Basaveshwar Engineering College (Autonomous), Bagalkot
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Scheme & Syllabus of Teaching and Evaluation for B.E Electrical and Electronics Engineering

Semester-7 **CAY 2021-22 [175 credits. 2018-19 admitted batch]**

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE751C	Computer Applications to Power System	3	3	0	0	50	50	100
02	UEE752C	High Voltage, Switchgear and Protection	3	3	0	0	50	50	100
03	UHS753C	Intellectual Property Rights	3	3	0	0	50	50	100
04	UEE754E	Dept. Elective – 4	3	3	0	0	50	50	100
05	UEE755E	Open. Elective – 2	3	3	0	0	50	50	100
06	UEE761L	Power System Simulation Lab	1	0	0	2	50	50	100
07	UEE762L	High Voltage and Relay Lab	1	0	0	2	50	50	100
08	UEE764I	Internship*	2	0	0	*	50	50	100
09	UEE765P	Project Work Phase – I	5	0	0	8	50	50	100
Total			24	15	0	12	450	450	900

* **Working hours will be as per scheduled working hours prescribed by the industry.**

List of Elective Subjects

Electrical Machine Drives	Operation Research
Solar Photovoltaic System Design	Standards and Indian Electricity Act
Professional Communication and Technical Writing	Autotronics (Automotive Electronics)
AI Applications to Power Systems	Embedded System and PLC

List of Open Electives Subjects @ 7th Sem	
Energy conservation in Industrial Systems	Electrical Safety for Engineers

Question paper pattern for Theory SEE:

1. Total of eight questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each question should not have more than 4 sub divisions.
3. Any five full questions are to be answered choosing at least one from each unit

Laboratory Assessments for SEE:

1. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE)
2. Allocation of 50 marks for CIE Performance and journal write-up: Marks for each experiment = 30 marks / No. of proposed experiments. One Practical test for 20 marks, (5 write up, 10 conduction, calculation, results etc., 5 viva-voce).
3. Allocation of 50 marks for SEE: 25% write up, 50% conduction, calculation, results

Computer Applications to Power System	
Subject Code: UEE751C	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01 Network Topology: **04 Hours**

Introduction, Elementary Graph Theory, Connected graph, Sub graph Loop, Cut-set, Tree, Co-tree, Basic loops, Basic cut-set. Incidence Matrices:
Element-node incidence matrix A (Bus-incidence matrix), Branch path incidence matrix K, Basic (Fundamental) cut-set incidence matrix B, Augmented cut-set matrix, Basic loop incidence matrix C, Augmented loop incidence matrix.

02 Primitive Network: **02 Hours**

General primitive element, Impedance and Admittance form of the primitive element, Primitive network matrices.

03 Network Matrices: **04 Hours**

Introduction, Derivation of Ybus = [A][y][A]T, Formation of Ybus by inspection method. Modeling: Transmission lines, Transformers, Loads and generator internal impedance. Examples.

Unit-II

04 Load Flow Studies: **01 Hours**

Introduction, Power Flow Equation, Classification of Buses, Operating Constraints, Data for Load Flow: System data, Generator bus data, Load Data,

06 Gauss-Seidal Method: **04 Hours**

Algorithm for GS method, Modification of algorithm to include PV buses, Q- limit violations, Acceleration of convergence and examples.

07 Newton – Raphson Method: **05 Hours**

Introduction, Algorithm for NR method in polar coordinates and rectangular coordinates. Fast Decoupled Load Flow and examples.

Unit-III

08 Economic Operations of Power System: **10 Hours**

Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation including generator limits and neglecting losses, Iterative technique, Economic Dispatch Including Transmission Losses: Approximation penalty factor, Derivation of transmission loss formula. Introduction to optimal scheduling for hydrothermal plants. Problem formulation, solution procedure and algorithm.

Unit-IV

09 Transient Stability Studies: **05 Hours**

Introduction, swing equation, machine equations. Power system equations.

10 Modeling : **04 Hours**

Modeling of excitation systems: Introduction, DC Excitation system, AC Excitation system. Type 1, Type 2 and Type 3 excitation. Load Model: Static, Dynamic load models.

References:

1. Stag.G. W., and EI-Abaid, A. H., "Computer Methods in Power System Analysis", (2019 Edition), MEDTECH, A Division of Scientific International 2019.
2. K. Uma Rao, "Computer Techniques and Model in Power Systems", 2nd edition, I. K. International , 2014.
3. Singh, L. P., "Advanced Power System Analysis and Dynamics", 6th edition, New Age

International (P) Ltd, New Delhi, 2014.

4. Nagrath, I. J., and Kothari, D. P., "Modern Power System Analysis", 4th edition, TMH, 2011
5. Pai., M.A., "Computer Techniques in Power System Analysis", 2nd edition, TMH, 2006.

Course outcomes:

After completion of the course, the students shall be able to:

1. State the concepts of power system analysis
2. Illustrate the development of mathematical skills and writing algorithm for various problems involved in power system
3. Apply optimization techniques in scheduling of thermal generators
4. Analyse the different types of algorithm in load flow analysis
5. Compare and contrast types of excitation and load Models
6. Construct the problem formulation in economic dispatch and in transmission losses.

HIGH VOLTAGE, SWITCHGEAR AND PROTECTION	
Subject Code: UEE752C	**Credits: 03**
Contact Hours: 03 (3L-0T-0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Generation of HV AC and DC Voltage: L-06 Hours

Classification of high voltages, HVAC-transformer, Need for cascade connection, working of transformer units connected in cascade, Series resonant circuit – principle of operation and advantages, Tesla coil.HV – DC voltage doublers circuit, Cock croft – Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop, Important applications of high voltages.

Generation of Impulse Voltage and Current:: **L-04 Hours**

Introduction to standard lightning and switching impulse voltages. Analysis of single -stage impulse generator, expression for output impulse voltage. Multistage impulse generator, working of Mark impulse generator, Rating of impulse generator, Components of multistage impulse generator.

Unit-II

Measurement of High Voltages:L-05Hours

Electrostatic voltmeter – principle, construction and limitation. Chubb and Fortessue method for HVDC measurements. Series resistance micro ammeter, Standard Sphere gap measurements for HVAC, HVDC and factors affecting the measurements.

Insulation Testing Techniques: L-05Hours

Dielectric loss and loss angle measurement using Schering Bridge, Transformer ratios arm bridge, Breakdown in solid dielectrics: Intrinsic breakdown, Breakdown of liquid dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown(bubble's theory)

Unit-III

Protective Relaying: L-05 Hours

Relay definition, Required qualities of Protective Relaying, Primary and Back up protection, Classification of protective Relaying, Induction type Non-directional over current relay, Directional relay. Differential relay- Principle of operation, Percentage Differential relay, Distance relays: Impedance Relay, Reactance Relay, Mho Relay, R-X diagram and Buchholz Relay.

Protection Schemes: L-05 Hours

Merz-Price protection for generator, Merz -Price protection of Transformer. Inter turn fault, Induction motor protection-Protection against phase fault, ground fault and single phasing.

Unit-IV

Static Relays : L-05 Hours

Introduction, Basic construction and classification. Definite time lag static over current relay, Inverse time static over current relay, Static over voltage and under voltage relay, Microprocessor based over current relay-block diagram approach.

Principles of Circuit Breakers : L-05 Hours

Principles of AC circuit breaking, Principles of DC circuit breaking, Initiation of arc, maintenance of arc, Arc interruption- High resistance and Low resistance interruption. Re striking voltage, Recovery voltage and resistance switching. Types of circuit breakers- Air break and air blast circuit breakers, SF6 circuit breakers- Puffer type and Non Puffer type.

References

1. Sunil Rao "Switchgear and Protection and Power Systmes", (13th edition),Khanna

Publishers,2008
2. J.B.Gupta "Switchgear and Protection", (2nd edition), Katson Publisher,2013
3. Ravindarnath B"Power System Protection and Switchgear", 2nd edition, New age International, 2008.

Course outcomes:

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

- Students should be able to define HV voltage generation, measurement and their protection schemes with different circuit configuration.
- Students should be able to illustrate high voltage HV generation, breakdown phenomena in insulating materials and various protective methods.
- Students should be able to solve numerical problems on HV and protection circuit by considering given system parameters.
- Students should be able to analyze the properties/characteristics of HV equipments and protection devices.
- Students should be able to compare & contrast multiple methods to implement protective schemes against different faults in electrical systems.
- Students should be able to develop the expression of fault current in HVAC & DC protective devices.

Intellectual Property Rights	
Subject Code: UHS753C	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Introduction to IPRS: **L- 10 Hours**

Importance of human creativity and its recognition and protection. Concepts of Property and Rights. History of IPRs. Different forms of IPRs. Role of IPRs in R and D.

P**atents** :

Meaning of Patent, Object and Value of Patent law. Advantages of Patent to the invertors. Criteria for Patentability. Software and Business Methods Patents. Govt. use of inventions, infringement of Patent and remedies for infringement. Compulsory license.

Unit-II

Patent Drafting: **L-10 Hours**

Scope of invention, definitions, types of specification, descriptions, drawing, claim drafting and improvement.

Filing Requirement of patent:

Work flow chart in obtaining Patents, Forms to be submitted, assignment requirements, filing mechanism through Individual patent office and PCT route. Importance of PTC, claiming priority from either route. Request for re -examination and revocation. Term of Patent and Patent renewal.

Searching of Prior art:

Prior art- Tangible versus Intangible prior art. Search strategy: key words, structures, sequences, use operators, database for searching- free and paid, disclosed versus claimed matters.

Unit-III

Trade-Marks: L - **10 Hours**

Meaning and functions of Trade Marks. Concept of Distinctiveness and Trade Marks registration. Trade Marks- Challenges in Non- Conventional Marks.Infringement of TradeMarks and remedies for infringement. Domain Names disputes and Well-Known Marks, Distinction between Trade names & Trade marks.

Industrial Design:

Definition of a design. Concept of Novelty and Originality; Inclusive and Exclusive Designs; Functions of Designs. Industrial Design registration in India. Duplicity of registration, Infringement of Design and remedies for infringement.

Unit-IV

Copyright: **L- 9 Hours**

Introduction. Nature of Copyright, Subject-matter, protection requirement in Copyright Law, Neighboring/Related Rights. Economic and Moral Rights of Authors. Copyright in the Digital Context. An overview of Copyright protection in India. Transfer of Copyright. Infringement of Copyright, Copyright- fair dealing and remedies. Comparison with Patent and Copyright.

Emerging Copyright works in which copy subsists: Snippet tax and Online Streaming Platforms, Sound related technology, Blockchain technology

Confidential Information and Trade Secrets:
Introduction, Conditions of protection. Essentials for an action for breach of confidence, distinction between Confidential Information and General Information. Data protection laws in India: Cyber-Crimes under the IT Act.2000.

References:

1. P.Naryan, "Intellectual Property Law", 3rd Ed,Easern Law House, 2007.
2. Dr. S.R.Myneni, "Law of Intellectual Property", 9th Ed, Asia law House, 2019.
3. Dr.G.B Reddy,"Intellectual Property Rights and Law", Gogia Law Agency. Hydrabad, Reprint edition2020
4. N.R. Subbaram.S.Viswanathan, "Hand book Indian Patent Law and, Practice"Printers and publishers Pvt,Ltd,2008.
5. Cornish,"Intellectual Property Rights", Universal publications.
6. Dr.B.L.Wadehra,"Law Relating to Intellectual Property" 5thedition,Universal Law publishing Co, Dehli.

Course outcomes:

After completion of the course, the students shall be able to:

1. **Distinguish and Explain various forms of IPRs.**
2. **Identify criteria's to fit one's own intellectual work in particular form of IPRs.**
3. **Apply statutory provisions to protect particular form of IPRs.**
4. **Analyse rights and responsibilities of holder of Patent, Copyright, Trademark, Industrial Design etc.**
5. **Identify procedure to protect different forms of IPRs national and international level.**
6. **Develop skill of making search using modern tools and technics.**

(Elective)

Solar Photovoltaic System Design	
Subject Code: UEE754E	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Chapter-01: [05 Hrs]

Solar Energy – Introduction and its scenario of India and global; Solar Radiation – solar radiation spectrum, diffuse & beam radiation, sun-earth angles and solar radiation measurement. Numerical problems.

Chapter-02: [05 Hrs]

Solar Cells – I-V & P-V characteristics; Technologies; Parameters; Factors affecting electricity generated; equivalent circuit, series, parallel and series & parallel connections; Numerical problems.

Unit-II

Chapter-03: [05 Hrs]

SPV module – Ratings, standard parameters; factors affecting electricity generated; measuring module parameters; I-V & P-V characteristics; connection of modules in series, parallel and series & parallel; Modeling SPV modules, Mismatch in series and parallel connections, Introduction to arrays.

Chapter-04: [05 Hrs]

Balance of System (BoS) - Batteries; Charge Controllers; MPPT; Inverters. (BoS to cover functions, working, types, features, typical specifications and cost). Numerical problems.

Unit-III

Chapter-05: [05 Hrs]

SPV system design and integration – Types of SPV systems; Design Methodology for Stand-alone SPV systems.

Chapter-06: [05 Hrs]

Grid connected Solar PV Power Systems (GCSPVPS) – Introduction, Configurations & Components of GCSPVPS, GCSPVPS Design for small applications and for power plants.

Unit-IV

Chapter-07: [04 Hrs]

Wires – Introduction, basics of current conduction, types of wires, measurement of wire dimensions, wire sizing; junction box;

Chapter-08: [05 Hrs]

Installation, Troubleshooting of stand-alone and grid connected solar PV power systems; Safety of SPV power plants; Solar PV plant installation check list – Electrical testing of PV array, inverter; islanding protection; commissioning and system functioning. Field visits within campus to study installations.

References:

1. Chetan Singh Solanki, *Solar Photovoltaics – Fundamentals, Technologies and Applications*, PHI Learning Private Limited, New Delhi, 2009
2. Chetan Singh Solanki, Solar Photovoltaic Technology and Systems – A Manual for Technicians, Trainers and Engineers, PHI Learning Private Limited, New Delhi, 2014
3. M S Imamuaa and P. Helm *Photovoltaic System Technology A European Hand book*.
4. Tiwari, G. N and Ghosal, M. K., Fundamentals of Renewable Energy Sources, Narosa Publishing House, New Delhi, 2007

Course outcomes:

After completion of the course, the students shall be able to:

1. Students should be able to define various parameters & features of solar cell, module, panel, array and SPV systems
2. Students should be able to describe working of SPV systems and their components
3. Students should be able to compute performance of SPV systems for different loads and applications based on numerical problems
4. Students should be able to compare and analyze different SPV systems for specific applications based on performance
5. Students should be able to operate and test working of SPV systems and their components
6. Students should be able to design & discuss a solar PV system – stand alone or grid connected – based on typical loads.

(Elective)

Operations Research	
Subject Code: UEE75XX	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01 Introduction: **10 Hours**

Definition, OR models characteristics and phase of OR. Modeling with linear Programming: Two variable LP model, Graphical LP solution.

02 Simplex Method:

Special cases in Simplex method Big M method.

Unit-II

03 Duality: **10 Hours**

Definition of the dual problem primal to dual relationships, economic interpretation of duality, additional simplex algorithms.

04 Transportation Model:

Definition of transportation model basic feasible solution by different methods, finding optimal solutions, MODI method, the assignment model, traveling salesman problem.

Unit-III

05 Advanced Linear Programming: **09 Hours**

Revised simplex method.

06 Game Theory:

Formulation of two – person, zero sum games, solving simple games, Max – Min, Min – Max principles, graphical solution procedure, solving by linear programming.

Unit-IV

07 Pert and CPM Techniques: **10 Hours**

Network representation, critical path computation, construction of the time schedule, variation under probabilistic models, crossing of simple networks, PERT calculation.

References:

1. Hamdy A Thoha, "Operation Research An Introduction", 8th edition, Pearson Education, 2008.
2. Fredrick S.Hillier and Lieverman "Operation Research Concept and Cases", 8th edition, TMH, 2009.
3. S.D. Sharma, "Operation Research" 16th revised edition, , KNRN New Delhi 2009.
4. S. S. Rao, "Optimization Techniques", 3rd Edition New age International Publishers, 2010.

Course outcomes:

After completion of the course, the students shall be able to:

1. Students should be able to Identify and develop operational research models from the algebraic linear equations of the real system.
2. Students should be able to illustrate the mathematical tools that are needed to solve different optimization problems.
3. Students should be to find the feasible solution for real time algebraic equations
4. Students should be able to make the feasible solution in terms of simplex and duality methods
5. Students should be able to gain the knowledge in game theory which will help in solving research problems
6. Students should be able to understand the design of PERT network and get solution by CPM methods

(Elective)

ELECTRIC MACHINE DRIVES

Subject Code :UEE74XX **SEE Marks :100**

Credits : 03 (3L - 0T - 0P) **Exam Duration :03 Hrs**

	UNIT – I	
01	**Review Of Micro Controllers In Industrial Drives System:**	**5 Hrs**
	Typical Micro controller's 8 bit 16 bit (only block diagram) Digital Data Acquisition system, voltage sensors, current sensors, frequency sensors and speed sensors	
02	**Evolution Of Power Electronics In Drives**:	**5 Hrs**
	Power semiconductors devices used for drives control, GTO, BJT, power MOSFET, IGBT, MCT and IGCT structures, Ratings, comparison and their applications. Block diagram of power integrated circuit for D C motor drives.	
	UNIT -II	
03	**AC Machine Drives**:	**5 Hrs**
	General classification and National Electrical Manufacturer Association (NEMA) classification, Speed control of Induction motors with variable voltage constant frequency, constant voltage variable frequency, (v/f) constant operation, drive operating regions. Variable stator current operation. Effect of Harmonics	
04	**Synchronous Special Machine Drives:**	**5 Hrs**
	Comparison of Induction machines and synchronous machines Drives, Torque angle characteristics of salient pole synchronous machines, synchronous reluctance permanent magnet (SRPM), variable reluctance machines (VRM). Principle operations of BLDC motors and SRM motors.	
	UNIT – III	
05	**Phase Controlled Converters:**	**5 Hrs**
	Converter controls, Linear firing angle control, cosine wave crossing control, and phase locked Oscillator principle, Electromagnetic Interference (EMI) and line power quality problems, cyclo-converters, voltage fed converters, Rectifiers, Current fed converters.	
06	**Principles Of Slip Power Recovery Schemes:**	**5 Hrs**
	Static Kramer's drive system, block schematic diagram, phasor diagram and limitations, Static Scherbins scheme system using D.C link converters with cyclo converter modes of operation, modified Scherbins Drive for variable source, constant frequency (VSCF) generation**.**	
	UNIT – IV	
07	**Vector Control of AC Drives:**	**5 Hrs**
	Phasor diagram, digital Implementation block diagram, Flux vector estimation, indirect vector control block diagram with open loop flux control, synchronous motor control with compensation**.**	
08	**Expert System Application To Drives (Only Block Diagram):**	**4 Hrs**
	Expert system shell, Design methodology, ES based P-I tuning of vector controlled drives system, Fuzzy logic control for speed controller in vector control drives, structure of fuzzy control in feedback system.	

Text Books:

1. Power Electronics & Motor Drives,Bimal Bose, Elsevier 2006 61
2. Modern Power Electronics & Drives,Bimal K. Bose, Pearson Education 2003.

Reference Book:

1. Advanced Microprocessor and Interfacing, Badri Ram, TMH, 1st Edition.

Course Outcomes:

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

1. Identify the evolution of drives in electrical engineering.
2. Illustrate the problem solving methods in different sectors tools that are needed to solve realtime problems.
3. find the feasible methods for different different electric drives.
4. Analyse the different feasible techniques to interpret in power systems

(Elective)

AI Applications in Power Systems

Subject Code: UEE75XX	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Introduction: AI, Definitions, history and evolution of AI, essential abilities of Intelligence and AI applications. **[10 hrs]**

Unit-II

Problem Solving: Problem characteristics, problem search strategies, forward and backward reasoning, AND-OR goal trees, game trees, search methods – informed and uninformed search, breadth first search and depth first search methods. **[10 hrs]**

Unit-III

Knowledge Representation: Logical formalisms: prepositional and predicate logic, syntax and semantics, wffs, clause form expressions, resolutions – use of RRTs for proofs and answers, examples from electric power systems. Non-monotonic logic: TMS, modal, temporal and fuzzy logic. Structured Representation of Knowledge: ISA/ISPART trees, associative/ semantic sets, frame and scripts, examples from electric power systems.**[10 hrs]**

Unit-IV

AI Language: LISP and ProLog – Introduction, sample segments, LisP primitives, manipulation functions, function predicates, variables, iteration and recursion, property lists, sample programs from electric power systems. **[9 hrs]**

References:

1. K.Warwick, A.O. Ekwue and R. Aggarwal, *Artificial Intelligence Techniques in Power systems.*
2. Patterson D.W., Introduction to Artificial Intelligence and Expert Systems, PHI, 1992.
3. Charniak E., and McDermott D., Introduction to AI, Addison-Wesley, 1985.
4. Rich Elaine and Kevin Knight, Artificial Intelligence, Tata McGraw Hill, 1991.
5. Nils J. Nilson, Problem Solving Methods in AI, Tata McGraw Hill, 1971.

Course outcomes:

After completion of the course, the students shall be able to:

5. Identify the evolution of AI in power systems.
6. Illustrate the problem solving methods in different sectors tools that are needed to solve realtime problems.
7. find the feasible methods for different logical methods
8. Analyse the different feasible languages to interpret in power systems

EMBEDDED SYSTEM AND PLC	
Subject Code: UEE7XXE	**Credits: 03**
Contact Hours: 03 (3L-0T-0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Introduction to embedded systems: L-10 Hours

Definition of embedded system, embedded system vs. general computing system, history of embedded system, classifications, purpose of embedded system, major application areas including some novel applications. The typical embedded system: Core of embedded system, memory, sensors and actuators, communication interface, embedded firmware, other system components, PCB and passive components

Unit-II

Characteristics and quality attributes of embedded systems: L-10 Hours

Characteristics of embedded system, quality attributes of embedded systems, embedded systems applications like washing machine and automotive. Designing embedded systems with 8-bit microcontrollers: factors to be considered in selecting a controller, features of 8051 microcontroller, designing with MCS-51 family microcontrollers

Unit-III

Real-Time Operating System Based Embedded System: L-10 Hours

operating system basics, need for RTOS, types operating system, tasks, process and threads, multiprocessing and multitasking, task scheduling, threads, processes and scheduling : putting altogether, task communication, task synchronisation, device drive how to choose an RTOS, identify one open source RTOS using that demonstrate the concepts of RTOS.

Unit-IV

Programmable Logic Controllers: L-10 Hours

Introduction, Parts of a PLC, Principles of Operation, Modifying the Operation, PLCs versus Computers, PLC Size and Application. PLC Hardware Components: The I/O Section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O Specifications, The Central Processing Unit (CPU), Memory Design, Memory Types, Programming Terminal Devices, Recording and Retrieving Data, Human Machine Interfaces (HMIs). Basics of PLC Programming: Processor Memory Organization, Program Scan, PLC Programming Languages, Relay-Type Instructions, Instruction Addressing, Branch Instructions, Internal Relay Instructions, Programming Examine If Closed and Examine If Open Instructions, Entering the Ladder Diagram, Modes of operation

References

1. Shibu K V, "Introduction to embedded systems", Tata McGraw Hill private limited, 2010.
2. Rajkamal, "Embedded systems: architecture, programming and design", Tata McGraw Hill private limited, second edition.
3. Programmable Logic Controllers Frank D Petruzella McGraw Hill 4th Edition, 2011
4. Frank Vahid, Tony Givargis "Embedded system design: A unified

hardware/software

Course Outcomes

At the end of this course,

- Student should able to describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.
- Student should able to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers.
- Student should able to write the programs for interfacing the hardware.
- Student should able to understand the role of embedded systems in industry.
- Design real time embedded systems using the concepts of RTOS.
- Student should able to understand the basic knowledge Programmable Logic Controllers.

(Open Elective-2)

Energy Conservation in Industrial Systems	
Subject Code: UEE75XX	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Concept and significance of energy conservation: Energy conservation opportunities (ECOs), ECOs in electrical power supply sector: Generation, transmission, distribution and utilization systems, ECOs in transportation system, ECOS in residential and commercial sectors, ECOs in industry sector. **[10 hrs]**

Unit-II

Industrial Motors: Selection of motor power capacity for- Continuous duty constant load motor application, Continuous duty variable load motor application, intermittent duty motor application and short time duty motor application. **[10 hrs]**

Unit-III

Industrial Heating: Methods of electrical heating: Resistance, Induction and electric heating principles; source of heating; factors controlling the depth of heat penetration. **[10 hrs]**

Unit-IV

Industrial Lighting: Types of lighting schemes, Factor affecting energy efficient lighting schemes, methods of lighting calculation, principles of light control; Factors controlling factory lighting, street lighting and flood lighting schemes. **[10 hrs]**

References:

1. S.Rao and B.B. Parulekar, Energy technology, kanna publishers, 1995.
2. M.V. Deshpande, Elements of electrical power station design, III edition wheeler publishing 1986.
3. J.B. Gupta, Generation, transmission and utilization of electric power, Kataria publication, New Delhi 1986.

Course outcomes:

After completion of the course, the students shall be able to:

9. Identify and develop energy conservation opportunities in the real system.
10. Illustrate the energy conservation in different sectors tools that are needed to solve different optimization problems.
11. find the feasible methods for different heatings
12. Analyse the feasible lighting methods

(Open Elective-2)

ELECTRICAL SAFETY FOR ENGINEERS	
Subject Code: UEE75XE	**Credits: 03**
Contact Hours: 03 (3L-0T-0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Indian Electricity Rules And Acts And Their Significance: L-05 Hours

Objective and scope, ground clearances and section clearances, standards on electrical safety, safe limits of current-voltage, earthing of system neutral, Rules regarding first aid and fire fighting facility.

Electrical Safety In Residential, Commercial And Agricultural Installations: L-05 Hours

Wiring and fitting, Domestic appliances, water tap giving shock, shock from wet wall, fan firing shock, multi-storied building, Temporary installations, Agricultural pump installation, Do's and Don'ts for safety in the use of domestic electrical appliances.

Unit-II

Safety During Installation, Testing, Commissioning, Operation and Maintenance: L-04 Hours

Preliminary preparations, safe sequence, risk of plant and equipment, safety documentation, field quality and safety, personal protective equipment, safety clearance notice, safety precautions, safeguards for operators and safety

Safety During Installation Of Plant and Equipment: L-06 Hours

Introduction, preconditions for start of installation work, during, risks during installation of electrical plant and equipment, safety aspects during installation, field quality and safety during erection, personal protective equipment for erection personnel, installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

Unit-III

Electrical Safety In Hazardous Areas: L-05 Hours

Hazardous zones – class 0, 1 and 2, spark, flashovers, corona discharge and functional requirements, Specifications of electrical plants, equipments for hazardous locations, Classification of equipment enclosure for various hazardous gases and vapours and classification of equipment/enclosure for hazardous locations.

Electrical Safety In Distribution System: L-05 Hours

Total quality control and management, Importance of high load factor, Disadvantages of low power factor, Causes of low P.F, power factor improvement equipments and Importance of P.F. improvement.

Unit-IV

Safety Management Of Electrical Systems: L-10 Hours

Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors and employees.

References

1. Rao, S. and Saluja, H.L., "Electrical Safety, Fire Safety Engineering and Safety Management", Khanna Publishers, 1988.
2. Pradeep Chaturvedi, "Energy Management Policy, Planning and Utilization",Concept Publishing Company, 1997.
3. Nagrath, I.J. and Kothari, D.P., "Power System Engineering", Tata McGraw Hill, 1998.
4. Gupta, B.R., "Power System Analysis and Design", S.Chand and Sons, 2003.
5. Wadhwa, C.L., "Electric Power Systems", New Age International, 2004

Course Outcomes

At the end of this course,

1. Student should be able to understand the Indian electricity rules and their significance
2. Student should be able to Explain the safety standard in residential, commercial and agricultural
3. Student should be able to Learn about electrical safety installation, testing and commission
4. Student should be able to understand about flashovers and corona discharge
5. Student should be able to understand about electrical safety in distribution system
6. Student should be able to state the electrical systems safety management and IE rules.

POWER SYSTEM SIMULATION LAB

Subject Code : UEE761L **SEE Marks : 100**

Credits : 1 **Exam Duration : 03 Hours**

Contact Hours: 02 (0L-0T-2P)

1. ABCD parameters for short and medium network of transmission lines.
   - Verification of Symmetry and Reciprocity of the network.
   - Determination of regulation and efficiency.
2. To determine fault currents and voltages in a single line systems with star-delta transformers at a specified location for SLGF, DLGF.LL and check boundary conditions.
3. Y Bus formation of power systems with and without mutual coupling by singular transformation and inspection method.
4. Determination of power angle diagrams for salient and non-salient pole synchronous m/c s, reluctance power, excitation emf and regulation.
5. Determine stability of power system using Swing equation.
   To determine critical clearing time for SMIB system by varying inertia constant, line parameters / fault location.
6. Write a program to perform load flow study using Gauss- Seidel method
   (only p q Bus not exceeding 4- buses).
7. Formation of Jacobian matrix for a given power system not exceeding 4 buses in polar Coordinates (no PV buses).
8. Write a program to perform load flow study using Fast-Decouple Load Flow Method
9. Optimal Generator Scheduling for Thermal power plants connected to load dispatch center.

Course outcomes:

Students should be able to

1. Formulate and determine the electrical network parameters using electrical topology
2. Model and simulate the steady state analysis of power system network
3. Evaluate generator scheduling and economic load dispatch in power plant.

Note:

All experiments must be simulated using MATLAB and MiPower Software.

LABORATORY ASSESSMENTS FOR SEE:

1) Each Laboratory is evaluated for 100 marks (50CIE and 50SEE)
2) Allocation of 50 marks for CIE
   - Performance and journal write-up: Marks for each experiment =30 marks/No. of proposed experiments.
   - One Practical test, for 20 marks, (5 write up, 10 conduction, calculation, Results etc., 5 viva-voce).
3) Allocation of 50 marks for SEE.25% write up, 50% conduction, calculation, results etc., 25% viva-voce.

HIGH VOLTAGE AND RELAY LAB	
Subject Code: UEE705L	**Credits: 01**
Contact Hours: 02 (0L-0T-2P)	**Assessment: CIE 50 and SEE 50**

Course Outcomes:

Students shall be able

- To know the concept of relays and HV systems.
- To understand the operation and IDMT and DMT characteristic of relay.
- To understand concept of various types of relay and their characteristics.
- To study the application of different types of relays in the power system.
- To study the flash over characteristics of HVAC.
- To study breakdown strength of transformer (insulating) oil.

List of Experiments:

1. Operating characteristics of static Under/Over Voltage relay.
2. Operating characteristics of Microcontroller over voltage relay (DMT and IDMT)
3. Operating characteristics of Electro-Mechanical over current relay.
4. Operating characteristics of Electro-Mechanical Earth fault relay.
5. Operating characteristics of Microcontroller over current relay (DMT and IDMT).
6. Operating characteristics of Numerical Under / Over voltage relay (DMT and IDMT).
7. Operating characteristics of static Over Current relay (DMT).
8. Break down strength of transformer oil.
9. Experiment on field plotting using electrodes.
10. Measurement of high AC and DC voltage using Spare-gap.
11. Flash-over characteristics of uniform and non-uniform Gaps for HVAC
    a. Plane-Plane Electrodes (Uniform field)
    b. Point-Plane Electrodes (Non-uniform field)
12. Flash-over characteristics of Uniform and non-uniform fields for Direct high voltage
    a. Plane-Plane Electrodes
    b. Point positive, Plane negative
    c. Point negative, Plane positive

Internship

Subject Code	**:UEE764I**	**CIE +SEE Marks**	**:50 + 50**
Credits	**:02**	**Exam Duration**	**:03 Hrs**

All the students have to undergo mandatory internship/training in any one of the reputed industry/ research institute. The training program has to be taken up during the vacation between 6th and 7th semester. The duration of the training program should be for period of 2 weeks. A report on the training is to be submitted. The supervisor/ guide from industry shall allot 50 marks of the CIE and the other 50% by the internal supervisor/guide. SEE evaluation will be made by a committee comprising of HoD as Chairman, UG coordinator and internal supervisor/guide. The SEE will be a Technical Seminar on the industrial training. Marks awarded shall be based on the evaluation of Report, Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

PROJECT PHASE -I

Subject Code	**:UEE765P**	**CIE +SEE Marks**	**:50 + 50**
Credits	**:05**	**Exam Duration**	**:03 Hrs**

Phase –I of the project is part of the final year UG Project. Students have to take up Literature survey, formulate the problem of the project, define the project objectives and prepare the project implementation schedule. A certified report and a seminar is to be presented by the students. The seminar should highlight – Broad project area, literature survey, problems definition, Project objectives, implementation schedule of the project and work carried out. Guide will allot CIE marks for 50. For SEE, student has to make a presentation of the work carried out to Project Evaluation Committee (PEC- guide, project coordinator, Hod/Nominee). PEC will allot SEE marks for 50.

Rubrics for Project Phase-I (VII Semester)

Rubrics	Phase	Period (Duration)	Rubric #	Marks	Evaluation by
CIE	Evaluation-I	Before one month from the start of 7th semester of BE Program	R1	15	Committee consisting of HOD/Nominee + Project Coordinator + Guide(s)
	Evaluation-II	Before 15 days from the last working day of 7th semester of BE Program	R2	15	
	Evaluation by guide	In the last week of working days	R3	20	Guide(s)
SEE	Semester End Examination	During SEE of 7th semester of BE Program	R4	50	Committee consisting of HOD/Nominee + Project Coordinator + External Examiner

Basaveshwar Engineering College (Autonomous), Bagalkot
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Scheme & Syllabus

Semester-8 CAY 2021-22 [175 credits. 2018-19 admitted batch]

Sl.	Sub Code	Subject	C	Hrs/ Week			Exam Marks		
				L	T	P	CIE	SEE	Total
01	UEE851E	Dept. Elective – 5	3	3	0	0	50	50	100
02	UEE852E	Dept. Elective – 6	3	3	0	0	50	50	100
03	UEE853E	Dept. Elective – 7	3	3	0	0	50	50	100
04	UEE860S	Technical Seminar	1	0	0	2	50	50	100
05	UEE865P	Project Work Phase – II	12	0	0	24	50	50	100
Total			22	9	0	26	250	250	500

List of Elective Subjects

Power System Operation and Control	Speech Signal processing
Power System Dynamics and Stability	Over Voltages in Power Systems
Data Base management Systems	HVDC Transmission
Energy Conservation, Audit and DSM	Advances in Instrumentation
Flexible AC Transmission Systems	Power System Planning
Digital Control Systems	Smart Grids

Question paper pattern for Theory SEE:

1. Total of eight questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each question should not have more than 4 sub divisions.
3. Any five full questions are to be answered choosing at least one from each unit

Laboratory Assessments for SEE:

4. Each Laboratory subject is evaluated for 100 marks (50 CIE and 50 SEE)
5. Allocation of 50 marks for CIE Performance and journal write-up: Marks for each experiment = 30 marks / No. of proposed experiments. One Practical test for 20 marks, (5 write up, 10 conduction, calculation, results etc., 5 viva-voce).
6. Allocation of 50 marks for SEE: 25% write up, 50% conduction, calculation, results

Power System Operation and Control	
Subject Code: UEE851E	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01. Automatic Generation Control:10 Hrs

Automatic voltage regulator, automatic load frequency control, AVR control loops of generators, performance of AVR, ALFC of single area systems, concept of control area, two area systems, expression for tie-line flow and frequency deviation, parallel operation of generators, tie-line bias control, area control error and parallel operation of generators

Unit-II

02.Control of Voltage and Reactive Power: 10 Hrs

Introduction, generation and absorption of reactive power, methods of voltagecontrol, sub synchronous resonance, voltage stability, PV and QV curves, voltage collapse Series K_{se} and shunt K_{sh} compensation and Compensating devices- Characteristics of SVC, TCR, TSC and STATCOM.

Unit-III

03.Unit Commitment: 10 Hrs

Statement of the problem, need and importance of unit commitment, constraints , spinning reserve, methods of UC -priority lists, dynamic programming, reliability in Unit commitment.

Unit-IV

04.Power System Security: 6 Hrs

Introduction, factors affecting power system security, power system contingency analysis, detection of network problems, network sensitivity methods, calculation of network sensitivity factor, contingency ranking.

05.Power System State Estimation: 4 Hrs

Introduction, power system state estimation, maximum likelihood weighted least-square estimation, maximum likelihood concepts, matrix formulations and example of weightedleast squares state estimation.

References:

1. Wood and B A J F Woollenberg **,"**Power generation, operation and control", 2nd edition, John Wiley andSons, 2007.
2. G.L.Kusic, "Computer Aided Power System Analysis", 2nd edition, PHI, 1992.
3. T. J. E Miler, "Reactive Power Control in Electric Power Systems", John Wiely and Sons NY , 1982.

Course outcomes:

After completion of the course, the students shall be able to:

1. Ability to understand the concept of power control loops, reactive power management and security of the power systems
2. Ability to develop the model of AVR and ALFC applied to the thermal generators in order to regulatethe frequency and terminal voltage.
3. To understand various concept of reactive power generation and absorption.
4. Ability to design and analysis various FACTs devices applied to power systems.
5. Ability to apply the unit Commitment and find the optimum

combination of thermal generators for supplying the demand

6. To understand the concept and develop the skills for analyzing the various power system algorithms likepower system security and state estimations.

ENERGY CONSERVATION, AUDIT AND DEMAND SIDE MANAGEMENT

Subject Code: UEE842E	**Credits: 03**
Contact Hours: 03 (3L-0T-0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01. Energy Scenario: 04 Hrs

Energy Definitions & Forms: Potential Energy – chemical, stored mechanical, nuclear and gravitational; Kinetic Energy – electrical, radiant, thermal, sound, and motion energies (only definitions); Units and Conversions; GDP, GNP and Per Capita Energy Consumption; Renewable Energy Act, International Energy Agency, OECD and Kyoto Protocol (only overview).

02.Economic Analysis of Energy: 06 Hrs

Economic analysis of investment, Cash Flows and CF diagrams, Economic analysis technique – Simple payback period method, Discounted cash flow method or Time adjustment technique, Net present value method, Present value index method or Profitability index method, Internal rate of return method, Accounting on average rate of return method; Interest Factors – Single Payment Compound Amount **(SPCA),** Single Payment Present Worth (**SPPW**), Uniform Series Compound Amount (**USCA**), Sinking Fund Payment (**SFP**), Uniform Series Present Worth (**USPW**), Capital Recovery (**CR). (**Simple Numerical problems**).**

Unit-II

Motors:L-05Hrs

Introduction, Motor Types, Motor Characteristics, Motor Efficiency, Motor Selection; Determination of energy saving, Energy saving options in oversized motors, Effect of variation of voltage on performance of motor, Effect on efficiency due to variation in load; Energy Efficient Motors, Choice of energy efficient motor, Factors Affecting Energy Efficiency, Rewinding Effects on Energy Efficiency, Standards and Star Labeling of Energy Efficient Induction Motors.

Lighting: L-05Hrs

Introduction, Terms and definitions – Lumen, Lux, Load efficacy, Lamp circuit efficacy, Colour rendering index(**CRI**); Characteristic of different types of lamps, Aspects of lighting system designing, Installed load efficacy ratio, Various means of energy savings – Use of natural day light, Reduction in light fixture, High efficiency lamps and luminaries, Effect of reduction in supply voltage on energy consumption, Electronic ballast and low loss electromagnetic choke, Timers and occupancy sensors, Fluorescent tube light, CFL lamps.

Unit-III

Energy Management and Audit: L-10 Hrs

Energy management; Developing energy use profiles; Sankey Diagram; Process flow diagrams; Material and energy balance; Energy auditing instruments.

Energy audit – Need for energy audit, Scope of energy audit, Types of energy audit – Preliminary energy audit, Detailed energy audit;

Unit-IV

Energy Conservation : L-05 Hours

Introduction, Results of energy conservation, Principles of energy conservation, Energy conservation planning, Energy conservation Act,; Energy conservation in residential and commercial sectors, Energy conservation in transportation, considerations for Energy conservation in industry, Energy conservation in electricity generation, transmission and distribution, Energy conservation in agricultural sector.

Demand Side management : L-04 Hours

Introduction, Energy efficiency and DSM, Motivation for DSM, Institutional requirements and Incentives, DSM Techniques, Load control, Effects of DSM on load shape, DSM program

approaches, Analysis of DSM options, Delivery mechanism for DSM program, DSM program design and implementation, Implementation issues, International experience of DSM, Utility-Initiated DSM action in India.

References

01. Suresh Kumar Soni and Manoj Nair, Energy Conservation and Audit, Satya Prakashan, New Delhi, 2010

02. Rajiv Shankar, Energy Auditing in Electrical Utilities, Viva Books, New Delhi 2010

03. Larry C. White, Philip S. Schmidt, David R. Brown, "Industrial Energy Management Systems", Hemisphere Publishing Corp, New York.

04. Albert Thumann, "Fundamentals of Energy Engineering", Prentice Hall Inc, Englewood Cliffs, New Jersey.

05. Gupta, B. R., "Generation of Electrical Energy", Eurasia Publishing House Pvt. Ltd., New Delhi, 6th, 2006.

Course outcomes:

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

1. define/list different energy resources, energy management/audits, energy efficient motors, lighting terminologies and demand side management terminologies.
2. describe/explain energy economic methods, energy audit methods, lighting criteria and DSM techniques
3. compute/determine numerical problems & interpret outcomes related to energy economics and energy efficient motors
4. compare & contrast on selection of energy economic techniques, lighting criterion, energy efficient motors and energy alternative from DSM techniques
5. evaluate various methods of energy conservation and DSM in different sectors like agriculture, commercial, transpiration and domestic
6. design and develop methods/techniques for energy conservation, audit & management

Over Voltage in Power System	
Subject Code: UEE8XXE	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Transients In Electric Power Systems **13Hrs**

Internal and external causes of over voltages, Travelling waves in transmission lines – Circuits with distributed constants – Wave equations – Reflection and refraction of travelling waves–Travelling waves at different line terminations. Problems on Reflection and refraction.

Unit-II

Switching Transients **13Hrs**

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor, current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch, normal and abnormal switching transients. Current suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a re-strike, with multiple re-strikes. Illustration for multiple re-striking transients – Ferro-resonance

Unit-III

Lightning Transients **13Hrs**

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder Clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for Lightning stroke - factors contributing to good line design - protection using ground wires – tower footing resistance - Interaction between lightning and power system

Unit-IV

Basic ideas about protection **13Hrs**

Protection of power systems against transient over-voltage due to switching and lightning, Lightning arrestors, Surge diverters, Surge capacitors and reactors, Overhead ground wires, Insulation coordination, Computer aids to calculate transient (EMTP).

References:

1. Allen Greenwood, 'Electrical transients in power systems', Wiley Inter science, 1991
2. Bewley, L.V., 'Travelling waves on Transmission systems', Dover publications, New York, 1963.
3. Gallaghar, P.J. and Pearman, A.J., 'High voltage measurement, Testing and Design', John Wiley and sons, New York, 2001.
4. Transients in Power Systems Lou van der Sluis Delft University of Technology Netherlands
5. M.S.Naidu and V.Kamaraju, „High Voltage Engineering", Tata McGraw Hill, Fifth Edition, 2013

Course outcomes:

After completion of the course, the students shall be able to:

1. Students will be able to list and classify the Internal and external causes of over voltages.
2. Students will be able to explain the different types of switching transients that occurs in power system.
3. Students will be able to drive the mathematical modeling of lighting mechanism.
4. Students will be able to solve the different types of line termination that occurs in travelling waves.
5. Students will be able to analyze the theories in the formation of the clouds and charge.
6. Student will be able to study the basic ideas of protection in power system.

Power System Dynamics and Stability

Subject Code: UEE8XX	**Credits: 03**
Contact Hours: 03 (3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Introduction: **L- 10 Hours**

Power system stability, Classification of stability, States of operation, System security and System dynamic problems.

Analysis of Systems Stability: Steady state stability - State space representation, Linearization, Synchronizing power coefficient; Transient Stability – Numerical Solutions and Equal area criterion.

Unit-II

Modeling of Synchronous Machine: L-10 Hours

Introduction, Mathematical description of synchronous machine, dq0 transformation, Per unit representation, Equivalent circuit of synchronous machine for direct and quadrature axis.

Steady state analysis, Electrical transient performance characteristics, Magnetic saturation, Representation of saturation in stability studies.

Unit-III

Excitation Systems: L-10 Hours

Elements and requirements of excitation systems, Types of excitation systems, Dynamic performance measures, Control and protective functions, Mathematical modeling of excitation systems.

Power System Loads: Basic load modeling concepts, Issues in load modeling, Mathematical modeling of induction motor, Acquisition of load-model parameters.

Unit-IV

Voltage Stability: L-10 Hours

Basic concepts related to voltage stability, Voltage collapse, Voltage stability analysis, Prevention of voltage collapse.

Methods to Improve Stability: Transient stability enhancement and Small signal stability enhancement

References:

7. Prabha Kundur., “Power System Stability and Control”, McGraw-Hill Publishing Company, NY, 2006.
8. Padiyar K.R., “Power System Dynamics, Stability and Control”, 2nd Edition, BS Publishers, 2008.
9. Marija Ilic, John Zaborszky, “Dynamics and Control of Large Electric Power Systems”, IEEE Press and John Wiley & Sons, Inc, 2000.
10. Paul M. Anderson, A. A. Fouad, “Power System Control and Stability”, 2nd Edition, IEEE Press and John Wiley & Sons, Inc, 2008.
11. K. Uma Rao, “Computer Techniques and Models in Power Systems”, 1st Edition, I. K. International publishing house, 2014.

Course outcomes:

After completion of the course, the students shall be able to:

7. List and define the basic terms associated with power system stability
8. Explain different components of power system and make the comparative illustrations
9. Solve the stability issues analytically and identify the suitable stability enhancement technique
10. Analyze the working principles of excitation systems, Load models, prime movers, PSS and other power system elements
11. Assess and decide the condition of power system stability by making use of suitable techniques
12. Develop the mathematical models of synchronous machine, excitation systems, load models etc.

DATA BASE MANAGEMENT SYSTEMS (DBMS)	
Subject Code: UEE8XXE	**Credits: 03**
Contact Hours: 03 (3L-0T-0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Introduction to Data Base Systems: L-05 Hours

Managing data, a historical perspective, File systems versus DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Queries in DBMS, Transaction management, Structure of DBMS, People who work with databases.

Entity – Relationship Model: L-05 Hours

Using high-Level Conceptual Data Models for Database Design, An example of Database Application, Entity types, Entity Sets, Attributes and Keys, Relationship types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design for the COMPANY database, ER Diagrams, Naming Conventions and Design Issues.

Unit-II

Relational Model and Relational Algebra: -05 Hours

Relational model concepts, relational model constraints and relational database schemes, update operations and dealing with Constraint Violations, Unary relational Operations, SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations, JOIN and DIVISION, Additional Relational Operations, examples of Queries in Relational algebra, relational database design using ER – to-Relational mapping.

SQL-The Relational Database Standard: -05 Hours

SQL Data definition and data types, specifying basic constraints in SQL, Schemes, Change statements in SQL, basic Queries in SQL, more complex SQL queries, Insert, Delete and Update statements in SQL, additional features of SQL, specifying general constraints as assertion, views (virtual tables) in SQL,

Unit-III

Data Base Design: -10 Hours

Informal Design Guidelines for Relation Schemes, Functional Dependencies, Normal Forms based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Properties of Relational Decompositions, Algorithms for Relational Database Scheme Design, Multivalued Dependencies and Fourth Normal Form, Join Dependencies and Fifth Normal Form, Inclusion Dependencies, Other Dependencies and Normal Forms.

Unit-IV

Transaction Management:10 Hours

The ACID properties, Transactions and Schedules, Concurrent Execution of transactions, Lock-based Concurrency control, performance of locking, Transaction support In SQL, Introduction to crash recovery; 2PL, ss for 4rializability and recoverability, Introduction to lock management, Lock Conversions, Dealing with Deadlocks, Specialized locking Techniques, Concurrency control without locking, Introduction to ARIES.

References

1. Raghu Ramakrishnan and JohannesGehrke,**"Database Management Systems",**3rd Edition, McGraw Hill, 2004.
2. Elmasri and Navathe, "Fundamentals of Database Systems", 4th Edition, Pearson Publication
3. Silberschatz, Korth and Sudharahan, "Data Base System Concepts", 5th Edition, Mc- Graw Hill, 2007.

Course Outcomes

At the end of this course,

- Students shall be able to construct, manipulate and share data base, for various application.
- Students shall be able to explain data base models-and draw ER diagrams.
- Students shall be able to construct relational database schemes, perform relational algebra operations and ER- to Relational Mapping
- Students shall be able to get the queues from database using SQL.
- Students shall be able to explain different normal forms and properties of relational decomposition.
- Students shall be able to perform about Transaction Management and Crash recovery.

Flexible AC Transmission Systems

Subject Code: UEE8XXE	Credits: 03
Contact Hours: 03 (3L-0T-0P)	Assessment: CIE 50 and SEE 50

Unit-I

Review of AC transmission lines: L-10Hrs

Electrical characteristics, performance equations, natural or surge impedance loading, equivalent circuit of a transmission line, performance requirements of power transmission lines, voltage and current profile under no load. Power transfer and stability considerations, Principles of transmission system compensation - series and shunt, Compensation by line sectioning, Concept of flexible AC transmission, FACTS- Benefits, Types and Brief descriptions.

Unit-II

Static Shunt Compensators: L-10Hrs

Objective of shunt compensation, Methods of controllable VAR Generation. SVC and STATCOM: Operating principle, Regulation slope, Transfer function and Dynamic performance, Transient stability enhanced and power oscillation damping, VAR Reserve Control. Comparison between STATCOM and SVC: V-I and V-Q Characteristics, Transient Stability,

Response Time, Capability to Exchange real power, operating with unbalanced AC system, Physical size and Installation, Merit of hybrid compensator, Static Var Systems.

Unit-III

Static Series Compensators GCSC, TSSC, TCSC: L-10Hrs

Objectives of series compensation, Voltage stability, Improvement of transient stability, power oscillation damping, sub synchronous oscillation damping, approaches to controlled series compensation.

Variable Impedance Type series compensators: GTO Thyristor- controlled series capacitor (GCSC), Thyristor-Switched Series Capacitor (TSSC), Thyristor Controlled Series Capacitor (TCSC), Thyristor- Controlled Voltage and Phase Angle Regulators (TCVRs and TCPARs).

Unit-IV

Dynamic Voltage Restorer (DVR) – **L-9Hrs**

Introduction to DVR, overview of voltage sag and swells.
Unified Power Flow Controller (UPFC): Basic operating principle, control capabilities, implementation, comparison to series compensators and Phase Angle Regulators, Control structure, Dynamic performance. Interline Power Flow Controller (IPFC): operating Principle, control structure and Applications.

References

01. Narain G. Hingorani and Lazlo Gyugyi, Understanding FACTS: Concepts and Technology of Flexible AC Transmission Systems, IEEE Press and John Wiley & Sons, Inc, 2000.

02. Prabha Kundur, Power System Stability and Control Tata McGraw Hill Publishers, New

Delhi, 2006.

03. R. Mohan Mathur, Static Controllers for Electrical Transmission Systems, IEEE Press and John Wiley & Sons, Inc. 2008.

04. R. Mohan Mathur, Rajiv K Varma, Thyristor-Based FACTS Controllers for Electrical Transmission Systems, IEEE Press and John Wiley & Sons, 2008

Course Outcomes

At the end of this course,

- Students shall be able to identify and list the various FACTS devices for power system network.
- Students shall be able to explain various FACTS devices
- Students shall be able to apply the FACTS devices for power system network
- Students shall be able to analyse the various FACTS devices for power system network.

SPEECH SIGNAL PROCESSING

Subject Code: UEE8XXE	**Credits:03**
Contact Hours:03(3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

Ch1.Introduction :10h

Speech Signal, Signal Processing, Digital Signal Processing, Digital Speech Processing (Digital transmission, and storage of speech, Speech synthesis systems, speaker verification and identification systems, speech recognition systems, aids to the handicapped, enhancement of signal quality), Sampling, sampling theorem, Digital models for the speech processing: Introduction, the process of speech production, The mechanism of speech production.

Unit-II

Ch2. Elements of Phonetics:10h

Acoustic Phonetics (vowels, diphthongs, semivowels, nasals, Unvoiced fricatives, voiced fricatives, voiced stops, unvoiced stops, affricates and /h/), The acoustic theory of speech production, sound propagation, example of uniform lossless tube, digital models for speech signals (vocal tract, radiation, excitation, complete model).

Unit-III

Ch3. Time domain models for speech processing: 10h

Introduction, time dependent processing of speech, short time energy and average magnitude, short time average zero crossing detectors, speech vs silence discrimination using energy and zero-crossings, pitch period estimation using parallel processing approach, short time autocorrelation function, short time average magnitude difference function

Unit-IV

Ch4. Short time Fourier analysis: 10h

Introduction, definitions and properties, Fourier transform interpretation, Linear filtering interpretation, sampling rates of $X_n(e^{jw})$ in time and frequency, filter bank summation method of short-time synthesis, overlap addition method for short-time synthesis, Homomorphic speech processing: Introduction, homomorphic systems for convolution, the complex cepstrum of speech, pitch detection, formant estimation, Homomorphic vocoder.

References:

1. L.R. Rabiner and R.W. Schafer, “Digital Processing of Speech Signal”, Pearson Education Asia 1st –edition Pt. Ltd., 2005
2. D. O’Shaughnessy, “Speech Communications: Human and machine”, University Press, 2nd edition, 2003.
3. Gold and N. Morgan, “Speech and Audio Signal Processing: processing and perception of speech and music”, Pearson Education, 2nd edition, 2011.
4. Thomas F. Quatieri, “Discrete-time speech signal processing,” Principles and Practice, Pearson Education, (edition), 2007

Course outcomes:

1. Acquired knowledge about audio and speech signals.
2. Ability to understand speech generation models.
3. Ability to understand speech recognition models.
4. Understanding of audio & speech signals estimations and detections
5. Acquired knowledge about hardware to process audio and speech signals.
6. Ability to relate human physiology and anatomy with signal processing paradigms.

Power System Planning	
Subject Code: UEE8xxE	**Credits:03**
Contact Hours:03(3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

1. Introduction of Power Planning: 5h

National and regional planning, structure of power system, planning tools, electricity regulation, Load forecasting, forecasting techniques, modeling.

02 Generation Planning: 5h

Integrated power generation, co-generation / captive power, power pooling and power trading, transmission and distribution planning.

Unit-II

03 Power System Economics:5h

Power system economics, power sector finance, financial planning, private participation, rural electrification investment, concept of rational tariffs.

04 Computer Aided Planning:5h

Wheeling, environmental effects, green house effect, technological impacts, insulation co-ordination, reactive compensation.

Unit-III

05 Power System Reliability:10h

Reliability definition, System Reliability, System adequacy and security, Reliability planni ng, Reliability evaluation, Functional zones, Generation, Transmission, Reliability target, Quality of supply.

Unit-IV

06 System Operation Planning:10h

Operations, Maintenance, Load management, Load prediction, Reactive power balance, Power grid, Online power flow studies, State estimation, Computerized management, Power system simulator.

References:

01. A.S.Pabla, Macmillan "Electrical Power System Planning", (edition), India Ltd, 2016.

02. Charles E Ebeling by "Reliability and Maintainability Engineering", (edition), Tata McGraw Hill, 2004.

Course outcomes:

01. To describe power system planning using forecasting techniques.

02. To explain co-generation captive power, power polling and power trading

03. To apply and analyse the power system economics using different parameters

04. To illustrate the power system planning using algorithm

05. To compare and contrast system operations planning using different parameters.

06. To combine and revise operations planning by different techniques

Smart Grids	
Subject Code: UEE8XXE	**Credits:03**
Contact Hours:03(3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01. Introduction: 4h

Introduction to Smart Grid I& II, Architecture of Smart Grid System, Standards for Smart Grid System Elements and Technologies of Smart Grid System

02. Technologies of Smart Grid System: 5h

Elements and Technologies of Smart Grid System-II Distributed Generation Resources-I, II, III & IV

Unit-II

3.Wide Area Monitoring:5h

Wide Area Monitoring Systems-I & II, Phasor Estimation-I & II, Digital relays for Smart Grid Protection

4.Islanding Detection Techniques: 5h

Islanding Detection Techniques-I, II, III & IV, Smart Grid Protection-I

Unit-III

5.Smart Grid Proetction : 5h

Smart Grid Protection-II& III, Modelling of Storage Devices, Modelling of DC Smart Grid components Operation and control of AC Microgrid-I

6.Operation and Control of AC Microgrid : 5h

Operation and control of AC Microgrid-II, Operation and control of DC Microgrid-I & II, Operation and control of AC-DC hybrid Microgrid-I & II.

Unit-IV

07 Case Study of Microgrid :5h

Simulation and Case study of AC Microgrid, Simulation and Case study of DC Microgrid, Simulation and Case Study of AC-DC Hybrid Microgrid, Demand response analysis of Smart Grid

8.Design of Smart Grid: 5h

Design of Smart grid and Practical Smart Grid case study-I & II. System Analysis of AC/DC Smart Grid.

References:

1. A Keyhani, M Marwali, “Smart Power Grids”- Springer, 2012
2. ArunPhadke , “Computer Relaying for Power Systems”- Wiley 2012
3. Nikos Hatziargyriou, “Microgrids Architecture and control”-Wiley 2014
4. Fang Lin Luo, Hong Ye , “Renewable Energy Systems”CRC Press, 2013
5. Amirnaser Yazdani, Reza Iravani, Voltage-sourced converters in power systems_ modeling, control, and applications

Course outcomes:

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

6. Identify & explain Smart Grid technologies, different smart meters and advanced metering infrastructure.
7. Apply and analyse with the power quality management issues in Smart Grid.
8. Compare and contrast the different high performance computing equipments for Smart Grid applications.
9. Evaluate the power quality management issues in Smart Grid.

HVDC Transmission	
Subject Code: UEE8XXE	**Credits:03**
Contact Hours:03(3L - 0T - 0P)	**Assessment: CIE 50 and SEE 50**

Unit-I

01. INTRODUCTION: 9h

General aspects of DC transmission and comparison of it with Ac transmission:

Historical sketch, constitution of EHV AC and DC links, Limitations and Advantages of AC and DC Transmission, Principle Application of DC Transmission. Converter circuits: Valve Characteristics, Properties of converter circuits, assumptions, single phase, three phase converters, choice of best circuits for HV DC circuits.

Unit-II

2. Analysis of Bridge Converter: **10h**

Analysis with Grid control but no Overlap, Analysis with Grid Control and with overlap less than 60 degree, Analysis with Grid Control and with overlap Greater than 60 degree, Complete characteristics of Rectifier, Inversion, series and parallel arrangements of valves, Anodes, or Bridges, Multi bridge Converter. Control: Grid control, Constant current versus Constant Voltage, Desired features of control, Actual control characteristics, constant-minimum Ignition-angle control, constant-current control, constant –extinction angle control, stability of control, frequency control.

Unit-III

3. Misoperation of converter: **10h**

Malfunction of Mercury-Arc Valves, Bypass Valves, Arcback, short Circuit on a rectifier, Commutation failure, Arch through, Misfire, Quenching, Generalization Inverter Faults and certain Faults. Protection: General, DC Reactor, Voltage Oscillation and Valve Dampers, Current Oscillation and Anode Dampers, DC line Oscillation and Dampers, Circuit Breakers

Unit-IV

4.Harmonics and Filters: **10h**

Characteristic Harmonics, Uncharacteristic harmonics, Troubles caused by Harmonics, Definition of wave distortion or ripple, means of reducing harmonics, Telephone Interference, Harmonic filter. Ground Return: Advantages and Problems, current field in the earth near an electrode, current field between the electrodes, natural current field in the earth, design of Electrode, design of land electrodes.

References:

1. Clark W Gellings, “The Smart Grid, Enabling Energy Efficiency and Demand Side Response”- CRC Press, 2009. Janaka Ekanayake, Kithsiri Liyanage,Jianzhong.Wu, Akihiko
2. Yokoyama, Nick Jenkins, “Smart Grid: Technology and Applications”- Wiley, 2012.
3. James Momoh, “Smart Grid :Fundamentals of Design and Analysis”-Wiley, IEEE Press, 2012.

Course outcomes:

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

10. Identify & explain Smart Grid technologies, different smart meters and advanced metering infrastructure.
11. Apply and analyse with the power quality management issues in Smart Grid.
12. Compare and contrast the different high performance computing equipments for Smart Grid applications.
13. Evaluate the power quality management issues in Smart Grid.

Technical Seminar

Subject Code	**:UEE860S**	**CIE +SEE Marks**	**:50 + 50**
Credits	**:01**	**Exam Duration**	**:03 Hrs**

Technical seminar is a critical survey/ investigation study on specific issue/topic of current interest in the field of energy systems and related technology. Students are expected select an internal guide/ subject expert for the seminar, under whose guidance the seminar shall be submitted. The students have to submit a certified report in the form of a paper at the end of the semester.

CIE evaluation will be made by a committee comprising of HoD as Chairman, Guide/co-guide, if any, and a senior faculty of the department. This evaluation will be a technical seminar on the prepared report. Marks awarded for, technical seminar presentation shall be based on the evaluation of Paper, Presentation skill and performance in Question and Answer session in the ratio 50:25:25.

PROJECT PHASE -II

Subject Code	**:UEE865P**	**CIE +SEE Marks**	**:50 + 50**
Credits	**:12**	**Exam Duration**	**:03 Hrs**

Project work, based on the objective defined in 7th semester should be continued and implemented in 8th semester. The implementation of the project work can be done as either study project or Hardware project. Project Evaluation Committee (PEC) consisting of Project coordinator, guide and Hod/Nominee) will monitor the progress of projects. PEC will review progress of the projects in the beginning of the semester and after completion of the project. A certified thesis on project work should be submitted to the department. CIE marks will be allotted by guide based on the work carried out. For SEE, student should present a seminar on the project to external examiner, internal examiner (project coordinator), & HOD/Nominee and demonstrate the working of the project. SEE marks shall be allotted based on the thesis evaluation, seminar and demonstration of the project.

SEMESTER VIII

Rubrics for	Phase	Period (Duration)	Rubric #	Marks	Evaluation by
CIE	**Evaluation -I**	**Before one month from the start of 8th semester of BE Program**	**R5**	**15**	**Committee consisting of HOD/Nominee + Project Coordinator + Guide(s)**
	Evaluation -II	**Before 15 days from the last working day of 8th semester of BE Program**	**R6**	**15**	
	Evaluation by guide		**R7**	**20**	**Guide(s)**
SEE	**Semester End Examination**	**During SEE of 8th semester of BE Program**	**R8**	**50**	**Committee consisting of HOD/Nominee + Project Coordinator + External Examiner**