RGPV (DIPLOMA WING) BHOPAL	OBE CURRICULUM FOR THE COURSE	FORMAT-3	Sheet No. 1/5

Branch	Electrical Engineering	Semester	VI

Course Code	602	Course Name	Utilisation of Electrical Energy & Traction

Course Outcome 1	Elaborate concept of illumination.	Teach Hrs	Marks
Learning Outcome **E0160211**	Define various illumination terminologies and describe laws of illumination. **[Cognitive Domain]**	**08**	**10**
Contents	• Electromagnetic wave spectrum. • Various terminologies: solid and plane angle, Luminous flux, Luminous intensity, Lumen, Illumination, Candle power (mean horizontal CP and mean spherical CP), Lamp efficiency, Brightness (or luminance), Specific consumption, Space height ratio, Utilization factor, Maintenance factor, Absorption factor, Reflection factor, Depreciation factor, Waste light factor, Polar curves. • Inverse square Law and Lambert's Cosine law. Numerical problems.		
Method of Assessment	External: End Semester theory examination. (Pen paper based)		
Learning Outcome **E0160212**	Describe working and applications of given lamps. **[Cognitive Domain]**	**08**	**10**
Contents	• Working, fitting and applications of following lamps with the help of circuit diagram: Incandescent lamp, Fluorescent lamp, CFL, Sodium Vapour lamp, Mercury Vapour lamp, LED lamp, Metal Halide lamp. • Electronic Ballasts. • Stroboscopic effect.		
Method of Assessment	Internal: Mid Semester – 1 theory exam. (Pen paper test)		
Learning Outcome **E0160213**	Evaluate brightness with the help of lux meter. **[Psychomotor Domain]**	**08**	**10**
Contents	• Measure lux level (Brightness) at different locations of institute and compare it with standards. • Make a chart of luminous efficacy (Lumen/watt) of different lamps.		
Method of Assessment	External: End semester practical exam. (Performance of task & viva voce)		

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Branch	Electrical Engineering	Semester	V

Course Code	602	Course Name	Utilisation of Electrical Energy & Traction

Course Outcome 2	Utilize the concept of electrical heating and welding.	Teach Hrs	Marks
Learning Outcome **E0160221**	Explain electrical heating. **[Cognitive Domain]**	**08**	**10**
Contents	• Advantages and disadvantages of electrical heating. • Various requirements of heating material. • Causes of failure of heating elements. • Methods of temperature control. • Working principle of induction heating: core type and core less type, construction and use of Ajax Wyatt furnace. • Working principle of dielectric heating and its applications. Numerical Problems.		
Method of Assessment	External: End semester theory examination. (Pen paper based)		
Learning Outcome **E0160222**	Illustrate electrical welding. **[Cognitive Domain]**	**08**	**10**
Contents	• Classification of electric welding: Resistance welding, Arc welding and Radiation welding. • Desirable qualities of a good weld. • Probable defects of weld. • Principle and application of Resistance welding, types of resistance welding: Butt welding, Seam welding, Spot welding and Projection welding. • Principle and application of Arc welding. • Principle and application of Radiation welding. • Electronic circuit for welding: Block diagram.		
Method of Assessment	External: End semester theory examination. (Pen paper based)		
Learning Outcome **E0160223**	Prepare an electric weld specimen and demonstrate induction heating. **[Psychomotor Domain]**	**08**	**10**
Contents	• To prepare a job specimen using butt joint welding. • To prepare a job specimen using seam/ spot welding. • To demonstrate induction heating.		
Method of Assessment	External: End semester practical exam. (Performance of task & viva voce)		

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Branch	Electrical Engineering	Semester	V

Course Code	602	Course Name	Utilisation of Electrical Energy & Traction

Course Outcome 3	Select various electrical drives and domestic appliances.	Teach Hrs	Marks
Learning Outcome **E0160231**	Explain the concept of an electrical drive. **[Cognitive Domain]**	**09**	**10**
Contents	• Block diagram of an electric drive system. • Merits and demerits of electric drive. • Types of electric drive: Individual, group and multi-motor drive. • Factors governing the selection of motor in an electric drive. • Motors suited for specific application: paper industry, cranes & hoist work, elevators, printing press, textile industry, rolling mills, cement plant, electric traction, refrigeration and air-conditioning, lathe & grinding, washing machine, electric vehicle, flour mill, vacuum cleaner, fan (ceiling, table and exhaust), lawn mower, toys, concrete vibrator, cooling fan of computer CPU, electric trimmer, mixer grinder/ juicer. • Load equalization: use of fly wheel. • Servomotor drive: Block diagram and application.		
Method of Assessment	External: End semester theory examination. (Pen paper based)		
Learning Outcome **E0160232**	Describe various domestic electric appliances. **[Cognitive Domain]**	**07**	**10**
Contents	• Operating principle and working using block diagram of following appliances: electric iron, electric toaster, electric water heater, fan (ceiling and table), microwave oven, washing machine, mixer/juicer/grinder, vacuum cleaner, air conditioner, flour mill, dish washer, lawn mower.		
Method of Assessment	Internal: Mid semester –2 theory exam. (Pen paper test)		
Learning Outcome **E0160233**	Demonstrate the performance of servo motor control and given domestic electric appliances. **[Psychomotor and Affective Domain]**	**08**	**10**
Contents	• To demonstrate the performance of servo motor control. • To demonstrate the performance of lawn mower/ room heater/ vacuum cleaner.		
Method of Assessment	Internal: Performance of task and viva voce.		

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Branch	Electrical Engineering	Semester	V

Course Code	602	Course Name	Utilisation of Electrical Energy & Traction

Course Outcome 4	Build the concept of electric traction.	Teach Hrs	Marks
Learning Outcome **E0160241**	Outline the general description of electric traction and track electrification. **[Cognitive Domain]**	**09**	**10**
Contents	• Electric traction: Desirable features of ideal traction system, advantages and disadvantages of electric traction. • Various systems for track electrification: D.C. traction system, 1ϕ A.C. system, 3ϕ A.C. system. • 25 kV A.C. 50 Hz system: Significance, advantages and disadvantages. • Traction mechanics: speed-time curves for train movement, simplified speed-time curves. [Derivation and Numerical]		
Method of Assessment	External: End Semester theory examination. (Pen paper based)		
Learning Outcome **E0160242**	Infer electric locomotive, traction motors and braking. **[Cognitive Domain]**	**07**	**10**
Contents	• Block diagram of A.C. electric locomotive. • Overhead equipment. (OHE) • Catenary construction: simple, modified and compound. • OHE supporting structure. • Current collection system: Pole collector, bow collector, pantograph collector. • Desirable features of traction motor. • Requirement and Types of electric braking: Rheostatic, Plugging and Regenerative.		
Method of Assessment	Internal: Quiz and Assignment.		
Learning Outcome **E0160243**	Identify the components used in traction sub-station and locomotive. **[Psychomotor Domain]**	**08**	**10**
Contents	• To visit traction sub-station/ locomotive shed and prepare a report.		
Method of Assessment	Internal: Performance of task and viva voce.		

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Branch	Electrical Engineering	Semester	V

Course Code	602	Course Name	Utilisation of Electrical Energy & Traction

Course Outcome 5	Analyze the significance of power factor improvement.	Teach Hrs	Marks
Learning Outcome **E0160251**	Explain causes and effects of low power factor. **[Cognitive Domain]**	**08**	**10**
Contents	• Significance of power factor. • Causes of low power factor. • Effects of low power factor. • Standard power factor of common electrical equipment like tube light, ceiling & exhaust fan, Induction motor, refrigerator/ freezer, washing machine, mercury vapor lamp.		
Method of Assessment	External: End semester theory examination. (Pen paper based)		
Learning Outcome **E0160252**	Identify importance and methods of power factor improvement. **[Cognitive Domain]**	**08**	**10**
Contents	• Advantages of power factor improvement. • Methods of improving power factor: by using static capacitors, by using synchronous condenser, by using phase advancer. • Advantages and disadvantages of above said methods of power factor improvement. • Incentives & penalties of power factor improvement for different consumers. • Determination of most economical power factor: constant kW consumption and constant kVA consumption. Numerical Problems.		
Method of Assessment	External: End Semester theory examination. (Pen paper based)		
Learning Outcome **E0160253**	Analyse power factor improvement using shunt capacitors. **[Psychomotor and Affective Domain]**	**08**	10
Contents	• To demonstrate the improvements in power factor by employing shunt capacitors. • To perform a case study on power factor improvement of Institute or Industry or sub-station.		
Method of Assessment	External: End semester practical exam. (Performance of task & viva voce)		

REFERENCE BOOKS:

S.N.	Name of Book, Publication, ISBN	Author	Publication/ Publisher
01.	Electrical Utilization and Traction	M. Rajalingam	Premier Publishing House, Hyderabad
02.	Utilisation of Electric Energy	E. Openshaw Taylor	University Press 1961
03.	Art and Science of Utilization of Electrical Energy	H. Partab	DhanpatRai and Sons, New Delhi 1986
04.	Utilization of Electric Power and Electric Traction	J. B. Gupta	S. K. Kataria and Sons
05.	Utilisation of Electric Power	Er. R. K. Rajput	Laxmi
06.	Modern Electric Traction,	H. Partab	DhanpatRai and Sons/ Vijay
07.	Utilisation of Electrical Energy and Traction	J. B. Gupta, Rajiv Manglik and Rohit Manglik	S. K. Kataria and Sons
08.	Utilization of Electrical Power and Electric Traction	G. C. Garg	Khanna Publishers
09.	Utilization of Electrical Power including Electric drives and Electric Traction	N. V. Suryanarayana	New Age International (P) Limited, Publishers 1996
10.	Generation Distribution and Utilization of Electrical Energy	C. L. Wadhwa	New Age International (P) Limited, Publishers 1997