Electrical Engineering

Semester VI

Teaching Scheme

Course Code	Course Name	Lecture hours	Tutorial hours	Practical hours	Credit
HS 3002	Introduction to Economics	3	0	0	4
EE 3006	Microprocessor and Microcontroller	3	0	3	5
EE 3007	Energy Management	3	0	0	4
EE 3008	Electrical Infrastructure	3	1	0	4
EE 3010	Department Elective- I	3	1	0	4
EE 3011	Department Elective- II	3	0	0	4
	Total	**18**	**2**	**3**	**25**

Department Elective- I & II

Course Code	Course Name
EE 3009	Communication Systems
EE 3010	Design of Electrical Machines

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I	Course Code	**HS 3002**			
II	Course Title	**Introduction to Economics**			
III	Credit Structure	L	P	T	C
		3	0	0	4
IV	Prerequisite(If any for the student)	Intermediate in any discipline with analytic bend of mind is required to take up this paper. 12th standard mathematical knowledge will also be helpful for the successful completion of this paper.			
V	Course Coordinators	Dr.Pravin Jadhav			
VI	Course Content	The purpose of Introduction to Economic course is to introduce the engineering student to the discipline of economics to impart the knowledge of economics as a subject and its importance while business in the field of engineering. Now a-days, the business decisions are made scientifically on the basis of all available information. So understanding and interpreting basic economic concepts/variables for e.g. demand and supply functions, forecasting demand, productions, costs, will make them aware of various operations carried in business. After imparting knowledge of these concepts they would be better equipped to understand various market structures, understanding of different pricing techniques that will be introduced in the class. These concepts will help them to understand day to day business decisions being taking by different firms (in different industries) in lieu of consumer behaviour in economic, social and to an extent in ethical manner. The second part of course examines different macroeconomic factors e.g. GDP, Inflation, Unemployment, Exchange rate and review how government policies influence macroeconomic outcome and performance of business. The last part of the course examines the time value of money and how engineers use the time value of money to make important economic decisions. In this section, we examine how interest rates and different compounding periods influence the future value of various capital investments Evaluation scheme for the course Assignments 5% Class tests/ Quizzes 10% Projects - 10% Mid semester examination 25% End semester examination 50%			

VII	Reference Books	1. Paul A Samuelson and William D Nordhaus (2013), Economics. McGraw Hill 2. Macroeconomics: Dornbusch, Fischer, and Startz (Ninth Edition), 2004. Tata McGraw-Hill 3. Macroeconomics: Olivier Blanchard (Fourth Edition), 2007. Pearson Education 4. Romer D., 1996, Advanced Macroeconomics, McGraw-Hill International

Lecture #	Prospective contents
1	**Introduction to Economics** Introduction to Economics and definition of economics, Branches of Economics, Meaning of Managerial Economics, Nature, and Scope & Objective of Managerial Economics.
2	**Demand and Supply Analysis** The demand & Supply Schedule, Demand function and Supply function, Law of Demand & Supply , Determinants of Demand & Supply, Demand and supply curve shift, Equilibrium with supply and demand curve. Effects of a shift in Supply or Demand, Interpreting Changes in Price & Quantity, Types of Elasticity of Demand & Supply, Measurement of Elasticity
3	**Theory of Production & Cost** Basic Concept of production, The Production function, Factors of Production Total, Average & Marginal product, Short & Long Run production Function, Law of Variable proportion, Law of Return to Scale, Law of diminishing Marginal product, Concept of cost, Total ,Marginal & Average Cost, Short Run & Long Run Cost, Relation Ship Between Marginal & Average cost
4	**Market Structures** Market Structure I Perfect Competition, Price & output Determination under perfect Competitive Market, Short Run & Long Run Equilibrium, Market Structure-II Monopoly, Definition of Imperfect Competition, Basic Concept of Monopoly, Short & Long run equilibrium Under Monopoly. Market Structure III Monopolistic Competition, Concept of Monopolistic Competition, Features of Monopolistic Competition, Market Structure IV Oligopoly, Concept of Oligopoly Market, Features of Oligopoly
5	**Measuring National Output and National Income** Structure of Macro Economy, Different sectors of the economy, Circular Flow of Income & Product, Leakages & Injections in the Circular Flow, Concepts relating to National Income and related Aggregates, Methods of calculation of National Income, GDP deflator, CPI and WPI and its impact on business.
6	**Unemployment and Inflation** Types and causes of unemployment, Measures to solve unemployment problem, Inflation, Meaning and types, Explanation of Inflation- demand pull inflation & cost push inflation, Effects of Inflation on distribution of income & wealth and on output & growth, Methods to control Inflation
7	**The Balance of Payments and Exchange Rates** Balance of Payments, Meaning and Components, Difference between BOP & BOT, Causes of disequilibrium in BOP, Measures to correct disequilibrium in BOP, Exchange Rate Determination, Meaning of Foreign Exchange Rate, Types of Exchange Rate- Fixed & Flexible Exchange Rate System, Purchasing Power Parity Theory
8	**Time Value of Money and Economic Equivalence** Cost- benefit analysis , Project Cash Flows, Initial Project Screening Methods: payback Screening and Discounted Cash Flow Analysis, Variations of Present-Worth Analysis.

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I	Course Code	**EE 3006**			
II	Course Title	**Microprocessor and Microcontroller**			
III	Credit Structure	L	P	T	C
		3	0	3	5
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	A block diagram view of a general purpose processor; elements of hardware and software architectures; introductory data and control paths concepts, registers and memory organization. Instruction set basics and assembly language programming: Instruction structure and addressing modes, instruction encoding, detailed study of 8085A instruction set and interfacing basics: memory interfacing, principles of I/O interfacing, polled and interrupts I/O handshaking principles. Examples of I/O devices: parallel port, serial port, keypad, display, etc. Introductory micro controllers: architectures, instruction set, programming, input-output interfacing, interrupts. **Laboratory**: Supplements the theory 8085-microprocessor kit based experiments: Software experiments demonstrate the use of the instruction set and assembly language programming. Hardware experiments for memory interfacing, parallel port, serial ports, interrupt driven I/O Simple micro controllers based experiments.			

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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 3007</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Energy Management</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Introduction: Energy mix in India, Sector wise energy consumption, demand supply gap, potential of renewable energy, energy conservation and its benefits Energy management and conservation in electrical devices and systems, Economic evaluation of energy conservation measures, Electric motors and transformers, Inverters and UPS, Voltages stabilizers, Energy audit and Instrumentation.
Energy conservation strategies in electric lighting and in domestic and industrial sectors Energy management in electric furnaces, ovens and boilers, Harmonic suppression and power factor correction Energy auditing and methodology, energy monitoring and statistical analysis of energy data Energy efficiency measures and efforts of BEE, India towards energy efficiency and energy conservation</td></tr>
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<tr><td>I</td><td>Course Code</td><td colspan="4">EE 3008</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Electrical Infrastructure</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Illumination:
Nature of light, Definitions, Laws of illumination, Different types of lamps, Tungsten lamp, discharge lamp, Sodium vapor lamp, Fluorescent lamp, Design of lighting scheme, methods of lighting, Calculations, examples., Flood lighting, Factory lighting and street lighting, Examples., Conservation approach to be considered.

Electric Traction:
Electric Traction, Principles and History, Mechanics of train movement, Adhesion, Traction motor, traction motor drives, Protection of electric locomotive and circuits, Traction sub systems, Railway signaling, traction substation, maglev

Hybrid Electric Vehicles:
Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

Electrolytic Process:
Principle, Faradays laws of electrolysis, Current efficiency, Energy efficiency etc., Rating of metals, Production of chemicals, Electro-deposition, Electroplating, Power supply for electrolytic processes.</td></tr>
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<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 3010</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Department Elective- I : Design of Electrical Machines</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>1</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Nil</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Introduction: Major Considerations in Electrical Machine Design Materials for Electrical Machine Design Choice of Specific Electrical and Magnetic loadings - Thermal considerations - Heat flow Temperature rise - Rating of machines National and International Standards.

DC Machines: Design of DC Machines-Design of Commutator and Brushes-Magnetic Circuit of A D.C. Machine-Design of field windings. Transformers: Specifications - KVA output for single and three phase transformers Window space factor Overall dimensions Operating characteristics Regulation No load current Temperature rise in Transformers Design of Tank - Methods of cooling of Transformers.

Induction Machines: Specifications Length of air gap- Rules for selecting rotor slots of squirrel cage machines Design of rotor bars & slots Design of end rings Design of wound rotor - Magnetic leakage calculations Leakage reactance of poly phase machines- Magnetizing current - Short circuit current Operating characteristics.

Synchronous Machines: Specifications choice of loadings Design of salient pole machines Short circuit ratio shape of pole face Armature design Armature parameters Estimation of air gap length Design of rotor Design of damper winding Determination of full load field mmf Design of field winding Design of turbo alternators Rotor design.</td></tr>
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<tr><td>I</td><td>Course Code</td><td colspan="4">EE 3011</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Department Elective- II : Digital Signal Processing and its Application</td></tr>
<tr><td rowspan="2">III</td><td rowspan="2">Credit Structure</td><td>L</td><td>P</td><td>T</td><td>C</td></tr>
<tr><td>3</td><td>0</td><td>0</td><td>4</td></tr>
<tr><td>IV</td><td>Prerequisite(If any for the student)</td><td colspan="4">Signals and Systems</td></tr>
<tr><td>V</td><td>Course Content</td><td colspan="4">Introduction to discrete-time signals and systems; linear time invariant (LTI) systems and properties, linear phase systems; brief review of Fourier representations; sampling and reconstruction of continuous-time signals; the z-transform, properties and applications to LTI systems; the discrete Fourier transform (DFT), properties, efficient DFT computation by FFT, effects of finite word length; linear and circular convolutions, block convolutions for long sequences; Signal analysis by DFT, spectral analysis by periodogram and autocorrelation estimates; brief review of analog filter design; IIR filters, stability, design by impulse invariance, bilinear transformations, frequency transformations of low pass IIR filters; FIR filter design by windowing method and Parks-McClellan algorithm, finite precision numerical effects; decimation and interpolation of signals, quadrature mirror filters and perfect reconstruction, subband decomposition; introduction to discrete wavelet transforms.</td></tr>
<tr><td>VI</td><td>Reference Books</td><td colspan="4">1. S. K. Mitra: Digital Signal Processing- A Computer based Approach, McGraw Hill. 2nd edition
2. A.V. Oppenheim and R. W. Schafer: Digital Signal Processing, Prentice Hall.
3. John. G. Proakis and Monolakis: Digital Signal Processing, Pearson Education
4. Ingle VK and Proakis John G : Digital Signal Processing A MATLab based Approach, Cengage Learning
5. Salivahanan and Vallavraj: Digital Signal Processing, Mc Graw Hill.
6. L.R. Rabiner and B. Gold: Theory and Application of Digital Signal Processing, Prentice Hall
7. Johnny R. Johnson: Introduction to Digital Signal Processing, PHI, New Delhi.
8. Schilling and Harris: Fundamentals of DSP using MATLAB, Cengage Learning.</td></tr>
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