Electrical Engg. Department

Semester :4

Teaching Scheme for Electrical Engineering – Semester IV

Course Code	Course Title	Lecture Hours	Tutorial Hours	Practical Hours	Credit
MA 2002	Mathematics IV: Introduction to Numerical Analysis	3	1	0	4
ME 2001	Materials Science nad Engineering	3	1	2	5
EE 2004	Control Systems	3	1	2	5
EE 2005	Electrical Machines	3	1	3	5
EE 2006	Electronic devices	3	1	0	4
	Total	**15**	**5**	**7**	**23**

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Semester : 4

I	Course Code	**MA 2002**			
II	Course Title	**Mathematics IV: Introduction to Numerical Methods**			
III	Credit Structure	L	P	T	C
		3	0	1	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Introduction, Floating Point Arithmetic, Interpolation by polynomials, divided differences, error of interpolating polynomial, piecewise linear and cubic spline interpolation. Numerical differentiation, Numerical quadrature (Trapezoidal, Simpson's and Gauss methods).Numerical Linear AlgebraSolution of a system of linear equations, Gauss elimination,Gauss Seidel methods, partial pivoting, LU factorization, Cholesky's method, matrixnorms. Eigen value problem, Gershgorin's theorem, Power and inverse power methods, QR method. Numerical solution of ordinary differential equations, Euler, Multistep, Runge-Kuttamethods. BVP finite difference methods. Introduction to finite element method and 1 D problem. Numerical solution to elliptic PDE. Introduction to statistics and probability. Random variable and probability function. Expectation of random variable.			
VI	Text/References	1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An algorithmic Approach (3rd edition), McGraw Hill, 1980. 2. C. E. Froberg, Introduction to Numerical Analysis (2nd edition), Addison-Wesley, 1981. 3. E. Kreyszig, Advanced Engineering Mathematics (Latest Edition) Wiley India. 4. K. Atkinson and W. Han, Elementary Numerical Analysis (3 rd Edition), Wiley India, 2004.			

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Semester : 4

I	Course Code	**ME 2001**			
II	Course Title	**Material Science & Engineering**			
III	Credit Structure	L	P	T	C
		3	2	1	5
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Introduction, Floating Point Arithmetic, Interpolation by polynomials, divided differences, error of interpolating polynomial, piecewise linear and cubic spline interpolation. Numerical differentiation, Numerical quadrature (Trapezoidal, Simpson's and Gauss methods).Numerical Linear AlgebraSolution of a system of linear equations, Gauss elimination,Gauss Seidel methods, partial pivoting, LU factorization, Cholesky's method, matrixnorms. Eigen value problem, Gershgorin's theorem, Power and inverse power methods, QR method. Numerical solution of ordinary differential equations, Euler, Multistep, Runge-Kuttamethods. BVP finite difference methods. Introduction to finite element method and 1 D problem. Numerical solution to elliptic PDE. Introduction to statistics and probability. Random variable and probability function. Expectation of random variable.			

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Semester : 4

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 2004</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">Control Systems</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>2</td><td>1</td><td>5</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">Basic concepts: Notion of feedback; open- and closed-loop systems. Modeling and representations of control systems: Ordinary differential equations; Transfer functions; Block diagrams; Signal flow graphs; State-space representations, Performance and stability: Time-domain analysis; Second-order systems; Characteristic-equation and roots; Routh-Hurwitz criteria, Frequency domain techniques: Root-locus methods; Frequency responses; Bode-plots; Gain-margin and phase-margin; Nyquist plots; Compensator design: Proportional, PI and PID controllers; Lead-lag compensators. State-space concepts: Controllability; Observability; pole placement result; Minimal representations.</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1.Automatic Control Systems by Benjamin C.Kuo, 8th Edition, Farid Golnaraghi, John Wiley & Sons.
2. Modern Control Engineering by Katsuhiko Ogata, 4th Edition, Prentice Hall of India.
3. Control Systems Engineering by Norman Nise, 6th Edition, Wiley India Pvt. Ltd.
4. Control System: Principals and Design by M Gopal, 3rd Edition, Tata McGraw Hill
5. Linear System Theory and Design by C T Chen, Oxford, 4th Edition, Oxford University Press
6. Modern Control Systems by Richard C. Dorf, Robert H. Bishop, 12th Edition, Prentice Hall of India</td></tr>
</table>

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Semester : 4

<table>
<tr><td>I</td><td>Course Code</td><td colspan="4">EE 2005</td></tr>
<tr><td>II</td><td>Course Title</td><td colspan="4">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>3</td><td>1</td><td>5</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">Transformers working principle, single phase transformer, equivalent circuit, voltage regulation, losses and efficiency; three phase transformer; autotransformer; instrument transformers. Principles of electromechanical energy conversion forces and torques in magnetic field system, field energy and coenergy; DC machines constructional details, generating and motoring modes, classification of machines, terminal characteristics, losses and efficiency, starting and speed control of DC motors; Alternator generation of three phase emf, circuit model, terminal characteristics, voltage regulation, parallel operation of alternators and load sharing; Synchronous motor creation of travelling magnetic field, starting methods, speed control; Induction motor constructional details, working principle, circuit model, terminal characteristics, starting methods, speed control; Special machines universal motor, single phase induction motor, stepper motor, servo motor, permanent magnet motors, switched reluctance motors; Selection of motor for specific application; Engineering aspects of electric machine performance and operation.</td></tr>
<tr><td>VI</td><td>Text/References</td><td colspan="4">1. A.E. Fitzgerald, C.Kingsley, S.D.Umans, Electrical Machinery, Tata McGraw Hill. Sixth Edition 2002
2. A. E. Clayton & N N Hancock, The Performance and Design of Direct Current Machines 1st Edition, CBS Publisher
3. P S Bhimbhra, Electrical Machinery (7th Edition), Khanna Publishers
4. M. G. Say, The Performance and Design of Alternating Current Machines 3rd Edition CBS Publisher
5. D. P Kothari & I J Nagrath, ELECTRIC MACHINES, 4th Edition, McGraw Hill Education (India) Private Limited</td></tr>
</table>

Electrical Engg. Department

Semester : 4

I	Course Code	**EE 2006**			
II	Course Title	**Electronic devices**			
III	Credit Structure	L	P	T	C
		3	0	1	4
IV	Prerequisite(If any for the student)	Nil			
V	Course Content	Introduction to semiconductors; Energy bands and charge carriers in semiconductors; Introduction to semiconductor equations and carrier statistics, Poisson's and Continuity equations, Fermi-Dirac statistics and Boltzmann approximation to the Fermi-Dirac statistics; Semiconductor diodes; Zener diode; Optoelectronic devices like photodiodes, light emitting diodes and lasers; MOS capacitor; MOS Transistor; Bipolar junction transistors; High frequency and high power devices like Tunnel diode, IMPATT diode, Gunn diode, PNPN diode and the semiconductor controlled rectifier.		
VI	Text/References	1. Integrated Electronics: Analog and Digital Circuit (English) 2nd Edition, McGraw Hill Education (India) Private Limited. 2. Solid State Electronic Devices by Streetman Ben G. , Banerjee Sanjay , Prentice Hall Series. 3. Electronics Devices and Circuit Theory by Robert L. Boylestad , 10 th Edition, Pearson Publication. 4. Semiconductor Physics And Devices: Basic Principles by Donald A. Neamen 4th edition, McGraw-Hill, 2011. 5. Electronic Devices and Circuits, Discrete and Integrated by Dailey, Denton, Prentice Hall.		