PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Subject Title	Subject Code	Credits			Theory		
		L	T	P	Externals (70)	Internals (30)	Total (100)
EHVAC/DC Transmission	EET- 801	3	1	0		Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
I	**EHV AC Transmission:** Need of EHV transmission lines, power handling capacity and surge impedance loading. Problems of EHV transmission, bundled conductors: geometric mean radius of bundle properties of bundle conductors. Electrostatic fields of EHV lines and their effects, corona effects: Corona loss, audio and radio noise
II	**Load Frequency Control:** Introduction to control of active and reactive power flow, turbine speed governing system. Speed governing characteristic of generating unit and load sharing between parallel operating generators. **Method of Load Frequency Control:** Flat frequency, flat tie line and tie line load bias control. Automatic generation control (description of block diagram only)
III	**Voltage Control:** No load receiving end voltage and reactive power generation. Methods of voltage control. Synchronous phase modifier, shunt capacitors and reactors, saturable reactors Thynstorised static VAR compensators- TCR, FC-TCR and TSC- TCR
IV	**FACTS:** Introduction to FACTS controllers, types of FACTS controllers, Brief description of STATCOM, Thyristor controlled series capacitors and unified power flow controller
V	**HVDC Transmission:** Types of D.C. links, advantages and disadvantages of HVDC transmission. Basic scheme and equipment of converter station. Ground return. Basic principles of DC link control and basic converter control characteristics. Application of HVDC transmission

REFERENCES:

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

PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Subject Title	Subject Code	Credits			Theory		
		L	T	P	Externals (70)	Internals (30)	Total (100)
Elective – II Power Quality	**EET- 8101**	3	1	0		Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
I	**Introduction to Power Quality:** Terms and definitions of transients, Long Duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; **Short Duration Voltage Variations:** interruption, Sag, Swell; Voltage Imbalance; Notching D C offset,waveform distortion; voltage fluctuation; power frequency variations
II	**Voltage Sag: Sources of voltage sag:** motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, Active Series Compensator.
III	**Electrical Transients:** Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection
IV	**Harmonics:** Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc. harmonic mitigation techniques,
V	**Measurement and Solving of Power Quality Problems:** Power quality measurement devices- Harmonic Analyzer , Transient Disturbance Analyzer, wiring and grounding tester, Flicker Meter, Oscilloscope, multimeter etc. Introduction to Custom Power Devices-Network Reconfiguration devices; Load compensation and voltage regulation using DSTATCOM; protecting sensitive loads using DVR; Unified power Quality Conditioner. (UPQC)

REFERENCES:

1. Roger C Dugan, McGrahan, Santoso & Beaty, "Electrical Power System Quality" McGraw Hill
2. Arinthom Ghosh & Gerard Ledwich, "Power Quality Enhancement Using Custom Power Devices"Kluwer Academic Publishers
3. C. Sankaran, " Power Quality" CRC Press

Semester: **VIII**

PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Subject Title	Subject Code	Credits			Theory		
		L	T	P	Externals (70)	Internals (30)	Total (100)
Elective – II Power System Deregulation	**EET- 8102**	3	1	0		Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
I	Need and conditions for deregulation. Introduction of Market structure, Market Architecture, Spot market, forward markets and settlements. Review of Concepts marginal cost of generation, least-cost operation, incremental cost of generation, Power System Operation: Old vs. New
II	Electricity sector structures and Ownership /management, the forms of Ownership and management. Different structure model like Monopoly model, Purchasing agency model, wholesale competition model, Retail competition model.
III	Framework and methods for the analysis of Bilateral and pool markets, LMP based markets, auction models and price formation, price based unit commitment, country practices
IV	Transmission network and market power. Power wheeling transactions and marginal costing, transmission costing. Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs- country practices
V	Ancillary Services and System Security in Deregulation. Classifications and definitions, AS management in various markets- country practices. Technical, economic, & regulatory issues involved in the deregulation of the power industry.

REFERENCES:

1. Power System Economics: Designing markets for electricity - S. Stoft
2. Power generation, operation and control, -J. Wood and B. F. Wollenberg
3. Operation of restructured power systems - K. Bhattacharya, M.H.J. Bollen and J.E. Daalder
4. Market operations in electric power systems - M. Shahidehpour, H. Yamin and Z.
5. Fundamentals of power system economics - S. Kirschen and G. Strbac
6. Optimization principles: Practical Applications to the Operation and Markets of the Electric Power Industry - N. S. Rau

Semester: **VIII**

PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Subject Title	Subject Code	Credits			Theory		
		L	T	P	Externals (70)	Internals (30)	Total (100)
Elective – II Advance Electrical Drive	**EET- 8103**	3	1	0	Min:	Min: Nil	Min: 40 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20

Assignment / Quiz – Max. Marks: 10

Unit	Contents (Theory)
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.
II	Review of closed loop controllers, sensors & transducers: PI, PID, Variable structure. AC, DC & Pulse tachogenerators.
III	DC Drives : Converter & chopper fed DC drive, Reversing, Starting, Regenerative breaking , Four quadrant operation, High power application AC Drive: Inverter & cyclo converter fed drive, Vector control, Sensor less operation, Linear electrical motor concept, Synchronous motor drive
IV	Special Drives: Switched reluctance & permanent magnet brushless DC Operation, Converters, Characteristics & Control, PLC based drives.
V	Servo drives & stepper motor- AC & DC Servomotor, Stepper motor, Control techniques, Controllers, Microstepping, Sensorless operation.

REFERENCES:

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

PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

Semester: **VIII**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	Externals (70)	Internals (30)	Total (100)	Externals (35)	Internals (15)	Total (50)
Computer Aided Design Of Electrical Machine	EET- 803	3	1	2		Min: Nil	Min: 40 (D Grade)	Min: 14	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours
Theory Internal - Max Marks: 30
Best of Two Mid Semester Test –Max Marks: 20
Assignment / Quiz – Max. Marks: 10
Practical Internal - Max Marks: 15
Lab work & Sessional –Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	**Basic Principles of Electrical Machine Design:** Specifications, Factors affecting the design, Limitations, main dimension, loadings, output equation, factor affecting the size and rating, Electrical Engineering Materials: conducting, magnetic and insulating materials. **Magnetic Circuit Calculation:** Ohm's law for magnetic circuit, mmf required for air gap and iron parts, tapered teeth, real and apparent flux density, magnetizing current.
II	**Heating and Cooling of Electrical Machines:** heat dissipation and heat flow equations, Newton's law of cooling, equations for temperature rise, **Rating of Machines**: Continuous, short and intermittent ratings, mean temperature rise, hydrogen cooling of turbo alternators, quantity of cooling medium.
III	**Computer Aided Design of Transformers:** Power and Distribution Transformers, core and yoke cross sections, square and stepped core, output equations, main dimensions, types &, design of windings, optimization concepts
IV	**Computer Aided Design of Synchronous Machines:** Turbo and Hydro alternators, choice of specific magnetic & electric loading, short circuit ratio and its effects, air gap length, output equation, main dimensions, flow charts for design of synchronous machine, design of stator core & winding
V	**Computer Aided Design of Induction Machines:** Output equation, main dimensions, design criteria, flow charts for design of induction motor, air gap length, design of stator core and winding, rotor design

REFERENCES:

5. Computer- Aided Design of Electrical Equipment- by Dr. M. Ramamoorthy-Affiliated East-West press Pvt. Ltd. New Delhi
6. Electrical Machine Design- by A.K. Sawhney, Dhanpat Rai & Sons
7. Principles of Electrical Machine Design with Computer Programmes by- S.K. Sen, Oxford & IBH Publishing Co.
8. Performance and Design of A.C. Machines-M.G. Say, Affiliated East West Press Pvt. Ltd., New Delhi.

PEOPLE'S UNIVERSITY, BHOPAL

Programme: **B. Tech. (Electrical Engineering)**

PRACTICALS:

1. Study of programming coad for c language help full in machine designing in simulation software
2. Develop program for calculating main dimension of DC generator
3. Develop program for design of commutator and brush
4. Program from calculating losses in efficiency
5. Temperature rise of armature
6. Design of synchronous machine
7. Design a 30000 kva, 3000 rpm, 50 Hz, t3 phase air cooled turbo alternator. The load power is 0.8 lagging.

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Programme: **B. Tech. (Electrical Engineering)**

Semester: **VIII**

Subject Title	Subject Code	Credits			Theory			Practical		
		L	T	P	Externals (70)	Internals (30)	Total (100)	Externals (35)	Internals (15)	Total (50)
Power System Analysis & Control	**EET-804**	3	1	2		Min: Nil	Min: 40 (D Grade)	Min: 14	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): 3 Hours

Theory Internal - Max Marks: 30

Best of Two Mid Semester Test –Max Marks: 20
Assignment / Quiz – Max. Marks: 10

Practical Internal - Max Marks: 15

Lab work & Sessional –Max Marks: 10
Assignment / Quiz – Max. Marks: 05

Unit	Contents (Theory)
I	(i) Percent and per unit quantities. Single line diagram for a balanced 3-phase system. **(ii) Admittance Model:** Branch and node admittances Equivalent admittance network and calculation of Y bus. Modification of an existing Y bus.
II	**Impendence Model:** Bus admittance and impedance matrices. Thevenin's theorem and Z b Direct determination of Z bus. Modification of an existing bus **(ii) Symmetrical fault Analysis** Transient on a Transmission line, short circuit of a synchronous machine on no load, short circuit of a loaded synchronous machine. Equivalent circuits of synchronous machine under sub transient, transient and steady state conditions. Selection of circuit breakers, Algorithm for short circuit studies. Analysis of 3 phases faults
III	**Symmetrical Components:** Fortescure theorem, symmetrical component transformation Phase shift in star-delta transformers. Sequence Impedances of transmission lines, Synchronous Machine and Transformers, zero sequence network of transformers and transmission lines. Construction of sequence networks of power system. **Fault Analysis:** Analysis of single line to ground faults using symmetrical components, connection of sequence networks under the fault condition.
IV	**Unsymmetrical Fault Analysis:** (i) Analysis of line-to-line and double line to ground faults IV using symmetrical components, connection of sequence networks under fault conditions. (ii) Analysis of unsymmetrical shunt faults using bus impedance matrix method.
V	**Load Flow Analysis:** Load flow problem, development of load flow equations, bus classification. Gauss Seidel, Newton Raphosn, decoupled and fast decoupled methods for load flow analysis. Comparison of load flow methods

REFERENCES:

1. C.L. Wadhwa, "Electric Power System" (Willey Eastem Ltd.)

2. IJ Nagnath and DP Kothari "Power System Engineering". Tata MGH

PRACTICALS:

1. To develop a program in Matlab for information of Y-bus matrix for N bus system.
2. Load flow solution for 3-bus system using Gauss- Seidel, Newton Raphson and FDLF methods up to 3 iteration.
3. Load flow solution for IEEE 6-bus and 30-bus system in Matlab using Newton Raphson method.
4. Assessment of transient stability of a single machine system.
5. Effect of compensation on voltage profile of IEEE 6-bus system.
6. Study of any software tools (PSAT, EDSA, MY POWER, ETAP etc).

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Programme: **B. Tech. (Electrical Engineering)**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	External	Internal	Total (50)
Electrical Engineering Simulation Lab	EET- 805	-	-	2	(Nil)	(50)	Min: 20 (D Grade)

Practical Internal - Max Marks: 50

Lab work & Sessional –Max Marks: 45

Assignment / Quiz – Max. Marks: 05

Contents (Practical)
Design and simulation of following Electrical Devices, circuits using PSCAD / MATLAB software. • Transformers • Generators • Motors • commutation • chopper • invertors • rectifier • UJT as triggering circuit • Speed control of motors

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Programme: **B. Tech. (Electrical Engineering)**

Semester: **VIII**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	Externals (140)	Internals (60)	Total (200)
Major Project II	**EET -806**	-	-	08	Min:	Min: Nil	Min: 40 (D Grade)

Practical Internal - Max Marks: 60

Lab work & Sessional –Max Marks: 55

Assignment / Quiz – Max. Marks: 05

Contents (Practical)

The student should prepare a working system or some design or understanding of a complex system that he has selected in the seventh semester using system analysis tools and submit the same in the form of a write-up i.e. detail project report. The student should maintain proper documentation of different stages of project such as need analysis, market analysis, concept evaluation, requirement specification, objectives, work plan, analysis, design, implementation and test plan wherever applicable. Each student is required to prepare a project report based on the above points and present the same at the final examination with a demonstration of the working system.

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Programme: **B. Tech. (Electrical Engineering)**

Semester: **VIII**

Subject Title	Subject Code	Credits			Practical		
		L	T	P	Externals (35)	Internals (15)	Total (50)
Professional Ethics & Proficiency	**BT- 807**	-	-	02	Min:	Min: Nil	Min: 20 (D Grade)

Practical Internal - Max Marks: 15

Lab work & Sessional –Max Marks: 10

Assignment / Quiz – Max. Marks: 05

Contents

Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Communication and personality development covering, Psychological aspects of communication, cognition as a part of communication; Emotional Intelligence; Politeness and Etiquette in communication; Cultural factors that influence communication; Mannerisms to be avoided in communication; Language and persuasion; Language and conflict resolution;

Career Oriental Communication covering, Resume and Biodata: Design & style; Applying for a job: Language and format of job application. Job Interviews: purpose and process;

Advanced Techniques in Technical Communication covering, Interview through telephone/video-conferencing; Power-point presentation: structure and format; Using e-mail for business communication; Standard e-mail practices; Language in e-mail; Using internet for collecting information; Referencing while using internet materials for project reports.