Jabalpur Engineering College, Jabalpur

Semester VIII Credit Based Grading System (CBGS) w.e.f. July 2018
Scheme of Examination
Bachelor of Engineering B.E. (Electrical Engineering)
Subject Wise Distribution of Marks and Corresponding Credits
Scheme of Examination w.e.f. July 2018 Academic Session 2018-19

S.No.	Subject Code	Subject Name & Title	Maximum Marks Allotted					Total Marks	Hours/Week			Total Credits
			Theory			Practical			L	T	P	
			End. Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work					
1	EE8001	EHV AC & DC Transmission	70	20	10	30	20	150	3	1	2	6
2	EE8002	Advance Electric Drives	70	20	10	30	20	150	3	1	2	6
3	EE8003	Elective-V	70	20	10	-	-	100	3	1	-	4
4	EE8004	Elective-VI	70	20	10	-	-	100	3	1	-	4
5	EE8005	Project-II	-	-	-	120	80	220	-	-	8	8
6	EE8006	Calibration/Testing Lab	-	-	-	-	50	50	-	-	2	2
7	EE8007	Group Discussion/Seminar (Internal Assesment)	-	-	-	-	50	50	-	-	2	2
		Total	**280**	**80**	**40**	**180**	**220**	**800**	**12**	**4**	**16**	**32**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

Department Elective-V (Three Subjects)			Department Elective-VI (Three Subjects)	
S.No.	Subject Code	Subject Name	Subject Code	Subject Name
1	EE8003A	SCADA Systems & Applications	EE8004A	Digital Image Processing
2	EE8003B	Process Control	EE8004B	Power Quality
3	EE8003C	Renewable & Non Conventional Energy Sources	EE8004C	Fuzzy Logic and Neural Network

Principal
Jabalpur Engineering College
Jabalpur - 482 011 (M.P.)

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		Theory			Practical		Total Marks	L	T	P	
		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
EE8001	EHV AC & DC Transmission	70	20	10	30	20	150	3	1	2	6

Unit-I

Constitution of EHV a.c. and d.c. links, Kind of d.c. links, Limitations and Advantages of a.c. and d.c. transmission, Principal application of a.c. and d.c. transmission, Trends in EHV a.c. and d.c. transmission, Power handling capacity. Converter analysis Graetz's circuit, Firing angle control, Overlapping.

Unit-II

FACTS devices, basic types of controller, series controller, static synchronous series compensator(SSSC), thyristor-controlled series capacitor(TCSC), thyristor controlled series reactor(TCSR), shunt controller (STATCOM), static VAR compensator(SVC), series-series controller, combined series-shunt controller, unified power flow controller(UPFC), thyristor controlled phase shifting transformer(TCPST).

Unit-III

Components of EHV d.c. system, converter circuits, rectifier and inverter valves, Reactive power requirements, harmonics generation, Adverse effects, Classification, Remedial measures to suppress, filters, Ground return. Converter faults & protection harmonics mis-operation, Commutation failure, Multi-terminal D.C. lines.

Unit-IV

Control of EHV d.c. system desired features of control, control characteristics, Constant current control,

Constant extinction angle control. Ignition Angle control. Parallel operation of HVAC & DC system. Problems & advantages.

Unit-V

Travelling waves on transmission systems, Their shape, Attenuation and distortion, effect of junction and termination on propagation of travelling waves. Over voltages in transmission system. Lightning, switching and temporary over voltages: Control of lighting and switching over voltages

Reference:

1. S. Rao,- "EHV AC & DC Transmission" Khanna pub.
2. Kimbark,-" HVDC Transmission" john willy & sons pub.
3. Arrillaga,- "HVDC Transmission"2nd Edition ,IEE londan pub.
4. Padiyar, -"HVDC Transmission" 1st Edition ,New age international pub.
5. T.K. Nagsarkar,M.S. Sukhiza, -"Power System Analysis", Oxford University
6. Narain.G. Hingorani, l. Gyugyi-"Undustanding of FACTS concept and technology", John Wiley & sons pub.
7. P.Kundur- "H.V.D.C. Transmission" McGraw Hill Pub.

EE8001 EHV A.C. & D.C. TRANSMISSION

After completion of this course students will be able to-

CO1. Apply the concepts of EHV AC and DC links, EHV AC and DC transmission.
CO2. Design various compensators, controllers using FACTS devices.
CO3. Utilize converter circuits and filters in EHV DC system.
CO4. Model EHV AC and DC system for Parallel operation.
CO5. Control lighting and switching over voltages in power system.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE8001(1)	3	-	-	-	-	-		-	-	-	-	-	-	3
EE8001(2)	2		-	-	-	-	-	-	-	-	-	-	-	3
EE8001(3)		2		-	-	-	-	-	-	-	-	-	-	2
EE8001(4)			2											3
EE8001(5)	-	2	-	-	-	-	-	-	-	-	-	-	-	2
EE8001	**1**	**0.8**	**0.4**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2.6**

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
EE8002	Advanced Electric Drives	70	20	10	30	20	150	3	1	2	6

Unit-I
Review of electric motors & Solid state converters: Speed control techniques of DC, Induction & synchronous motor, Converters, inverters, chopper and cyclo converter operation, Effects of power electronic equipments on load side & supply side.
Review of closed loop controllers, sensors & transducers : PI, PID, Variable structure. AC, DC & Pulse tachogenerators.

Unit-II
DC Drives : Converter & chopper fed DC drive, Reversing, Starting, Regenerative breaking , Four quadrant operation, High power application

Unit-III
AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear electrical motor concept, Synchronous motor drive

Unit-IV
Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters, Characteristics & Control, PLC based drives.
Servo drives & stepper motor- AC & DC Servomotor, Stepper motor, Control techniques, Controllers, Microstepping, Sensorless operation.

Unit-V
Power Quality & energy Conservation- Line Side pollution, standards, Harmonic elimination techniques in converter, Filters, Energy efficient electric motors, Pay back periods, Energy conservation through sold state control.

Reference Books:

1. Ned Mohan, T.M. Undeland, W.P. Robbins, Power Electronics-Converters, Applications and design", John Wiley & Sons.
2. J.M.D. Murphy, F.O. Turnbull, "Power Electronic Control of AC motors", Pergamon Press.
3. P.C. Sen, D.C. drive, Pergamon Press
4. B.K. Bose, Power Electronics & AC drive prentice Hall.
5. Dubey G.K. "Power semi Conductor controller drives, Prentice Hall.
6. Vedam Subramanyam, "Electrical Drives".
7. T.J.E. Miller, Switched Reluctance & P.M. B.L. DC motor, Pergamon Press
8. P.V. Rao, "Power semiconductor Drives", BS Publications.

EE8002 Advance Electric Drive

After completion of this course students will be able to-

CO1. Explain PI, PID based closed loop controllers.
CO2. Design four quadrant speed control system of DC drive using power electronic converters.
CO3. Compare vector control and sensorless speed controller for induction motor.
CO4. Select suitable speed control technique for SRM and BLDC motors.
CO5. Estimate harmonic elimination techniques for converters.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life Long Learning**	**Machine**	**Power System**
EE8002(1)	2	-	-	-	-	-	-	-	-	-	-	-	1	-
EE8002(2)		-	2	-	-	-	-	-	-	-	-	-	2	-
EE8002(3)	2												2	
EE8002(4)				1									2	
EE8002(5)		1		-	-	-	-	-	-	-	-	-		-
EE8002	**0.8**	**0.2**	**0.4**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**1.4**	**0.0**

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-V EE8003A	SCADA Systems & Applications	70	20	10	-	-	100	3	1	-	4

Unit I

Introduction to SCADA and PLC:SCADA: Data acquisition system, evaluation of SCADA, communication technologies, monitoring and supervisory functions. PLC: Block diagram, programming languages, Ladder diagram, Functional Block diagram, Applications, Interfacing of PLC with SCADA.

Unit II

SCADA system components: Schemes, Remote Terminal Unit, Intelligent Electronic Devices, Communication Network, SCADA server.

Unit III

SCADA Architecture-Various SCADA Architectures, advantages and disadvantages of each system, single unified standard architecture IEC 61850 SCADA / HMI Systems.

Unit IV

SCADA Communication-Various industrial communication technologies- wired and wireless methods and fiber optics, open standard communication protocols.

Unit V

Operation and control of interconnected power system-Automatic substation control, SCADA configuration, Energy management system, system operating states, system security, state estimation. Unit VI: SCADA applications Utility applications, transmission and distribution sector operation, monitoring analysis and improvement. Industries oil gas and water. Case studies, implementation, simulation exercises.

Reference Books:

1. Stuart A Boyer: SCADA supervisory control and data acquisition.
2. Gordan Clark, Deem Reynders, Practical Modem SCADA Protocols.
3. Sunil S. Rao, Switchgear and Protections, Khanna Publication.

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ELECTIVE-V EE8003B	Process Control	70	20	10	-	-	100	3	1	-	4

Unit I

Special characteristics of process systems large time constants, interaction, multistaging, pure lag; control loops for simple systems and their Dynamics & stability.

Unit II

Generation of control action in electronic and pneumatic controllers. Control valves, valve positioners, relief and safety valves, relays, volume boosters, pneumatic transmitters for process variable. Tuning of controllers - Zeigler Nichols and other techniques.

Unit III

Different control techniques and interaction of process parameters e.g. feed forward, cascade, ratio, override controls Batch continuous process controls. Feed forward Control schemes.

Unit IV

Various process schemes / unit operations and their control schemes e.g. distillation columns, absorbers,
heat exchangers, furnaces, reactors, mineral processing industries, etc. Use of control schemes for process optimization.

Unit V

Advanced control strategies with case studies. Use of DDC and PLC. Introduction to supervisory control. Conversion of existing control schemes in operating plants, data loggers.

References:

- Dale Patrick, Stephen Fardo, "Industrial Process Control System".
- Shinskey F.G., "Process Control System", III Ed., McGraw Hill.
- Smith C.A. & A.B. Corripio, "Principle & Practiced Automatic Process Control", J. Willey.
- Rao M & S.Qiv, "Process Control Engg.", Gorden & Breach.

EE8003(B) Process Control

After completion of this course students will be able to-

CO1. Design blocks diagram and mathematical model of various processes.
CO2. Utilize different types of controller like electronic, pneumatic and hydraulic.
CO3. Implement different control schemes to various processes.
CO4. Select relay logic for various processes.
CO5. Understand batch process with an example.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE8003B(1)			1	-	-	-	-	-	-	-	-	-	-	-
EE8003B(2)		1			-	-	-	-	-	-	-	-	-	-
EE8003B(3)		2		-	-	-	-	-	-	-	-	-	-	-
EE8003B(4)	2													
EE8003B(5)	2			-		-	-	-	-	-	-	-	-	-
EE8003B	**0.8**	**0.6**	**0.2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-V EE8003C	Renewable & Non Conventional Energy Sources	70	20	10	-	-	100	3	1	-	4

Unit - I

Renewable Energy Systems

Energy Sources, Comparison of Conventional and non-conventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II

Wind Energy System

Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, winddiesel, wind hydro biomass etc. wind operated pumps, controller for energy balance.Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for stand alone systems. Use of electronic load controllers and self excited induction generators.Wave Energy System: System configuration: grid connected and hybrid systems.

Unit - III

Solar Radiation

Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, **Solar Photo tonic System** Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels.

Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit – IV

Energy from oceans

Ocean temperature difference, Principles of OTEC, plant operations,

Geothermal Energy

Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern non-conventional energy sources.

Unit - V

Electric Energy Conservation

Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, air-conditioning, power plants, process industries, illumination etc. Methods of Energy Audit.

Measurements systems; efficiency measurements. energy regulation, typical case studies, various measuring devices analog and digital, use of thyristors.

References:

1. John Twidell & Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-VI EE8004A	Digital Image Processing	70	20	10	-	-	100	3	1	-	4

UNIT-I : DIGITAL IMAGE PROCESSING :
Elements of a Digital Image Processing system, Structure of the Human eye, Image Formation and contrast sensitivity, Sampling and Quantization, Neighbors of a pixel, Distance measures, Photographic file structure and exposure, Linear scanner, Video camera, Image processing applications.

UNIT-II : IMAGE TRANSFORMS:
Introduction to Fourier transform-DFT, Properties of two dimensional FT, Separability, Translation, Periodicity, Rotation, Average value, FFT algorithm, Walsh transforms, Discrete Cosine transform, Wavelet transform .

UNIT - III : IMAGE ENHANCEMENT :
Definition, Spatial domain methods, Frequency domain methods, Histogram modify technique, Neighborhood averaging, Media filtering, Lowpass filtering, Image sharpening.

UNIT – IV : IMAGE RESTORATION :
Definition, Degradation model, Noise Models, Restoration in the presence of Noise Models ,Inverse filtering .

UNIT - V : IMAGE ENCODING :
Fundamentals ,Image compression Models, Basic encoding process, Variable length coding, Bit-plane coding, Lossless predictive coding - Lossy compression: Lossy predictive coding, transform coding, wavelet coding. Introduction to Image compression techniques and standards.

References :

1. "Digital Image Processing" by Rafael, C. Gonzlez., and Paul, Wintz, Addison-Wesley Publishing Company.
2. "Fundamentals of Digital Image Processing" by Jain Anil K. Prentice Hall.
3. "Digital Image Processing" by Sosenfeld, and Kak, A.C., Academic Press.
4. The Image Processing Handbook, (5/e), CRC, 2006 by J.C. Russ,
5. Digital Image Processing with MATLAB by . R.C.Gonzalez & R.E. Woods; Prentice Hall, 2003

EE8004(A) Digital Image Processing

After completion of this course students will be able to-

CO1. Explain Basic of Digital Image processing system.
CO2. Utilize Various image transforms DFT and FFT
CO3. Develop various image enhancement techniques and filtering techniques
CO4. Elaborate image restoration in presence of noise models.
CO5. Categorized image restoration and image encoding techniques

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	Engineering Knowledge	**Problem Analysis**	**Design/Development of Solutions**	**Conduct Investigations of Complex Problems**	**Modern Tool Usage**	**The Engineer and Society**	**Environment and Sustainability**	**Ethics**	**Individual and Team Work**	**Communication**	**Project Management and Finance**	**Life-Long Learning**	**Machine**	**Power System**
EE8004A(1)	3	-		-	-	-	-	-	-	-	-	-	-	-
EE8004A(2)	2	-		-	-	-	-	-	-	-	-	-	-	-
EE8004A(3)		-	2	-	-	-	-	-	-	-	-	-	-	-
EE8004A(4)			2											
EE8004A(5)	2	-	-	-	-	-	-	-	-	-	-	-	-	-
EE8004A	**1.4**	**0**	**0.8**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-VI EE8004B	Power Quality	70	20	10	-	-	100	3	1	-	4

UNIT-I
Introduction, power quality -voltage quality, power quality evaluations procedures term and definition: general classes of power quality problem, causes & effect of power quality disturbances.

UNIT-II
Voltage sags and interruption: sources of sags and interruption, estimating voltages sag performance, fundamental principles of of protection, monitoring sags.

UNIT-III
Transients over voltages: sources of transient over voltages, principles of over voltages protection, utility capacitor switching transients, fundamentals of harmonics and harmonics distortion, harmonics sources from commercial load and from industrial loads.

UNIT-IV
Applied harmonics : harmonics distortion evalutions, principles for controlling harmonics, harmonics studies devices for controlling harmonic distortion, filters, passive input filter standards of harmonics.

UNIT-V
Electro-magnetic compatibility, constant frequency control, constant tolerance band control, variable tolerance band control, discontinuous current control.

Reference Books:

1. Power Quality- by R.C. Duggan
2. Power System harmonics –by A.J. Arrillga
3. Power electronic converter harmonics –by Derek A. Paice

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		End Sem	Mid Sem MST	Quiz, Assignment	End Sem	Lab Work					
ELECTIVE-VI EE8004C	Fuzzy Logic and Neural Network	70	20	10	-	-	100	3	1	-	4

Unit-I
Fuzzy system introduction, Fuzzy relation, Membership function, Fuzzy matrices and entropy, Fuzzy operation and composition.

Unit-II
Fuzzy Variables, Linguistic variables, measures of fuzziness, concepts of defuzzification, Fuzzy control applications.

Unit-III
Fundamentals of Artificial Neural networks- Biological prototype – Artificial neuron, Activation functions, Single layer and multiplayer networks. Training Artificial neural networks, Preceptrons, Exclusive Or Problem – Linear seperability, Storage efficiency, Preceptron learning, perceptron training algorithms. Back propagation, Training algorithm, network configurations, Network paralysis, Local minima, temporal instability.

UNIT-IV
Counter propagation networks, Kohonen layer, Training the kohonen layer, Pre processing the inputted vectors, Initialising the wright vectors, Statistical properties, Training the grosberg layer. Full counter propagation networks, Applications. Statistical methods, Boltzman training, Cauchy training, Artificial specific heat methods, Applications to general non-linear optimization problems. Back propagation and cauchy training.

UNIT-V
Hopfield nets, Recurrent networks, Stability, Associative memory, Thermodynamic systems, Statistical Hopfiled networks, Applications. Bi-directional associative memories, Retrieving on stored association, Encoding the associations.

References :

1. Laurence Fausett "Fundamentals of Neural Networks", Prentice Hall.
2. Zimmermann H.J. "Fuzzy Set Theory and its Applications", Allied Publishers Ltd.
3. Klir G.J. and Folger T., "Fuzzy Sets, Uncertainty and Information", Prentice Hall.
4. Limin Fu, "Neural Networks in Computer Intelligence", McGraw Hill.
5. Zuroda J.M. "Introduction to Artificial Neural Systems", Jaico Publishing.
6. Haykin S. "Artificial Neural Network, A Comprehensive Foundation" Asia Pearson Pub.
7. Sivanandam & Deepa- An Introduction to Neural Networks using Matlab 6.0 1 ed., TMH
8. M.Amirthavalli, Fuzzy logic and neural networks, Scitech publications.