SYLLABUS

EIGHTH SEMESTER B.E.
(E&P/ELECTRICAL/EEE)

GONDWANA UNIVERSITY, GADCHIROLI

(With effect from 2015-16)

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: COMPUTER APPLICATIONS IN POWER SYSTEM

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)	Credits
4	1	2	5	05+01=06

Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	25	25	50

UNIT	CONTENT	HRS
I	**Incidence and Network Matrices** Graphs, Incidence Matrices, Primitive Network, Formation of network matrices by singular transformation	08
II	**Algorithms for formation of network matrices** Algorithm for formation of bus impedance matrix, modification of the bus impedance matrix for changes in the network. Numericals without mutual coupling. **Three Phase Networks** Three-phase network elements, three-phase balanced network elements, transformation matrices, three-phase unbalanced network elements, Incidence and network matrices for three-phase networks, Algorithm for formation of three-phase bus impedance matrix, Modification of three-phase bus impedance matrix for changes in the network. Numericals without mutual coupling.	12
III	**Load Flow Studies** Power flow equation, classification of buses. Algorithm and flow chart for Gauss-Seidel method, Modification of algorithm to include P-V buses, Q-limit violations, acceleration of convergence. Newton-Raphson method in Rectangular and Polar co-ordinates form, load flow solution with and without P-V buses. Derivation of Jacobean elements, algorithm and flow chart.	12
IV	**Short circuit studies** Short circuit calculations using $Z_{BUS,}$ System representation, fault currents and voltages. Short circuit calculations for balanced three phase network using $Z_{BUS:}$ Transformation to symmetrical components. Three phase to ground fault, Line to line fault, Line to ground fault.	10

V	**Transient stability studies** Swing equation, Solution techniques: Modified Euler method and Runge-Kutta fourth order method.	08
	TOTAL	**50**

*Minimum Eight Practical on above syllabus

Text Books:

1. Computer methods in power systems analysis by G.W. Stagg, Ahmed H. Ei-Abiad, McGraw-Hill International Editions.
2. Computer techniques in power system analysis by M.A.Pai,Tata McGraw –Hill Publishing company Ltd. New Delhi.
3. Computer techniques and models in power systems by K. Uma Rao,I.K. International publishing house Pvt. Ltd., New Delhi.

Reference books:

1 (Modern power system analysis by D.P. Kothari and I.J. Nagrath Tata McGraw –Hill Education Pvt. Ltd., New Delhi.

2. Computer aided power system operation and analysis by R.N. Dhar,Tata McGraw –Hill, New Delhi.

3. Computer aided power system analysis by George L. Kusic,Prentice Hall of India(P) Ltd., New Delhi.

GONDWANA UNIVERSITY GADCHIROLI

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: POWER SYSTEM OPERATION AND CONTROL

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)			Credits
03	01	0	04			04
Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	-	-	-

UNIT	CONTENT	HRS
I	**Power System Stability** Introduction to stability, dynamics of synchronous machine, swing equation, power angle equation and curve, types of power system stability (concepts of steady state, transient, dynamic stability), equal area criterion, applications of equal area criterion (sudden change in mechanical input, effect of clearing time on stability, critical clearing angle, short circuit at one end of line, short circuit away from line ends and recloser), solution of swing equation by point by point method, concept of multi-machine stability, methods to improve steady state and transient stability, numerical based on equal area criteria.	10
II	**Reactive Power management** Necessity of reactive power control, reactive power generation by a synchronous machine, effect of excitation, loading capability curve of a generator, compensation in power system (series and shunt compensation using capacitors and reactors), concept of sub synchronous resonance, synchronous condenser.	10
III	**FACTs Technology** Problems of AC transmission system, evolution of FACTs technology, principle of operation, circuit diagram and applications of SVC, TCSC, STATCOM and UPFC.	08
IV	**Economic load dispatch and unit commitment** A) Economic load dispatch: Introduction ,revision of cost curve of thermal and hydropower plant, plant scheduling method, equal incremental cost method, method of LaGrange multiplier (neglecting transmission losses), Economic scheduling of thermal plant considering effect of transmission losses, penalty factor, numerical. B) Unit commitment:- Concept of unit commitment, constraints on unit commitment – spinning reserve, thermal and hydro constraints, methods of unit commitment – priority list and dynamic programming.	12
V	**Automatic generation and control** Concept of AGC, complete block diagram representation of load-frequency control of an isolated power system, steady state and dynamic response, control area concept, two area load frequency control, load frequency control with generation rate constraints (G.R.C.S.), effect of speed governor dead band on A.G.C., digital load frequency controller.	10
		50

Text Books:

1. Abhijit Chakrabarti, SunitaHalder, “Power System Analysis Operation and Control”, Prentice Hall of India
2. I. J. Nagrath, D. P. Kothari, “Modern Power System Analysis”, Tata McGraw Hill Publishing Co. Ltd.
3. P. S. R. Murthy, “Power System Operation & Control”, Tata McGraw Hill Publishing Co. Ltd.
4. P. S. R. Murthy, “Operation & Control in Power System”, B. S. Publication

Reference Books:

1. Allen J. Wood, Bruce F. Wollenberg “Power Generation, Operation, and Control”, Wiley India Edition.
2. “Electrical Power System Handbook”, IEEE Press
3. Hingorani, “Understanding FACTs” IEEE Press
4. Olle I. Elgerd, “Electrical Energy System Theory”, 2nd Edition, Tata McGraw Hill Publishing Co. Ltd.
5. PrabhaKundur “ Power system stability and control” Tata McGraw Hill
6. R. Mohan Mathur, Rajiv K. Varma, “Thyrister based FACTs controller for Electrical transmission system’, John Wiley & Sons Inc.

GONDWANA UNIVERSITY GADCHIROLI

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: ADVANCED ELECTRICAL DRIVES

Lectures	Tutorial(s)	Practical	Total periods/week (each of 60 minutes duration)	Credits
04	01	--	05	05

Evaluation System						
Theory				Practical		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	---	---	---

Units	Contents	Hours
I	**Electric Drives** Introduction to electric drives: Advantages of Electric drives, Choice of Electric Drives and Losses. Latest trends in DC & AC Drives, Dynamics, Equivalent values of drive parameters, Load Torque: component , Natures and classification, steady state stability, Speed-torque characteristics, criteria load equalization.	10
II	**DC Motor Drives** Starting, Braking, Speed control of DC motors using single phase fully controlled and half-controlled rectifiers. Three phases fully controlled and half-controlled converter fed DC motor drives. Chopper controlled DC drives.	8
III	**AC Motor Drives** Three phase induction motor drives - ac voltage controlled drives –- VSI fed induction motor drive – stator side control – scalar control and vector control – rotor side control - slip power recovery scheme - CSI controlled induction motor drives. Regeneration in drives: dynamic braking, regenerative braking, dc injection, plugging. Basic concepts of synchronous motor drives, switched reluctance motor drives and permanent magnet motor drives.	12
IV	**Industrial application** Drive for rolling mills,(four quadrant operation), Machine tools(constant torque application), Textile mills , sugar mills, paper mill, Cement mill.	8

V	**Synchronous Motor & Brushless motor drives** Steady state & dynamic stability limits of synchronous motor drives, True synchronous & self synchronous modes of operation, Variable frequency control of multiple synchronous motors, Self-controlled synchronous motor drive employing load commutated thruster inverter, Starting of large synchronous machines, Self-controlled synchronous motor drive employing cycloconverters, Brush less D.C. Motor drives. Important features & applications.	12
	TOTAL	50

TEXT BOOKS:

1. "Fundamentals of Electric Drives", by G K Dubey ,Narosa Publications.
2. "Power Electronic Circuits, Devices and applications", by M.H.Rashid, Prentice Hall of India
3. "Modern Power Electronics and AC Drive", by B.K. Bose ,Pearson Education
4. "Electric Drives", N. K. De, P. K. Sen,,Prentice Hall of India Eastern Economy Edition

REFERENCE BOOKS :

1. "Thyristor Control of Electric drives" by Vedam Subramanyam, Tata McGraw Hill Publilcations.
2. "A First course on Electrical Drives", by S K Pillai, New Age International(P) Ltd. 2
3. "Electric Drives", by S.K.Pillai, University Press India, 1993
4. "Control of electrical drives", by Werner Leonhard, Springer, 1995.
5. "Electric Drives: Concepts & Application", by V. Subrahmanyam ,Tata Mc-Graw Hill
6. "Power semiconductor Drives", S. B. Dewan & G. R. Stemon & A. Straughen, Wiley Inter Science
7. "Power Electronics, Devices, Circuits and Industrial Applications", V.R. Moorthi, "Oxford University Press, 2005.

GONDWANA UNIVERSITY, GADCHIROLI

ELECTIVE-II

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: FACTS & REACTIVE POWER CONTROLLER

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)	Credits
3	00	00	03	03

Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

UNIT	CONTENT	HRS
I	**Introduction to FACTS** FACTS Concepts and General System Considerations: Transmission Interconnections, Flow of Power in AC system, Limits of Loading Capability, Power Flow and Dynamic Stability Considerations of a transmission interconnection, Relative Importance of controllable Parameters, Basic Types of FACTS Controllers, Brief Description and Definition of Shunt, Series and combined Controllers. Benefits from FACTS Technology.	12
II	**Static Shunt Compensators** Objectives of shunt compensation, Methods of controllable VAR generation, Variable impedance type Static Var Generator (TCR, TSR ,TSC,FC-TCR), Switching converter type Var Generators, basic operating principle.	12
III	**Static Series Compensators** Objectives of series compensation- Variable impedance type series compensation, Switching converter type series compensation (only SSSC).	08
IV	**Combined Compensators** Unified Power Flow Controller (UPFC), Interline Power Flow Controller (IPFC), Generalized and Multifunctional FACTS Controllers.	08
V	**Control of Voltage and Reactive Power** Introduction, Generation and absorption of reaction power, relation between voltage, power and reactive power at a node, methods of voltage control. Injection of reactive power, use of tap changing transformers, combined use of tap changing transformers and reactive power injection.	10
	TOTAL	50

Books Recommended :

1. understanding FACTS", N G Hingorani and L Gyugyi, IEEE Press,1999.
2. "Flexible AC Transmission Systems" (FACTS), Yang hue Song, IEEE Press, 1999.
3. "Reactive Power Control in Power Systems", T J E Miller,John Wiley, 1982

GONDWANA UNIVERSITY, GADCHIROLI

ELECTIVE-II

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: ELECTRICAL INSTALLATION & DESIGN

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)	Credits
3	00	00	03	03

Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

UNIT	CONTENT	HRS
I	**Standards and Procedures** Project Procedures, Regulations and Standards, Power Company Network, Coordination with Local Power Company, Load Estimates, and Revenue and Check Metering.	08
II	**Selection of Network** Basic Principles, Residential System Networks, Commercial System Networks, Industrial System Networks, Overhead Power Distribution, Pole-mounted Substation, Outdoor High-voltage Switchyard, Space Planning, Storage and Installation, Rooms and Areas Containing Electrical Equipment, Installation in Hazardous Areas, Installation in Wet Areas, Cable Installation and Support Systems.	12
III	**Earthing** Earthing Systems and Principles, Earthing of Equipment in Distribution System, Outdoor Switchyard Earthing, Lightning Protection of Buildings and Structures, Lightning Protection of Outdoor Switchyard and Lines, Over Voltage Protection of Equipment. Testing and Handover: Factory Testing, Labels and Signs, Site Testing and Commissioning, As-Built Documentation and Training.	12
IV	**The Estimating Process** Components of an Estimate, Types of Estimates, Before Starting the Estimate, The Quantity Takeoff, Pricing the Estimate, Direct Costs , Indirect Costs , The Unit Price, Project Overhead Summary, and Estimate Summary Sheets, Pre bid Scheduling, Bidding Strategies, Project Cost Control and Analysis.	08
V	**Indian Electricity Act 2003** Definitions, , National Electricity Policy And Plan, Generation Of Electricity, Licensing, Transmission Of Electricity, Distribution Of Electricity, Tariff, Works, Central Electricity Authority, Regulatory Commissions, Appellate Tribunal For Electricity, Investigation And Enforcement, Reorganisation Of Board, Offences And Penalties, Special Courts, Dispute Resolution, Miscellaneous.	10
	TOTAL	50

Text Books

1. Residential, Commercial and Industrial Electrical Systems: Network and Installation, Volume 2
2. Residential, Commercial and Industrial Electrical Systems: Protection, Testing and Commissioning, Volume 3
3. Electrical Estimating Methods, 4th Edition, Wayne J. Del Pico ISBN: 978-1-118-76698-9, John Wiley & Sons, Inc.
4. Indian Electricity Act 2003
5. *www.cea.nic.in/reports/electricity_act2003.pdf*

REFERENCE BOOKS

Electric Power Distribution system by pabla
Electrical Power System Design By M.V. Deshpande TMI
Electrical Engineering Hand book - Wadhwa

GONDWANA UNIVERSITY, GADCHIROLI

ELECTIVE-II

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: EMBEDDED SYSTEMS

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)	Credits
3	00	00	03	03

Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

Unit	Contents	Hours
I	Introduction to Embedded system, examples of embedded systems, challenges to embedded system design, Processor in the System, Microcontroller, Memory Devices, and Embedded System Project Management, embedded system design and Co-design issues in System development Process, Design cycle in the development phase for an embedded system.	8
II	Introduction to Real – Time Operating Systems: Tasks and Task States, Tasks and Data, Semaphores, and Shared Data; Message Queues, Mailboxes and Pipes, Timer Functions, Events, Memory Management, Interrupt Routines in an RTOS Environment.	9
III	Embedded Software: Programming embedded systems in assembly and C – Program elements used for embedded programs. Embedded Software Development Tools: Host and Target machines, Linker/Locators for Embedded Software, Getting Embedded Software into the Target System; Debugging Techniques: Testing on Host Machine, Using Laboratory Tools.	12
IV	Basic Design Using a Real-Time Operating System: Principles, Semaphores and Queues, Hard Real-Time Scheduling Considerations, Saving Memory and Power, An example RTOS like uC-OS (Open Source); An Example System.	8
V	Overview of Microcontroller: Microcontroller and Embedded Processors, Overview of 8051 Microcontroller family: Architecture, The program Counter and ROM Spaces in the 8051, Data types, 8051 Flag Bits ad PSW Register, 8051 Register Banks and Stack Instruction set, Loop and Jump Instructions, Call Instructions, Time delay generations and calculations, I/O port programming Addressing Modes, accessing memory using various addressing modes, Arithmetic instructions and programs, Communication with 8051: Basics of Communication, Overview of RS-232, I2C Bus, UART, USB, 8051 connections to RS-232, 8051 serial communication programming, 8051 interrupts.	13
	TOTAL	50

Text Book/s:

1. Raj Kamal, “Embedded Systems”, second edition, 2008. TMH.
2. David E. Simon, “An Embedded Software Primer”, second edition.Pearson Education.

Reference Book/s:

1. K.J. Ayala, “The 8051 Microcontroller”, Penram International, 1991.
2. Dr. Rajiv Kapadia, “8051 Microcontroller & Embedded Systems”, Jaico Press
3. Dr. Prasad, “Embedded Real Time System”, Wiley Dreamtech, 2004.
3. M.A. Mazidi and J. G. Mazidi, “The 8051 Microcontroller and Embedded Systems”, PHI, 2004.

GONDWANA UNIVERSITY, GADCHIROLI

ELECTIVE-II

COURSE: B.E. VIII- SEMESTER (ELECTRICAL/ E&P/ EEE)

SUB JECT: POWER QUALITY

Lectures	Tutorial(s)	Practical	Total Periods/week(each of 60 minutes duration)	Credits
3	00	00	03	03

Evaluation System						
THEORY				PRACTICAL		
MSE	IE	ESE	TOTAL	TW	POE	TOTAL
10	10	80	100	--	--	--

UNIT	CONTENT	HRS
I	**Introduction** Importance of Power Quality and Definition of power quality as per IEEE std 1159, Need For Power Quality, Sensitive Loads, Nonlinear Loads, Interconnected Power System, Deregulation, Utilities, End Users, Lawyers, .Definition and terminology of grounding , purpose of grounding, good grounding practices and problem due to grounding.	10
II	**Power Quality Characteristics** Power Quality Theory, Types Of Power Quality Problems, Long- and short Duration voltage variations, RMS voltage variations in power system, Over Voltage, under voltage, voltage sags, voltage swells, imbalance, transient and flicker, Voltage Fluctuations, Electrical Noise, Sources Of Power Quality Problems, Utility Side Of The Meter, End User Side Of The Meter, Effects Of Power Quality Problems, Power Quality Problem- Solving Procedures, Power Quality Solutions.	10
III	**Waveform Distortion** Definition of Harmonics, inter harmonics, sub harmonics, oscillations .Causes and effects of harmonics on all equipments, Harmonic indices, Harmonic study procedure voltage and current distortion, A.C. quantities under non sinusoidal conditions. Overview of Fourier analysis. Principles for controlling harmonics. Harmonics filtering passive and active filters. Locating sources of harmonics. Study of different types tuned and detuned filters.	10
IV	**Power Quality Standards** Power Quality Standards Organizations, Institute Of Electrical & Electronics Engineers (IEEE). American National Standards Institute(ANSI), International Electro Technical Commission (IEC Other International Standards Organizations, Purpose Of Power Quality Standards, Types Of Power Quality Standards, Voltage Sag (Dip) Standards, Transients Of Surges, Voltage Unbalance, Voltage Fluctuation Or Flicker Standards, Harmonics Standards, Transformer Overheating Standards, Natural Conductor Loading Standards, Static Electricity, Telephone Power Quality Standards, Grounding And Wiring Standards, Sensitive Electronics Equipment's Standards, Trends In Power Quality Standards,.	10

V	**Power Quality Solutions** Reduce Effects On Sensitive Equipment, Reduce Or Eliminate Cause, Reduce Or Eliminate Transfer Medium, Install Power Conditioning Equipment, Surge Suppressors, Noise Filters, Isolation Transformers, Line- Voltage Regulators, Motor- Generator Sets, Magnetic Synthesizers, Static VAR Compensators (SVCS) Uninterruptible Power Supply (UPS) Solid-State Switches, Harmonics Solutions, Selection Of Appropriate Power Conditioning Equipment, Grounding And Wiring Solutions.	10
	TOTAL	50

Text Books:

1. Power Quality by Barry. W. Kennedy Primer, McGraw- Hill
2. Electrical Power System Quality by R.C.Dugan, M.F.Mcgranghan, S. Santoso, H.W.Beaty Tmh2nd Edition 2011
3. Voltage quality in Electrical power system by A.T. Jhones and D.F. Warne , IET power and energy series