RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA, BHOPAL

New Scheme Based On AICTE Flexible Curricula

Electrical & Electronics Engineering, VII-Semester

Open Elective EX- 703 (A) Hybrid &Electrical Vehicles

UNIT 1:- Introduction Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance. 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.

UNIT 2:- 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. Electric Trains Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control Of Switch Reluctance Motor drives, drive system efficiency. drive-train topologies, fuel efficiency analysis.

UNIT 3:- Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery based energy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

UNIT 4:- Energy Management Strategies Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

Text / References:

1. C. Mi, M. A. Masrur and D. W. Gao, “Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives”, John Wiley & Sons, 2011.
2. S. Onori, L. Serrao and G. Rizzoni, “Hybrid Electric Vehicles: Energy Management Strategies”, Springer, 2015.
3. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2004.
4. T. Denton, “Electric and Hybrid Vehicles”, Routledge, 2016.

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Electrical & Electronics Engineering, VII-Semester

Open Elective EX- 703 (B) Energy Audit & Management

Unit-I

Introduction to energy & power scenario of world, National Energy consumption data, environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.

Unit-II

Components of EB billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency computation, energy efficient motors; Illumination Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.

Unit-III

Thermal systems, Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories.

Unit-IV

Energy conservation in major utilities; pumps, fans, blowers, compressed air systems, Refrigeration& Air Conditioning systems, Cooling Towers, DG sets.

Unit-V

Energy Economics- discount period, payback period, internal rate of return, net present value; Life Cycle costing ESCO concept.

Text Books:

1. Witte L.C. , Schmidt P.S. and Brown D.R., Industrial Energy Management and Utilization, Hemisphere

Publ., Washington, 1988.

2. Callaghn P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford, 1981.

3. Murphy W.R. and McKay G., Energy Management, Butterworths, London, 1987.

4. Energy Manager Training Manual , Bureau of Energy Efficiency (BEE) under Ministry of Power, GOI, 2004

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Electrical & Electronics Engineering, VII-Semester

Open Elective EX- 703 (C) Digital Signal Processin

Unit 1: Discrete-time signals and systems

Discrete time signals and systems: Sequences; representation of signals on orthogonal basis; Representation ofdiscrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theoremand Nyquist rate.

Unit 2: Z-transform

z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z-transform, Properties of Z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Unit 3: Discrete Fourier Transform

Frequency Domain Analysis, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, FastFourier Transform Algorithm, Parseval's Identity, Implementation of Discrete Time Systems.

Unit 4: Design of Digital filters

Design of FIR Digital filters: Window method, Park-McClellan's method. Design of IIR Digital Filters: Butterworth,Chebyshev and Elliptic Approximations; Low-pass, Band-pass, Band stop and High-pass filters. Effect of finiteregister length in FIR filter design. Parametric and non-parametric spectral estimation. Introduction to multi-ratesignal processing.

Unit5: Applications of Digital Signal Processing

Correlation Functions and Power Spectra, Stationary Processes, Optimal filtering using ARMA Model, LinearMean-Square Estimation, Wiener Filter.

Text/Reference Books:

1. S. K. Mitra, "Digital Signal Processing: A computer based approach", McGraw Hill, 2011.

2. A.V. Oppenheim and R. W. Schafer, "Discrete Time Signal Processing", Prentice Hall, 1989.

3. J. G. Proakis and D.G. Manolakis, "Digital Signal Processing: Principles, Algorithms And Applications",Prentice Hall, 1997.

4. L. R. Rabiner and B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall, 1992.

5. J. R. Johnson, "Introduction to Digital Signal Processing", Prentice Hall, 1992.

6. D. J. DeFatta, J. G. Lucas andW. S. Hodgkiss, "Digital Signal Processing", John Wiley & Sons, 1988.