PEOPLE'S UNIVERSITY, BHOPAL

(Applicable for Admitted from Academic Session 2019-20 onwards)

Programme: **Diploma in Engineering** **Semester – VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P	External	Internal	Total (100)	External	Internal	Total
DEE1602	Installation & Maintenance of Electrical Equipments	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: -Nil	Assignment / Quiz- Max. Marks: -Nil

Pre-Requisite	Knowledge of Electrical Tools.
Course Outcome	1. Tools and mechanism required for electrical installation, maintenance and repair works.
	2. Installation of transmission and distribution line, telecommunication line and railway line.
	3. Maintenance of transmission and distribution system and provision of safety fuse.

Unit	Contents (Theory)	Marks weightage
I	Tools and Accessories: Tools, accessories and instruments required for installation, maintenance and repair work, Knowledge of Indian Electricity rules, safety codes, causes and prevention of accidents, artificial respiration of an electrocuted person, workmen's safety devices.	**14**
II	Installation: Installation of transmission and Distribution Lines: Erection of steel structures, connecting jumpers, tee-off points, joints and dead ends; crossing of roads, streets, power/telecommunication lines and railway line crossings, clearances; earthing of transmission lines and guarding, spacing and configuration of conductors: Arrangement for suspension and strain insulators, bird guards, anti-climbing devices and danger plates; sizes of conductor, earth wire and guy wires, Testing and Commissioning. Laying of service lines, earthing, provision of service fuses, installation of energy meters.	**14**
III	Elementary idea regarding, inspection and handling of transformers; Pole mounted substations, plinth mounted substations, grid substation, bus bars, isolation, voltage and current transformers, lightning arrestors, control and relay panels, HT/LT circuit breakers, LT switches, installation of power/distribution transformers, dehydration. Earthing system, fencing of yard, equipment foundations and trenches.	**14**
IV	Maintenance:- Types of maintenance, maintenance schedules, procedures, Maintenance of Transmission and Distribution System; Location of faults using Meggar, effect of open or loose neutral connections, provision of proper fuses on service lines and their effect on system, causes of dim and flickering lights.	**14**
V	Maintenance of Distribution Transformers: Transformer maintenance and points to be attended to in respect of various items of equipment, Checking of insulation resistance, transformer oil level and BDV test of oil, measurement of earth resistance Domestic Installation: Introduction, testing of electrical installation of a building, testing of insulation resistance to earth, testing of insulation and resistance between conductors continuity or open circuit test.	**14**

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Programme: **Diploma in Engineering** **Semester – VI**

Text Book/References Books/ Websites

1. Rao S.; "Testing, Commissioning, Operation and Maintenance of Electrical Equipment"; Khanna Technical Publication, New Delhi.
2. Asfaq Hussain; "Basic Electrical Engineering"; Dhanpat Rai Publication.
3. Sharotri S K ; "Preventive Maintenance of Electrical Apparatus"; Katson Publishing House,Ludhiana

Suggested List of Laboratory Experiments :- Nil

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Programme: **Diploma in Engineering** **Semester – VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (35)	Internal (15)	Total (50)
DEE1603	Electric Drive -II	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	Min: 14 (D Grade)	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: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: -10	Assignment / Quiz- Max. Marks: -05

Pre-Requisite	Knowledge of Power electronics and DC drives.
Course Outcome	1. Review of conventional methods & convertor control methods used in speed control of I.M.
	2. Various power recovery schemes in AC drives to improve the efficiency of the drives in industry.
	3. Analysis of special drives and digital control of drives used in modern technologies.

Unit	Contents (Theory)	Marks weightage
I	**Introduction**-Introduction to AC drives, AC drives and DC drives comparisons, Review of Conventional methods of speed control of induction motor drives, convertor control methods of speed control of AC drives, comparison of converter controlled methods with conventional method of speed control etc.	**14**
II	**Traction Drives**-Introduction to Traction drive, nature of traction load, conventional ac and dc traction drive, CSI fed squirrel cage induction motor drive, load commutated inverter synchronous motor drive, PWM VSI fed induction motor drive	**14**
III	**Induction and synchronous motor drive**-Introduction to the concept of controlling the speed of induction motor, stator voltage control using A.C. voltage controller, stator frequency control, V/F control of induction motor, rotor side control of induction motor, static rotor resistance control, Slip power recovery schemes, Kramer drive, Scherbius drive, Introduction to synchronous motor drive	**14**
IV	**Special Drives** : Fundamentals of Switched reluctance motors, Stepper Motors, Permanent Magnet Motor Introduction to vector control; Digital control of drives.	**14**
V	**Case Studies** Electric traction, steel & cements plants, textile & paper mills, machine tool drive and CNC, electric cars.	**14**

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Programme: **Diploma in Engineering** **Semester – VI**

Text Book/References Books/ Websites

1. Pillai S. K.; "A first course on Electrical Drives"; Second edition, Wiley Eastern.
2. Dubey G. K..; "Fundamentals of Electrical Drives"; Narosa Publishing House.
3. Murphy M. D. and Tumbuli F.; "Power Electronic Control of AC Motors", Pergamon Press, Oxford University Press.
4. P.V. Rao; "Power semiconductor Drives"; BS Publications.

Suggested List of Laboratory Experiments :- (Expandable)

1. To study the starting and breaking methods of a three-phase induction motor drives.
2. To study the VSI fed three-phase induction motor using PWM technique.
3. To control the speed of a three phase slip ring induction motor using rotor resistance control.
4. To study the frequency controlled synchronous motor drive.
5. To study the control & characteristics of switched reluctance motor.

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Programme: **Diploma in Engineering** **Semester – VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (35)	Internal (15)	Total (50)
DEE1604	Power Systems -II	3	1	1	External (70)	Internal (30)	Min: 40 (D Grade)	Min: 14 (D Grade)	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: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment / Quiz/Attendance Max. Marks: 05

Pre-Requisite	Knowledge of power plant and their services.
Course Outcome	1. Become Familiar with the curricular structure of Transmission System.
	2. Awareness of General Structure of Power Distribution System.
	3. Acquire knowledge about various types of Conductors, Line Parameter and its Performances.

Unit	Contents (Theory)	Marks weightage
I	**Introduction**: Electrical energy demand, Electrical energy growth in India, Electrical energy sources, Present status of electrical demand in Madhya Pradesh. **Per Unit System** – Advantage, Conversion of Impedance & Change of base for Alternators & Transformers (DIFFERENT 3 PHASE CONNECTIONS).	**14**
II	**Cables**: Classification, Construction and characteristic of different types. Insulation resistance and capacitance, grading (capacitance and inter sheath), laying, jointing. Phenomenon of dielectric losses, dielectric stress and sheath loss in cables.	**14**
III	**Transmission & Distribution Systems**: Various systems of transmission & their comparison. Primary and secondary distribution systems, concentrated & uniformly distributed loads on distributors fed at one and both ends, ring distribution, sub mains and tapered mains, voltage drop and power loss calculations, voltage regulators, Feeders.	**14**
IV	**Overhead Line Insulators**: Types of Insulator in Transmission Line, string efficiency. **Design Of Overhead Lines** – Sag, Tension, Spacing For EHV Lines, Corona Loss, Related IEE Rules.	**14**
V	**Overhead Transmission Lines**: Types of Conductors, Line Parameters: Calculation of inductance and capacitance of single and double circuit transmission lines, three phase lines with Stranded and bundle conductors. Series and shunt compensation.	**14**

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Programme: **Diploma in Engineering** **Semester – VI**

Text Book/References Books/ Websites

1. Nagrath IJ and Kothari DP; "Power System Engineering", Tata McGraw Hill
2. John S. Grainger and W. D. Stevenson Jr.," Power System Analysis", McGraw Hill.
3. Deshpande MV; "Electric Power System Design", TMH.
4. Central Electricity Generating Board; "Modem Power System Practice", Vol 1-8, Pergamon Oxfd
5. Wadhwa CL "Electric Power Systems"; Wiley Eastern Limited.
6. Ashfaq Hussain; "Electrical Power System

Suggested List of Laboratory Experiments :- (Expandable):-

1. To study of line parameters and sequence impedances of transmission lines.
2. To Study of Line load ability.
3 Steady state operation of transmission lines
4 Symmetrical and Unsymmetrical power system faults.
5 To study current time characteristics of fuses.
6 Distribution system design.

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Programme: **Diploma in Engineering** **Semester – VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (175)	Internal (75)	Total (250)
DEE1605	Major Project	-	-	5	External (Nil)	Internal (Nil)	Min: (Nil)	Min: 70 (D Grade)	Min: Nil	Min: 100 (D Grade)

Duration of Theory (Externals): - Nil

Theory Internal- Max Marks: -Nil	Best of Two Mid Semester Test – Max Marks: -Nil	Assignment/Quiz/Attendance Max. Marks: -Nil
Practical Internal Max Marks: 75	Lab work & Sessional – Max Marks: -70	Assignment / Quiz/Attendance Max. Marks: 05

Pre-Requisite	**Knowledge of Concern Subject.**
Course Outcome	The student will be able to-An ability to utilize technical resources:
	1. Identify, analyze & define the problem.
	2. Generate alternative solutions to the problem identified.
	3. Compare & select feasible solutions from alternatives generated.
	4. Design, develop, manufacture & operate equipment/program.
	5. Acquire higher-level technical knowledge by studying recent development in Engineering field.
	6. Compare machines/devices/apparatus for performance practices.
	7. Work effectively in a team.

Unit	Contents (Theory)	Marks Weightage
I	The student should prepare a working system or some design or understanding of a complex system that he has selected for his project work 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 if applicable. Evaluation will be based on his performance in technical work pertaining to the solution of a small size problem, project report, and presentation of work and defending it in a viva-voce.	**250**

Text Book/References Books/ Websites: Nil

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (Nil)	External (35)	Internal (15)	Total (50)
DPE1606	Development of Professional Ethics	-	-	1	External (Nil)	Internal (Nil)	Min: 40 (D Grade)	Min: 14 (D Grade	Min: Nil	Min: 20 (D Grade)

Duration of Theory (Externals): - Nil

Theory Internal- Max Marks: Nil	Best of Two Mid Semester Test – Max Marks: -Nil	Assignment/Quiz/Attendance Max. Marks: -Nil
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment / Quiz Max. Marks: 05

Pre-Requisite	**Nil**
Course Outcome	Ability to use of presentation aids, Presentation skills, Interview Technique and ethics .

Unit	Contents (Theory)	Marks Weightage
I	**Presentation Skills:-** Body Language -- Dress Like The Audience Posture, Gestures, Eye Contact And Facial Expression. Presentation Skill – Stage Fright, Voice And Language – Volume, Pitch, Inflection, Speed, Pause; Pronunciation, Articulation, Language, Practice Of Speech; Use Of Aids –OHP,LCD Projector, White Board	**50**
	Group discussion and Interview technique: – Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making **INTERVIEW TECHNIQUE** Necessity, Tips For Handling Common Questions.	
	Working in Teams:- Understand and work within the dynamics of a groups. Tips to work effectively in teams, Establish good rapport, interest with others and work effectively with them to meet common objectives, Tips to provide and accept feedback in a constructive and considerate way, Leadership in teams, handling frustrations in group.	
	Professional Ethics:- The foundations and norms of professional ethics. The need for separate code of conduct for professionals. The relation between professional and general ethics. Moral conflict and the issue of autonomy of professional ethics. Impact of Violation of Professional Ethics on Society. Remedies.	

Text Book/References Books/ Websites

1. Michael Hatton ;Presentation Skills (Canada – India Project) ;ISTE New Delhi
2. Richard Hale ,Peter;Target setting and Goal Achievement; Whilom Kogan page India
3. Chakravarty, Ajanta ;Time management ;Rupa and Company
4. Harding ham; Working in Teams;.A Orient Longman.
5. Koehn, D.; The Ground of Professional Ethics, Routledge, 1995.
6. Wuest, D.E; Professional Ethics and Social Responsibility, Rowman & Little field, 1994.

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Suggested List of Laboratory Experiments :- (Expandable):

1. Deliver a seminar for 10-12 minutes using presentation aids on the topic given by your teacher.
2. Watch/listen an informative session on social activities. **Make a report** on topic of your interest using audio/visual aids.
3. **Mini Project** on Task Management. Decide any task to be completed in a stipulated time with the help of teacher. Write a report on the group task assigned by teacher related to social and technical activities.
4. Conduct an interview of a personality and write a report on it.
5. Discuss a topic in a group and prepare minutes of discussion. **Write thorough description** of the topic discussed.
6. **Arrange an exhibition**, displaying flow-charts, posters, paper cutting, photographs etc on the topic given by your teacher.

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (35)	Internal (15)	Total (50)
DEE16011	Utilization of Electrical Power	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	Nil	Nil	Nil

Duration of Theory (Externals): 3 Hours

Theory Internal- Max Marks: 30	Best of Two Mid Semester Test – Max Marks: 15	Assignment/Quiz/Attendance- Max. Marks: 15
Practical Internal Max Marks: Nil	Lab work & Sessional – Max Marks: -Nil	Assignment / Quiz- Max. Marks: -Nil

Pre-Requisite	Knowledge of heating welding and electric power utilization.
Course Outcome	1. Maintain various electrical appliances and drioves used in industry and elsewhere.
	2. Design Electric Traction and discuss specific energy consumptions.
	3. Articulate different types of Electric Heating, welding and Illumination.

Unit	Contents (Theory)	Marks weightage
I	Electric Heating: Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating.	**14**
II	Electric Welding: Electric Arc Welding Electric Resistance welding Electronic welding control Electrolyte Process: Principles of electro deposition, Laws of electrolysis, applications of electrolysis	**14**
III	Illumination: Various Definitions : flux, solid angle, luminous intensity, illumination, luminous efficiency, depreciation factor coefficient of utilization, space to height ratio, reflection factor, laws of illumination, requirements of good lighting, Design of indoor lighting and outdoor lighting systems.	**14**
IV	Electrochemical Processes: Need of electro-deposition. Faraday's laws in electro- deposition. Simple numerical problems, Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner	**14**
V	Electric Traction: Types of electric traction, systems of track Electrification Traction mechanics-types of services, speed time curve and its simplification, average and schedule speeds, Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence.	**14**

Text Book/References Books/ Websites

1. Partab H.; "Art and Science of Electrical Energy", Dhanpat Rai & Sons.
2. Dubey G. K.; "Fundamentals of Electric Drives", Narosa Publishing House
3. Taylor E.O.; "Utilization of Electric Energy",Pitman & Sons

Suggested List of Laboratory Experiments :- Nil

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Programme: **Diploma in Engineering** **Semester – VI**

Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (35)	Internal (15)	Total (50)
DEE16012	Design of Electrical Machine	3	1	-	External (70)	Internal (30)	Nil	Nil	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: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: 15	Lab work & Sessional - Max Marks: 10	Assignment / Quiz/Attendance Max. Marks: 05

Pre-Requisite	Knowledge of Different type of electrical machine. DC Machines and Transformers, Synchronous and Induction Machines.
Course Outcome	1. Ability to understand the knowledge of different machine parameters.
	2. Students will be able to design different type of electrical machines.
	3. Awareness of industrial parameters of Electrical Machine Design.

Unit	Contents (Theory)	Marks weightage
I	**Introduction:** Major considerations in Electrical Machine Design – Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings – Thermal considerations – Heat flow – Temperature rise and Insulating Materials – Rating of machines – Standard specifications.	**14**
II	**Transformers:** Output Equations – Main Dimensions – kva output for single and three phase transformers – Window space factor – Design of core and winding – Overall dimensions – Operating characteristics – No load current – Temperature rise in Transformers – Design of Tank – Methods of cooling of Transformers.	**14**
III	**DC Machines:** Output Equations – Main Dimensions – Choice of Specific Electric and Magnetic Loading - Maganetic Circuits Calculations– Net length of Iron –Real & Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes.	**14**
IV	**Induction Motors:** Output equation of Induction motor – Main dimensions – Choice of Average flux density – Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Magnetic leakage calculations –Magnetizing current – Short circuit current - Losses and Efficiency.	**14**
V	**Synchronous Machines:** Output equations – choice of Electrical and Magnetic Loading – Design of salient pole machines – Short circuit ratio – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.	**14**

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Text Book/References Books/ Websites

1. Nagarajan V.S., Rajini.V ; "Electrical Machine Design"; Pearson.
2. Sawhney, A.K. ; "A course in Electrical Machine Design" ;Dhanpat Rai & Sons, New Delhi, 1996.
3. Rai, H.M.; "Principles of Electrical Machine Design"; Sathyaprakashan New Delhi, 4th Edition, 1995.
4. Surjeet Singh; "Electrical Design & Drawing"; S.K.Kataria & Sons New Delhi.

Suggested List of Laboratory Experiments :- (Expandable): Nil

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Subject Code	Subject Title	Credit			Theory			Practical		
		L	T	P			Total (100)	External (35)	Internal (15)	Total (50)
DEE16013	Renewable Energy Sources	3	1	-	External (70)	Internal (30)	Min: 40 (D Grade)	Min: 14 (D Grade)	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: 15	Assignment/Quiz/Attendance Max. Marks: 15
Practical Internal Max Marks: 15	Lab work & Sessional – Max Marks: 10	Assignment / Quiz Max. Marks: 05

Pre-Requisite	Knowledge of Non conventional energy sources.
Course Outcome	1. To understand the various forms of conventional energy resources.
	2. To learn the present energy scenario and the need for energy conservation.
	3. To analyze the environmental aspects of renewable energy resources.

Unit	Contents (Theory)	Marks weightage
I	**Energy Scenario**: Classification of Energy Sources, Energy resources (Conventional and nonconventional), Energy needs of India,. Energy efficiency and energy security. Energy and its environmental impacts, Distributed generation.	**14**
II	**Solar Energy**: Introduction to solar energy, Solar thermal Systems: Types of collectors, Collection systems, efficiency calculations, applications. Photo voltaic (PV) technology: Present status, solar cells, cell technologies, characteristics of PV systems, integrated PV system, its components, Peak power operation.	**14**
III	**Wind Energy**: Introduction to wind energy, wind speed and power relation, power extracted from wind, Wind power systems: system components, Introduction to hydro power and hydro power plant, Types of Turbine, Turbine rating. Choice of generators, turbine rating etc.	**14**
IV	**Energy storage and hybrid system configurations**: Energy storage, Battery – types, equivalent circuit, performance characteristics, battery design, charging and charge regulators. Battery management. Flywheel-energy relations, components, benefits over battery. Fuel Cell energy storage systems. Bio-Mass and Bio-Fuels.	**14**
V	**Grid Integration**: Stand alone systems, Concept of Micro-Grid and its components, Hybrid systems, load sharing, Hybrid system economics, Stable operation, Transient-safety, Operating limits of voltage, frequency, stability margin, energy storage, and load scheduling. Effect on power quality, harmonic distortion, voltage transients and sags, voltage flickers, dynamic reactive power support. Systems stiffness.	**14**

Text Book/References Books/ Websites

1. G.S. Sawhney; Non-conventional sources of energy; PHI.
2. D.P. Kothari; Renewable energy sources and emerging technologies; PHI.
3. C.L. Wadhwa; Electrical power systems; New Age International Publishers.

Suggested List of Laboratory Experiments :- Nil