 e-ISBN 978-3-642-19157-2, Springer

5. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015 3. Editors Ovidiu Vermesan

6. Peter Friess,'Internet of Things – From Research and Innovation to Market Deployment', River Publishers, 2014

7. N. Ida, Sensors, Actuators and Their Interfaces, SciTech Publishers, 2014.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Power System Operation and Control

(Professional Elective – II)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code:U20PE740EE
Credits : 3	CIE Marks: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To provide knowledge on obtaining solution for load dispatch problems. 2. To provide knowledge on modelling and analysis of power system under steady and dynamic conditions.	1. Draw the fuel cost characteristics, input-output characteristics and heat rate characteristics of generating units and solve the load dispatch problem. 2. Solve unit commitment problems using iterative technique satisfying equality and inequality constraints for optimal solution. 3. Compute steady state error for changes in load demand and design controllers to minimize the error for single area and two area systems. 4. Determine the steady state and transient stability of power system. 5. Illustrate power factor correction techniques and voltage control methods in power system.

UNIT – I: Interconnection of power systems:
Importance of interconnection of Power Systems

Economic Operation of Power System: Input output curves – Heat rates and incremental cost curves – Equal incremental cost criterion and economic operation neglecting transmission losses. Transmission loss coefficients, Economic operation including Transmission losses.

UNIT – II: Unit Commitment:
Spinning Reserve, Constraints in unit commitment-thermal unit constraints, hydro constraints and fuel constraints, Unit commitment solution methods-Priority list methods, Dynamic programming method and Lagrangian relaxation method

UNIT – III: Load Frequency Control:
Governor Characteristics – Regulation of two generators in parallel – concept of control area – incremental power balance of a control area - single area control. Flat frequency control – Flat tie line frequency control – Tie line bias control– Development of model for two area control. Automatic Voltage Regulator.

UNIT – IV: Power System Stability:
Definitions of Steady State Stability and Transient Stability, Steady state stability of a synchronous machine connected to infinite bus, calculation of steady state stability limit, synchronous machine models with and without saliency, Equal area criterion, Application of equal area criterion, Swing equation, Step by step solution of Swing equation, factors effecting transient stability, Introduction to voltage stability problem.

UNIT-V: Power factor control and voltage control:
Causes and disadvantages of low power factor, methods of power factor improvement-Static capacitors, Synchronous condensers and phase advancers. Advantages of power factor improvement.
Necessity of voltage control, methods of voltage control-excitation control, tap changing transformers and booster transformers Reactive Power Control: Reactive power generation by synchronous generators, Introduction to FACTS devices-TCSC, STATCOM, UPFC.

Learning Resources:

1. D.P.Kothari and I.J.Nagrath, Modern Power Systems Analysis, 3rd Edition, Tata McGraw Hill, 2004
2. John J.Grainger, William D.Stevenson Jr., Power Systems Analysis, 3rd Edition, Tata McGraw Hill, 2003
3. C.L.Wadhwa, Electrical Power Systems. 3rd Edition, New age International (P) Ltd., 2002
4. Haadi Sadat, Power Systems Analysis, Tata McGraw Hill
5. Olle I. Elgerd, Electrical Energy Systems Theory, TMH
6. A. J. Wood and B.F.Wollenberg, Power Generation, Operation and Control, 2nd edition, Wiley India Pvt. Ltd., 2005
7. A.Chakrabarti, Sunita Halder, Power Systems Analysis Operation and Control, 3rd Edition, PHI, 2012
8. S.Sivanagaraju and G.Sreenivasan, Power Systems Operation and Control, Pearson Education, 2010

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Wind and Solar Energy Systems
(Professional Elective – II)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hours/week):3:0:0	SEE Marks :60	Course Code : U20PE750EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To provide a survey of the solar energy and wind energy resources and the technologies for harnessing these resources and control of generated power based on power electronics.	1. Energy scenario and the consequent growth of the power generation from renewable energy sources. 2. Basic physics of wind and solar power generation. 3. Power electronic interfaces for wind and solar generation. 4. Issues related to the grid-integration of solar and wind energy systems.

Unit I: Physics of Wind Power:
History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and
power-cumulative distribution functions.

Unit II: Wind generator topologies:
Review of modern wind turbine technologies, Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent- Magnet Synchronous

Generators, Power electronics converters. Generator-Converter configurations, Converter Control.

UNIT III: The Solar Resource and Solar thermal power generation:

The Solar Resource: Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

Solar thermal power generation : Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis.

UNIT IV: Solar photovoltaic:

Technologies-Amorphous, monocrystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms, Converter Control.

UNIT V: Network Integration Issues:

Overview of grid code technical requirements. Fault ride-through for wind farms - real and
reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems.

Learning Resources:

1. G.D. Rai, Non-Conventional Energy Sources , Khanna Publishers, New Delhi, 2011.
2. B H KHAN, Non-Conventional Energy Resources, McGraw Hill, 2nd Edition, 2009.
3. T. Ackermann, " Wind Power in Power Systems" , John Wiley and Sons Ltd., 2005.
4. G. M. Masters, " Renewable and Efficient Electric Power Systems**",** John Wiley and Sons, 2004.

5. S. P. Sukhatme, " Solar Energy: Principles of Thermal Collection and Storage" , McGraw Hill, 1984.
6. H. Siegfried and R. Waddington, " Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
7. G. N. Tiwari and M. K. Ghosal, " Renewable Energy Applications" , Narosa Publications, 2004.
8. J. A. Duffie and W. A. Beckman, " Solar Engineering of Thermal Processes" , John Wiley & Sons,1991.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Advanced Control Systems

(Professional Elective – II)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P(Hours /week):3:0:0	SEE Marks :60	Course Code: U20PE760EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
Understand advanced control systems concepts and also analyze the stability of advanced control systems	1. assess the controllability and observability of analog and discrete control systems. 2. Analyse non-linear systems. 3. Analyse stability using lyapunov's stability criterion. 4. formulate and analyze optimal control problem

UNIT-I: Review of state space representation of continuous time systems and their solutions:

State models for discrete time systems described as difference equations and transfer functions. Transfer function from state model, state transition matrix and solution of state equation for discrete time systems.

UNIT-II: Controllability and Observability:

Concepts of controllability and observability, controllability tests for continuous time, discrete time , time invariant systems. Observability tests for continuous time and discrete time, time invariant systems, controllability and observability modes in state. Jordon's canonical form, controllable andobservable companion forms for single input single output systems, pole placement by state feed back.

UNIT-III: Nonlinear systems:

Behaviour of non-linear systems, Jump resonance, sub harmonic

oscillation, limit cycles, common physical, non – linearities, singular points, phase plane, method, construction of phase plane trajecties, isocline method, delta method, computation of time.

UNIT- IV: Stability:

Lvapunov's stability criteria, Theorems, The direct method of Liapunov for linear systems, Methods of constructing Liapunov function Krasovski's Method, variable gradient method.

UNIT-V: Optimal Control:

Formulation of optimal control problem, calculus of variations, Minimisation of functionals . Formulation of variational calculus using Hamiltonian method.

LEARNING RESOURCESS:

1. Gopal M. Modern, Control System Theory, Wiley Eastern Ltd. 2004.
2. Schulz DG , Melsa JL , State functions of linear control systems, Mc Graw Hill.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Distributed Generation
(Professional Elective – III)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE770EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To develop a conceptual introduction to various distributed generation systems, micro grids and their control	1. Describe a range of distributed energy sources including wind, PV, hydro, and energy storage systems. 2. Demonstrate the impacts that distributed energy sources are having on the control and operation of power systems including voltage control, power factor, power quality and protection coordination. 3. Analyze grid integration of different types of DGs and their effect on dynamic, steady state stability of power system. 4. Illustrate grid integration system issues and challenges with conventional and non-conventional energy sources and estimate reliability of DG based systems. 5. Model and analyze a micro grid taking into consideration the planning and operational issues of the DGs to be connected in the system.

UNIT-I: Need for Distributed generation:

Renewable sources in distributed generation and current scenario in Distributed Generation, Planning of DGs, Siting and sizing of DGs optimal placement of DG sources in distribution systems,

UNIT-II: Grid integration of DGs:

Different types of interfaces, Inverter based DGs and rotating machine based interfaces, Aggregation of multiple DG units, Energy storage elements – Batteries, ultra capacitors, flywheels.

UNIT -III :Technical impacts of DGs:

Transmission systems, Distribution systems, De-regulation – Impact of DGs upon protective relaying – Impact of DGs upon transient and dynamic stability of existing distribution systems – Steady state and Dynamic analysis.

UNIT-IV :Economic and control aspects of DGs:

Market facts, issues and challenges – Limitations of DGs – Voltage control techniques, Reactive power control, Harmonics, Power quality issues – Reliability of DG based systems

UNIT- V : Introduction to micro-grids :

Types of micro-grids – Autonomous and non-autonomous grids – Sizing of micro-grids – Modeling & analysis – Micro-grids with multiple DGs – Micro-grids with power electronic interfacing units – Transients in micro-grids – Protection of micro-grids – Case studies.

Learning Resources:

1. H. Lee Willis, Walter G. Scott , 'Distributed Power Generation – Planning and Evaluation', Marcel Decker Press, 2000.
2. M.Godoy Simoes, Felix A.Farret, 'Renewable Energy Systems – Design and Analysis with Induction Generators', CRC press.
3. Robert Lasseter, Paolo Piagi, 'Micro-grid: A Conceptual Solution', PESC 2004, June 2004.

4. F. Katiraei, M.R. Iravani, 'Transients of a Micro-Grid System with Multiple Distributed Energy Resources', International Conference on Power Systems Transients (IPST'05) in Montreal, Canada on June 19-23, 2005.
5. Z. Ye, R. Walling, N. Miller, P. Du, K. Nelson, 'Facility Micro grids', General Electric Global Research Canter, Niskayuna, New York, Subcontract report, May 2005.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering
Electric and Hybrid Vehicles
(Professional Elective-III)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE780EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
Acquire knowledge about fundamental concepts, principles, analysis and design of hybrid and electric vehicles and learn electric drive in vehicles / traction.	At the end of this course, studentswill demonstrate the ability to 1. Understand the importance of electric and hybrid vehicles over internal combustion engines 2. Identify variousEV & HEV drive trains 3. Select various types of propulsion units andtheir control depending upon the application 4. Understand the different possible ways ofenergy storage. 5. Adopt different strategies relatedto battery & energy management systems &charging topologies.

Unit I: Introduction

Conventional Vehicles: Vehicle dynamics fundamentals: Rolling resistance, aerodynamic drag, gradient resistance, acceleration resistance, Tractive effort, Torque speed Characteristics of internal combustion engine & electric motor, Vehicle Dynamics Modelling and Simulation

Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, Social and environmental importance of hybrid and electric vehicles,

Comparison of well to wheels efficiencies of EV's & ICE, impact of modern drive-trains on distribution system and electric grid.

Unit-II: Drive Trains

Hybrid Electric Drive-trains: Classification of various HEV's: mild, macro, full hybrid, plug-in hybrid, range extended vehicles. Configurations of HEV drive trains: series, parallel, series-parallel complex, power flow control, Regenerative braking

Electric Drive Trains: Configurations of EV drive train: Rear wheel drive, front wheel drive, Out Wheel motor rear-wheel drive, Out wheel motor front-wheel drive, Duel out wheel motors front-wheel drive, In-wheel motor drive, Barriers to EV adoption, Single or Multiple motor configuration

Unit-III :Electric Propulsion Unit

EV & EHV motor requirements, Classification of EV motors, 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 Switch Reluctance Motor drives

Unit-IV: Energy Storage

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage andits analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Ragone chart of various energy sources, Hybridisation of energy sources for EV's & HEV's.

Unit-V: Battery &Energy Management Strategies

Battery Management strategy: Importance of battery management system, BMS for EV's, BMS block representation, Battery monitoring system for an EV

Energy Management Strategy: Benefits of energy management, Energy management system for EV's, Energy management strategies for HEV: Rule based control strategy, Optimisation based control strategy

Charging Topologies: Level-1, Level-2, Level-3 charging & Wireless charging; Vehicle to Grid (V2G), Battery swapping

Case Studies: Toyota Prius, Tesla Roadster

Text / References:

1. Mehrdad. Ehsani, Yimin Gao Stefano Longo Kambiz M. Ebrahimi "Modern Electric, Hybrid Electric,and FuelCell Vehicles, 3rd edition, CRC Press, 2018.
2. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles andApplications with Practical Perspectives", John Wiley & Sons, 2011.
3. S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy ManagementStrategies", Springer, 2015.
4. T. Denton, "Electric and Hybrid Vehicles", Routledge, 2016.
5. John M. Miller, Propulsion Systems for Hybrid Vehicles, IET 2nd Edition, 2010

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Electrical Power Distribution Engineering(Professional Elective-IV)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks: 60	Course Code:U20PE712EE
Credits: 3	CIE Marks: 40	Duration of SEE: 3Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To provide knowledge on structure of Electrical Distribution System 2. To provide knowledge on performance of Electrical distribution system. 3. To provide knowledge on Distribution Automation.	1. Compute contribution factor, coincidence factor, load factor and loss factors based on the characteristics of loads. 2. Design primary and secondary system of Distribution Network based on the factors effecting them 3. Choose the optimal size and location of capacitors for improvement of Power Factor and Voltage Profile using algorithms. 4. Compute fault currents for different faults in distribution systems and choose the protective schemes and co-ordinate the protective devices 5. List the procedures for Distribution automation using different Communication systems and Automated devices.

UNIT – I: Load Modeling and Characteristics:
Introduction, Load characteristics, Diversified demand, non- coincident demand, coincidence factor contributions factor problems, Load modeling.

Distribution System:
Sub transmission system and Substation Bus Schemes.

UNIT – II: Distribution feeders:
Design considerations of Primary Systems: Radial type Primary feeder, Loop type primary feeder, Primary Network, Factors affecting feeder voltages, feeder loading, Tie Lines. Application of ABCD parameters to feeder circuits.
Design practice of secondary distribution systems-Secondary Voltage levels, Present design practice, Secondary banking, Secondary networks, Secondary mains, Spot Networks.(Theoretical aspects only).

UNIT – III: Voltage drop and power loss calculation:
3-phase , non-3-phase primary lines, single phase two wire laterals with ungrounded neutral, single phase two wire ungrounded laterals. Application of capacitors to distribution systems, Effect of series and shunt capacitors, power factor correction, Economic justification for capacitors, Best capacitor location.

Unit IV: Distribution system Protection:
Objectives-protection schemes- Circuit Breakers-Sectionalizers-Coordination of protective devices-objectives-types of coordination-classification of faults-fault calculations(Theoretical aspects only)

UNIT – V:Distribution Automation:
Project planning, Communication, SCADA, Consumer Information Service (CIS), Automatic Meter Reading (AMR)

LEARNING RESOURCESS:
1. Turan Gonen, Electric Power distribution Engineering, McGraw Hill Book Co., International Student Edition, 1986.
2. Electric Power Distribution and Automation by S.Sivanagaraju and V.Sankar, Dhanpat Rai and Co.

3. A.S.Pabla, Electric Power Distribution, Tata McGraw Hill publishing Ltd., 1997
4. Kamalesh Das, Electric Power Systems for Industrial Plants" Jaico Publishing House, 2007.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Power Quality

(Professional Elective – IV)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:1:0	SEE Marks :60	Course Code:U20PE713EE
Credits : 3	CIE Marks: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To know different terms of power quality. 2. To Illustrate of voltage power quality issue - short and long interruption 3. To construct study of characterization of voltage sag magnitude and three phase unbalanced voltage sag. 4. To know the behavior of power electronics loads; induction motors, synchronous motor etc by the power quality issues 5. To prepare mitigation of power quality issues by the VSI converters.	1. Know the severity of power quality problems in distribution system. 2. Understand the concept of voltage sag transformation from up-stream (higher voltages) to down-stream (lower voltage) 3. Compute the concept of improving the power quality to sensitive load by various mitigating custom power devices

UNIT-I: Introduction:

Introduction of the Power Quality (PQ) problem, Terms Used in PQ: Voltage Sag, Swell, Surges, Harmonics, over voltages, spikes, Voltage fluctuations, Transients, Interruption, overview of power quality phenomenon, Remedies to improve power quality, power quality monitoring. Power Quality Data: Data collection, Data analysis, Database Structure, Creating PQ databases, Processing PQ data.

UNIT-II: Voltage sag -characterization:
Voltage sag -definition, causes of voltage sag, voltage sag magnitude, monitoring, theoretical calculation of voltage sag magnitude, voltage sag calculation in non-radial systems, meshed systems, voltage sag duration. Three phase faults, phase angle jumps, magnitude and phase angle jumps for three phase unbalanced sags, load influence on voltage sags.

UNIT-III: PQ considerations in Industrial Power Systems:
Adjustable speed drive (ASD) systems and applications, mitigation of harmonics. Characterization of voltage sags experienced by three-phase ASD systems: Types of sags and phase -angle jumps. Effects of momentary voltage dips on the operation of induction and synchronous motors. Voltage sag coordination for reliable plant operation.

UNIT-IV: Effects of Harmonics on Power Quality:
Harmonic analysis of industrial customers, technical barriers in ASDs. Methods of evaluation of harmonic levels in industrial distribution systems. Harmonic effects on transformers. Impact of distribution system capacitor banks on PQ. Guidelines for limiting voltage harmonics.

UNIT-V: Power Quality Monitoring:
Introduction, site surveys, Transducers, IEC-measurement techniques for Harmonics, Flicker, IEC Flicker meter.

Learning Resources:
1. Math HJ Bollen, "Understanding Power Quality Problems ", IEEE I Press.
2. C. Sankaran, "Power Quality" CRC Press.
3. R.Sastry Vedam, M.Sarma, "Power Quality- Var Compensation in Power Systems ", CRC Press, 2009.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Programmable Logic Controllers

(Professional Elective – IV)

SYLLABUS FOR B.E. VII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE714EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. Design,Programme and build an operational control system complete with instrumentation, analog/ digital inputs and outputs and Programmable Logic controllers. 2. Practicalities of working with PLCs in an industrial environment and fault-finding in an automated environment.	1. Designa PLC system, component, or process to meet a set of specifications. 2. Describe and understand how analogue and digital instrumentation connect to a PLC. 3. Understand advanced programming techniques including functional block and statement list. 4. Program, edit and test PLC programs incorporating combinational and sequential logic function, timers, counters and data handling instructions. 5. Design,understand and solve industrial problems with automation solutions

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.

UNIT-II:

PLC Programming input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill-press operation. Digital logic gates programming in the Boolean algebra system,

conversion examples Ladder diagrams for process control Ladder diagrams and sequence listings, ladder diagram construction and flow chart for spray process system.

UNIT-III:

PLC Registers: Characteristics of Registers module addressing holding registers input registers, output registers. PLC Functions Timer functions and industrial applications counters 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 and Sweep functions and their applications. Bit Pattern and changing a bit shift register, sequence functions and applications, controlling of two axes and three axis Robots with PLC, Matrix functions.

UNIT-V:

Analog PLC operation: Analog modules and systems Analog signal processing multi bit data processing, analog output application examples, PID principles position indicator with PID control, PID modules, PID tuning,PID functions.

Learning Resources:

1. Programmable Logic Controllers – Principle and Applications by John.W.Webb and Ronald A Reiss Fifth edition, PHI.
2. Programmable Logic Controllers – Programming Method and Applications by JR Hackworth and F.D Hackworth – Jr- Pearson, 2004.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS) :: IBRAHIMBAGH, HYDERABAD – 500 031.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

SCHEME OF INSTRUCTION AND EXAMINATION (R-20) :: B.E. - EEE : EIGHTH SEMESTER (2023-24)

B.E (EEE) VIII Semester								
Course Code	**Name of the Course**	**Scheme of Instruction**			**Scheme of Examination**			
		Hours per Week			**Duration in Hrs**	**Maximum Marks**		**Credits**
		L	**T**	**P/D**		**SEE**	**CIE**	
THEORY								
U20PE8XXEE	Professional Elective –V	3	-	-	3	60	40	3
U20PE8XXEE	Professional Elective –VI	3	-	-	3	60	40	3
PRACTICALS								
U20PW819EE	Project / Internship	-	-	12	VIVA-VOCE	50	50	6
	Total	**6**	**-**	**12**		**170**	**130**	**12**
	Grand Total	**18**				**300**		**12**
Student should acquire one online course certification equivalent to two credits during III Sem to VII sem.								

Professional Elective – V:

1. U20PE810EE - Electrical Machine Design
2. U20PE820EE - Switched mode power conversion
3. U20PE830EE - SCADA system and application

Professional Elective – VI:

1. U20PE840EE – AI applications to Power Systems
2. U20PE850EE – Advanced Modulation Techniques for Power Converters
3. U20PE860EE – Smart Grid Technologies

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Electrical Machine Design

(Professional Elective – V)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE810EE
Credits : 3	CIE Marks: 40	Duration of SEE: 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To impart the fundamentals of electric machine design such that the students can apply these concepts for designing the machines**.**	1. Choose materials for conducting, magnetic, insulating parts of the machine based on machine design requirements using the knowledge of properties of materials. 2. Design the thermal circuit for the permissible temperature rise and develop different methods to limit temperature to the maximum permissible value using different cooling methodologies. 3. Design AC machines, transformer,3 phase Induction machines in compliance with the given specifications applying the fundamentals 4. Demonstrate the use of computer in machine design to simplify the design process 5. Interpret the design of PMSMs, BLDCs and claw-pole machines.

Unit I:

Introduction

Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electric and magnetic loadings, thermal considerations, types of cooling, types of enclosures, Quantity of Cooling Medium required, heat flow, temperature rise, rating of machines.

Unit II:

Transformers

Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, temperature rise in transformers, design of cooling tank, methods for cooling of transformers.

Unit III:

Induction Motors

Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor.

Unit IV:

Synchronous Machines

Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

Unit V:

Computer aided Design (CAD):

Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to

FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs and claw-pole machines.

Learning Resources:

1. A. K. Sawhney, "A Course in Electrical Machine Design", Dhanpat Rai and Sons, 2016.
2. M.G. Say, "The Performance & Design of Alternating Current MAchines", CBS Publishers 2002
3. Principles of Electrical Machine Design ,R.K. Agarwal,S K Kataria and Sons; Reprint 2012 edition
4. Design and Simulation of Electrical Machines with MATLAB, Nova Science Publishers.
5. K M Vishnu Murthy Computer Aided Design of Electrical Machines , B S Publications.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1. No. of Internal Tests	: 2	Max. Marks for each Internal Test	:	30
2. No. of Assignments	: 3	Max. Marks for each Assignment	:	5
3. No. of Quizzes	: 3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Switched Mode Power Conversion

(Professional Elective-V)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE820EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To apply the basic concepts of power electronics for designing converters and implement practical circuits for UPS, SMPS etc.	1. Design converter system for electrical applications 2. Design SMPS for small power applications. 3. Choose suitable control scheme for converters. 4. Design appropriate filter to get harmonic free power supply. 5. Choose appropriate filter for reduction of EMI.

UNIT – I: Basic Converter Circuits:

Buck Regulator, Buck- Boost Regulator, Boost Regulator, Cuk Converters and Resonant Converters. Choice of switching frequency.

UNIT – II: Isolated SMPS:

Fly back Converter, Forward Converter, Half-Bridge and Full Bridge Converters, Push-Pull Converter and SMPS with multiple outputs. Choice of switching frequency.

UNIT – III: Control Aspects:

PWM Controllers, Isolation in feedback loop, Power Supplies with multiple output.

UNIT – IV: Design Considerations:

Selection of output filter capacitor, Selection of energy storage inductor, Design of High Frequency Inductor and High frequency Transformer,

Selection of switches. Snubber circuit design.

UNIT – V: Electro Magnetic Interference (EMI):

EMI Filter Components, Conducted EMI suppression, Radiated EMI suppression, Measurement.

Learning Resources:

1. Switched Mode Power Supplies, Design and Construction, H. W. Whittington, B. W.Flynn and D. E. MacPherson, Universities Press, 2009 Edition.
2. Mohan N. Undeland . T & Robbins W, Power Electronics Converters, Application andDesign. John Wiley, 3rd edition, 2002
3. Umanand L., Bhat S.R., Design of magnetic components for switched Mode PowerConverters. , Wiley Eastern Ltd.,1992
4. Robert. W. Erickson, D. Maksimovic .Fundamentals of Power Electronics., SpringerInternational Edition, 2005
5. Course Material on Switched Mode Power Conversion, V. Ramanarayanan.
6. Krein P.T .Elements of Power Electronics., Oxford University Press
7. M.H.Rashid, Power Electronics. Prentice-Hall of India

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

SCADA System and Application

(Professional Elective-V)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE830EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
1. To understand what is meant by SCADA and its functions. 2. To know SCADA communication. 3. To get an insight into its application.	1. Describe the basic tasks of Supervisory Control Systems (SCADA) as well as their typical applications. 2. Acquire knowledge about SCADA architecture, various advantages and disadvantages of each system. 3. Knowledge about single unified standard architecture IEC 61850. 4. To learn about SCADA system components: remote terminal units, PLCs, intelligent electronic devices, HMI systems, SCADA server. 5. Learn and understand about SCADA applications in transmission and distribution sector, industries etc.

Unit – I:Introduction to SCADA:

Data acquisition systems, Evolution of SCADA,
Communication technologies. Monitoring and supervisory functions,
SCADA applications in Utility Automation, Industries SCADA

Unit – II: Industries SCADA System Components:

Schemes- Remote Terminal
Unit (RTU), Intelligent Electronic Devices (IED), Programmable Logic Controller (PLC), Communication Network, SCADA Server, SCADA/HMI Systems

Unit – III:SCADA Architecture:

Various SCADA architectures, advantages and disadvantages of each system - single unified standard architecture –IEC 61850.

Unit – IV:SCADA Communication:

various industrial communication technologies
-wired and wireless methods and fiber optics. open standard communication protocols.

Unit – V: SCADA Applications:

Utility applications- Transmission and Distribution sector-operations, monitoring, analysis and improvement. Industries - oil, gas and water.
Case studies, Implementation, Simulation Exercise

Learning Resources:

1. Stuart A. Boyer: "SCADA-Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA,2004.
2. Gordon Clarke, Deon Reynders: "Practical Modern SCADA Protocols: DNP3, 60870.5 and
Related Systems", Newnes Publications, Oxford, UK,2004.
3. William T. Shaw, "Cybersecurity for SCADA systems", PennWell Books, 2006.
4. David Bailey, Edwin Wright, "Practical SCADA for industry", Newnes, 2003.
5. Wiebe, "A guide to utility automation: AMR, SCADA, and IT systems for electric power", PennWell 1999.

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

AI Applications to Power Systems

(Professional Elective – VI)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE840EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
Apply Artificial Neural Networks, Fuzzy logic and optimization techniques for practical Power Systems problems	1. Analyse the Artificial Neural Networks and apply it for load forecasting. 2. Illustrate the Fuzzy Logic technique and apply it for Load Frequency Control problem in Power Systems. 3. Apply the functioning of Genetic Algorithm in attaining the global optimal solution for any Power Systems problem. 4. Interpret the functioning of Particle Swarm Optimization and Jaya Algorithm in identifying the global optimal solution for any Power Systems problem. 5. Apply optimization techniques to solve the practical Power Systems problems of Economic Scheduling, Optimal DG placement, Optimal Power Flows, Reactive Power Planning.

Unit I

Biological foundations to Intelligent Systems, Artificial Neural Networks, Activation functions, Architecture of Neural networks: Single layer and Multilayer Feed Forward Neural Networks, Types of learnings, Supervised Learning Algorithms: Hebb network, Perceptron model, Adaline model, Back Propagation Algorithm and Radial Basis Function Networks, Application: Load Forecasting

Unit II

Introduction to Fuzzy Logic, Fuzzy Sets operations, properties of fuzzy sets, Membership functions, Features of Membership Functions, Fuzzification, Fuzzy inference system, Defuzzification methods: Max-Membership Principle, Centroid method, Weighted Average method, Mean-Max Membership, Centre of Largest areas, center of sums, First of Maxima, Last of Maxima, Application: Load Frequency Control in Power System.

Unit III

Introduction to Evolutionary algorithms; Introduction to Genetic algorithm, encoding methods, Selection methods: Roulette wheel selection, Rank based Selection, Tournament selection, Linear Ranking Selection, Exponential Ranking Selection, Elitism operation; Crossover operation; Mutation operation; Development of Algorithm and Numerical on GA.

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Unit IV

Particle Swarm Optimization: Introduction to Particle Swarm Optimization, Development of PSO Algorithm, Numerical on PSO algorithm

Jaya Algorithm: Introduction to Jaya algorithm; Development of Jaya algorithm, Numerical on Jaya Algorithm.

Unit V

Applications of AI Techniques to Practical Power Systems problems: Economic scheduling of generators; optimal DG placement in Distribution system, Optimal power flow, Reactive Power Planning.

Suggested reading

1. Jacek.M. Zurada,"An Introduction to ANN", Jaico Publishing House
2. Simon Haykins, "Neural Networks", Prentice Hall
3. Timothy J. Ross,"Fuzzy Logic with Engg. Applications",Wiley Publishers

4. Driankov Dimiter,Hans Hellendoorn, Michael Reinfrank "An Introduction to Fuzzy Control", Springer-Verlag Berlin Heidelberg
5. David E.Goldberg,"Genetic Algorithms", Pearson Education India
6. Sivanandam, S. N., and S. N. Deepa. Principles of soft computing, John Wiley & Sons, 2007.
7. https://ieeexplore.ieee.org/Xplore/home.jsp
8. https://www.sciencedirect.com

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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3. No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Advanced Modulation techniques for Power Converters

(Professional Elective – III)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE850EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
To know the modulation techniques employed for power electronic converters and design multi-level inverters with different topologies.	1: Understand the basic converter topologies and multilevel inverter topologies 2: Apply fundamentals of PWM schemes with different analysis for inverters 3: Analyze modulation of single phase and three VSIs. 4: Design multi level inverters with carrier based PWM

UNIT-I Introduction to Power Electronic Converters:

Basic Converter Topologies, Voltage Source/Stiff Inverters, Switching Function Representation of Three-Phase Converters, Output Voltage Control, Current Source/Stiff Inverters, Concept of a Space Vector, Three-Level Inverters, Multilevel Inverter Topologies.

UNIT-II Modulation of One Inverter Phase Leg:

Fundamental Concepts of PWM, Evaluation of PWM Schemes, Double Fourier Integral Analysis of a Two Level Pulse Width Modulated Waveform, Naturally Sampled Pulse Width Modulation, PWM Analysis by Duty Cycle Variation, Regular Sampled Pulse Width Modulation, Direct

Modulation, Integer versus Non-Integer Frequency Ratios, Review of PWM Variations

UNIT-III Modulation of Single-Phase Voltage Source Inverters:
Topology of a Single-Phase Inverter, Three-Level Modulation of a Single-Phase Inverter, Analytic Calculation of Harmonic Losses, Sideband Modulation, Switched Pulse Position, Switched Pulse Sequence

UNIT-IV Modulation of Three-Phase Voltage Source Inverters:
Topology of a Three-Phase Inverter (VSI), Three-Phase Modulation with Sinusoidal References, Third-Harmonic Reference Injection, Analytic Calculation of Harmonic Losses, Discontinuous Modulation Strategies, Triplen Carrier Ratios and Sub-harmonics.

UNIT-V Carrier-Based PWM of Multilevel Inverters:
PWM of Cascaded Single-Phase H-Bridges, Over modulation of Cascaded H-Bridges, PWM Alternatives for Diode-Clamped Multilevel Inverters, Three-Level Naturally Sampled PD PWM, Three-Level Naturally Sampled APOD/ POD PWM, Over modulation of Three-Level Inverters, Five-Level PWM for Diode-Clamped Inverters, PWM of Higher Level Inverters.

Learning Resources:

1. D. Grahame Holmes and Thomas A. Lipo, "Pulse width modulation for power converters principles and practice", IEEE Series on Power Engineering, A JOHN WILEY & SONS, INC., PUBLICATION

The break-up of CIE: Internal Tests+ Assignments + Quizzes

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Duration of Internal Tests: 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)
IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Smart Grid Technologies
(Professional Elective – III)

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):3:0:0	SEE Marks :60	Course Code : U20PE860EE
Credits : 3	CIE Marks: 40	Duration of SEE : 3 Hours

COURSE OBJECTIVES	**COURSE OUTCOMES** On completion of the course, students will be able to
Understand Smart grid and its functions, Distribution generation technologies, Communication technologies inSmart Grid	1. Analyse the features of Smart Grid 2. Assess the need of automatic in Power sector and its components 3. Illustrate various Distributed technologies adopted in Power Systems 4. Interpret role of PMUs and WAMs in Smart Grid. 5. Analyse control techniques adopted in Smart Grid

Unit I

Introduction to Smart Grid: Basics of Power Systems, definition of Smart Grid, need for Smart Grid, and Associated Concepts – Smart Grid Functions - Traditional Power Grid and Smart Grid – New Technologies for Smart Grid – Advantages – Indian Smart Grid – Key Challenges for Smart Grid.

Unit II

Smart Grid Architecture and Components: Architecture of Smart Grid Design– Review of the proposed architectures for Smart Grid. The

fundamental components of Smart Grid designs – Transmission Automation – Distribution Automation

Unit III

Distribution Generation Technologies: Introduction to Renewable Energy Technologies – Microgrids –Storage Technologies – Electric Vehicles and plug–in hybrids –Environmental impact– Economic Issues.

Unit IV

Communication Technologies and Smart Grid: Introduction to Communication Technology – Synchro-Phasor Measurement Units (PMUs) –Wide Area Measurement Systems (WAMS).

Unit V

Tools and Techniques for Smart Grid: Computational Intelligence Techniques –Evolutionary Algorithms, Artificial Intelligence techniques Control of Smart Power Grid System: Load Frequency Control (LFC) in Micro Grid System – Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid.

Suggested reading

1. Stuart Borlase, "Smart Grids, Infrastructure, Technology and Solutions", CRC Press, 2013.
2. Janaka Ekanayake, Kithsiri Liyanage, Jianzhong Wu, Akihiko Yokoyama, Nick Jenkins, "Smart Grid: Technology and Applications", Wiley, 2012.
3. Gil Masters, "Renewable and Efficient Electric Power System", Wiley-Electrical & Electronics Engineering Press, 2004.
4. Arun G. Phadke James S. Thorp, "Synchronized Phasor Measurements and their Applications", Second Edition, Springer, 2017
5. V. C. Gungor, Dilan Sahin, Taskin Kocak, Salih Ergut, Concettina Buccella, Carlo Cecati, Gerhard P. Hancke "Smart Grid Technologies: Communication Technologies and Standards", in IEEE Transactions on Industrial Informatics, vol. 7, no. 4, pp. 529-539, Nov. 2011, doi: 10.1109/TII.2011.2166794.
6. https://ieeexplore.ieee.org/Xplore/home.jsp
7. https://www.sciencedirect.com

The break-up of CIE: Internal Tests+ Assignments + Quizzes

1.	No. of Internal Tests	:	2	Max. Marks for each Internal Test	:	30
2.	No. of Assignments	:	3	Max. Marks for each Assignment	:	5
3.	No. of Quizzes	:	3	Max. Marks for each Quiz Test	:	5

Duration of Internal Tests : 90 Minutes

With effect from the Academic Year 2023-24

VASAVI COLLEGE OF ENGINEERING (Autonomous)

IBRAHIMBAGH, HYDERABAD – 500 031

Department of Electrical & Electronics Engineering

Project

SYLLABUS FOR B.E. VIII - SEMESTER

L:T:P (Hours /week):0:0:12	SEE Marks: 50	Course Code: U20PW819EE
Credits: 6	CIE Marks: 50	Duration of SEE: -

Solving the real life problem' should be the focus of U.G. project. Faculty members should prepare the project brief well in advance which should be made available to the students at the Departmental library. The project may be classified as hardware, software, modeling , simulation. It should involve one or many elements of techniques such as analysis, design, synthesis.

The Department will appoint a project co-ordinator who will coordinate the following

- Grouping of students (a maximum of three in a group)
- Allotment of projects and project guides
- Project monitoring at regular intervals.

All project allotment are to be completed by 4th week of IV year 1st semester so that students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through students presentation. Sessional marks should be based on the grades/marks, awarded by a monitoring committee of faculty members and marks given by the supervisor.

Efforts be made that some of the projects are carried out in Industries with the help of Industry co-ordinators. Problems can also be invited from the industries to be worked out through UG project.

Common norms will be established for final documentation of the project report by the respective Department.

* Excellent /Very good/Good/Satisfactory/Unsatisfactory.

Note: Three periods of contact load will be assigned to each project guide.