



2-Year Master of Technology (M.Tech) Curriculum and Syllabus for Electrical Engineering (EE)

First Semester

Course Structure

Sl	Subject Code	Subject	Contacts			Credits
			L	T	P	
Theory						
1	TIU-PEE-T101	Advanced Power Electronics	3	1	0	4
2	TIU-PEE-T103	Analysis of Electrical Machines	3	1	0	4
3	TIU-PEE-T105	Advanced Control Systems	3	1	0	4
4	TIU-PMA-T115	Advanced Numerical Analysis	3	0	0	3
5	TIU-PCS-T109	Artificial Intelligence	3	1	0	4
Practical						
1	TIU-PEE-L101	Advanced Power Electronics Laboratory	0	0	3	2
2	TIU-PEE-L103	Electrical Machines Lab.	0	0	2	1
3	TIU-PEE-L105	Advanced Control Systems Lab	0	0	3	2
Sessional						
1	TIU-PES-S199	Entrepreneurship Skill Development	-	-	-	3
Total						27



Detailed Syllabus

Advanced Power Electronics

LTP: 3-1-0

Credits: 4

- 1. Solid-State Devices:** Review of SCR, driving circuits and protection; Modern semiconductor devices: MOSFET, GTO, IGBT, GTO, SIT, SITH, MCT, their operating characteristics; Heat sink design.
- 2. Phase Controlled Converters:** Review of single-phase controlled converters, effect of load and source impedances, effect of freewheeling diode; Three-phase converters, fully controlled and half controlled converters, twelve-pulse converter; Multi-pulse converters using transformer connections; Dual converter.
- 3. Improved Quality Converters:** Power factor improvement techniques, PWM converter, buck and boost converters, voltage source converter, current control methods.
- 4. DC-DC Converters:** Review of voltage and current commutated choppers; Buck converter, boost converter, buck-boost converter, Cuk converter, Fly-back converter.
- 5. AC-AC Converters:** Three-phase ac regulators, operation with resistive load; Single-phase and three-phase cyclo-converters; Matrix converters, output voltage control techniques, commutation methods.
- 6. Inverters:** Review of three-phase voltage source inverters, voltage and frequency control; Harmonic reduction techniques, PWM inverters, Space Vector Modulation; Multi-level inverters, configurations: Diode clamped, flying capacitor and cascade multilevel inverters, applications; Current source inverter, commutation circuits, transient voltage suppressing techniques; DC link resonant converters, operation and control.



7. Simulation Techniques: MATLAB simulation of power electronic converters.

Suggested Books:

1. Dubey G. K., Doradla S. R., Joshi A. and Sinha R. M. K., "Thyristorised Power Controllers", New Age International Private Limited. 2008
2. Mohan N., Underland T.M. and Robbins W.P., "Power Electronics – Converters, Applications and Design", 3rd Ed., Wiley India. 2008
3. Bose B.K., "Power Electronics and Variable Frequency Drives – Technology and Applications", IEEE Press, Standard Publisher Distributors 2001
4. Lander C. W., "Power Electronics", 3rd Ed., McGraw-Hill International Book Company. 2007
5. Rashid M., "Power Electronics- Circuits, Devices and Applications", 3rd Ed., Pearson Education.

Analysis of Electrical Machines

LTP: 3-1-0

Credits: 4

1. Generalized transformations, Physical model, Different reference frame, Primitive machine, dynamic variable, Formulation of dynamic equations of a generalized machine in arbitrary reference frame.
2. Analysis of induction machines, Space vector, induction motor modeling in arbitrary reference frame and in field oriented frame, Performance analysis.
3. Analysis of synchronous machine, Modeling, Operational impedances, Time constants, torque expression, Asynchronous damping.
4. Steady state and transient performance, Phasor diagram and power angle characteristics.
5. Symmetrical and asymmetrical short circuit analysis, Measurement of reactances and time constants.



Suggested Books:

1. Concordia, Charles, "Synchronous Machines- Theory and Performance", Wiley, New York. 1989
2. Kimbark E.W., "Power System Stability: Synchronous Machines", Vol.3, Cover Publication, New York. 1976
3. Adkins B., Harley R.G., "The Generalized Theory of Alternating Current Machines", Chapman & Hall, London. 1979
4. Leonard W., "Control of Electrical Drives", 3rd Edition. Springer Press, New York. 2002
5. Murphy J.M.D., Turnbull F.G., "Power Electronics Control of AC Motors", Pergamon Press, New York.

Advanced Control Systems

LTP: 3-1-0

Credits: 4

State variable representation of LTI systems. Conversion of transfer functions to canonical state variable forms. Solution of state equations. Controllability and observability. Linear state variable feedback and observer design. Linear quadratic regulator. Kalman filter.

Representation of nonlinear system in state space. Phase plane analysis of nonlinear systems. Variable structure systems. Lyapunov's stability theorems. Feedback linearisation. Model reference adaptive control.

Sliding mode control.

ADVANCED NUMERICAL METHODS

TIU-PMA-T115

CREDIT:4

L-T-P: 3-1-0

1. Solution of Simultaneous Linear Equations - Direct Methods – Gauss Elimination, Gauss Jordan, LU Decomposition, Matrix Inversion.



2. Iterative Methods – Gauss - Jacobi, Gauss – Seidel
3. Relaxation method. Necessary and sufficient conditions for convergence. Speed of convergence. (Proofs not required) S.O.R. and S.U.R. methods. Gerschgorin's circle theorem. (Statement only).
4. Eigen value problem – Numerical largest value, Determination of eigen value by iterative methods.
5. Quadratic Approximation, Cubic Spline Interpolation.
6. Least Square Curve Fitting, nonlinear regression
7. Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta and Predictor-Corrector method.

Text Books :

1. Sukhendu Dey, Shishir Gupta, Numerical Methods, McGraw Hill Pvt. Ltd.
2. P. Thangaraj, Computer-Oriented Numerical Methods, PHI Learning Pvt. Ltd.
3. Srimanta Pal, Numerical Methods: Principles, Analyses, and Algorithms, Oxford University Press.

Subject Name: ARTIFICIAL INTELLIGENCE

Subject Code: TIU-PCS-T109 (Credit: 4)

COURSE TOPICS:

Unit-I Introduction and historical perspective, Hard and Soft AI – disciplines and applications, Theories of Intelligence, Detecting and Measuring Intelligence, Knowledge based approach, the prepare deliberate engineering trade-off, Procedural v/s Declarative knowledge, Criticism of symbolic AI, Knowledge representation, desirable properties of KR schemata, Use of predicate calculus in AI.

Unit-II Heuristic search of state space, DFS, BFS, UCS, choice of a search algorithm, Admissibility theorems, search performance metrics, Game playing, Alpha-Beta pruning, N-Queen Problem, Quiescence search, Killer Move heuristic, AI programming environments. AI oriented language and architecture – requirements and taxonomy.

Unit-III Unification and Resolution, Architecture, design and manipulation of semantic networks, Frame Systems, Property Inheritance, Procedure Attachment, Conceptual Dependency, Current research areas in



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knowledge representation, Introduction to Artificial Neural Networks, Genetic Algorithm and Natural Language Processing.

Unit-IV Expert Systems, Components, Production rules, Backwards vs Forward reasoning, Statistical reasoning, certainty factors, measure of belief and disbelief, Meta level knowledge, Introspection, Knowledge engineering case studies, Case studies.

READINGS:

1. Artificial Intelligence, Rich, Tata McGraw Hill.
2. Artificial Intelligence: A Modern approach, Norvig, PEARSON (3rd Ed)
3. Artificial Intelligence: A new synthesis, Nils J Nilsson, Morgan Kaufmann Publishers.
4. Artificial Intelligence, R.B. Mishra, PHI, India.