

## Electronics and Communication Engineering

### Semester - II

S. No	Course Code	Course Name	L	T	P	C
1	MA 102	<u>Linear Algebra</u>	3	1	0	4
2	MA 103	<u>Differential Equations -I</u>	3	1	0	4
3	EE 204	<u>Digital Systems</u>	2	1	0	6
4	EE 214	<u>Digital Circuits Laboratory</u>	0	0	3	3
5	EE 205	<u>Network Theory</u>	2	1	0	6
6	EE 229	<u>Electronic Devices</u>	3	0	0	3
7	ME 111	<u>Engineering Graphics Lab</u>	1	0	3	5
8	ME 113	<u>Hands on Engineering Lab</u>	0	0	3	3
9	NO 105/107	NSS/NSO/NCC/NCA	0	0	2	2
		Total Credits				

1	<b>Title of the course</b> (L-T-P-C)	<b>Linear Algebra</b> <b>(3-1-0-4)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	Vectors in $\mathbb{R}^n$ , notion of linear independence and dependence, linear span of a set of vectors, vector subspaces of $\mathbb{R}^n$ , basis of a vector subspace. Systems of linear equations, matrices and Gauss elimination, row space, null space, and column space, rank of a matrix. Determinants and rank of a matrix in terms of determinants. Abstract vector spaces, linear transformations, matrix of a linear transformation, change of basis and similarity, rank-nullity theorem. Inner product spaces, Gram-Schmidt process, orthonormal bases, projections and least squares approximation. Eigenvalues and eigenvectors, characteristic polynomials, eigenvalues of special matrices (orthogonal, unitary, hermitian, symmetric, skew-symmetric, normal). Algebraic and geometric multiplicity, diagonalization by similarity transformations, spectral theorem for real symmetric matrices, application to-quadratic-forms.
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. H. Anton, Elementary linear algebra with applications (8th Edition), John Wiley (1995).</li> <li>2. G. Strang, Linear algebra and its applications (4th Edition), Thomson (2006)</li> <li>3. S. Kumaresan, Linear algebra - A Geometric approach, Prentice Hall of India (2000)</li> <li>4. E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999)</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Differential Equations -I</b> <b>(3-1-0-4)</b>
2	<b>Pre-requisite courses(s)</b>	Nil
3	<b>Course content</b>	Exact equations, integrating factors and Bernoulli equations. Orthogonal trajectories. Lipschitz condition, Picard's theorem, examples on non-uniqueness. Linear differential equations generalities. Linear dependence and Wronskians. Dimensionality of space of solutions, Abel-Liouville formula. Linear ODEs with constant coefficients, the characteristic equations. Cauchy-Euler equations. Method of undetermined coefficients. Method of variation of parameters. Laplace transforms generalities. Shifting theorems. Convolution theorem.
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999)</li> <li>2. W. E. Boyce and R. DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005)</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Digital Systems</b> <b>(2-1-0-6)</b>
2	<b>Pre-requisite courses(s)</b>	None
3	<b>Course content</b>	<ul style="list-style-type: none"> <li>• Introduction to Digital Systems</li> <li>• Number systems and Logic: Number Systems, Different Codes, Boolean logic, basic gates, truth tables</li> <li>• Introduction to Logic families: TTL, CMOS etc.</li> <li>• Boolean Algebra: Laws of Boolean Algebra, logic minimization using K maps</li> <li>• Combinational Logic Circuits: Adders, Subtractors, Multipliers, MSI components like Comparators, Decoders, Encoders, MUXs, DEMUXs</li> <li>• Sequential circuits: Latches, Flipflops, Analysis of clocked sequential circuits, Registers and Counters (Synchronous and Asynchronous), State Machines</li> <li>• Introduction to Hardware Description Languages</li> <li>• Array based logic elements: Memory, PLA, PLD, FPGA</li> </ul> <p>Special Topics: Asynchronous State machines, Testing and Verification of Digital Systems</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. J. F. Wakerly: Digital Design, Principles and Practices, 4th Edition, Pearson Education, 2005</li> <li>2. M. Moris Mano; Digital Design, 4th Edition, Pearson, 2009</li> <li>3. Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009</li> <li>4. H. Taub and D. Schilling; Digital Integrated Electronics, McGraw Hill, 1977.</li> <li>5. Charles H Roth; Digital Systems Design using VHDL, Thomson Learning, 1998.</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Digital Circuits Laboratory</b> <b>(0-0-3-3)</b>
2	<b>Pre-requisite courses(s)</b>	Digital Systems Theory (EE224)
3	<b>Course content</b>	<p>This purpose of this lab is to complement the Digital Systems Theory Course. The following is the tentative list of experiments for this lab:</p> <p>Experiments with discrete ICs</p> <ol style="list-style-type: none"> <li>1. Introduction of digital ICs</li> <li>2. Realizing Boolean expressions</li> <li>3. Adder/Subtractor</li> <li>4. Shift registers</li> <li>5. Synchronous Counters</li> <li>6. Asynchronous Counters + 7- segment display</li> <li>7. Finite State Machines (2 weeks) Experiments with CPLD</li> <li>8. Arithmetic and Logic Unit</li> <li>9. LCD, Buzzer Interfacing Pipelining</li> </ol>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. M. Moris Mano; Digital Design, 5th Edition, Pearson, 2009</li> <li>2. J.F.Wakerly: Digital Design, Principles and Practices,4th Edition,Pearson Education, 2005.</li> <li>3. Ronald J. Tocci; Digital System, Principles and Applications, 10th Edition, Pearson, 2009</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Network Theory</b> <b>(2-1-0-6)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p><b>Graphs of networks:</b> current and voltage spaces of graphs and their representations: incidence, cutset and circuit matrices; Tellegen's Theorem. Formal study of methods of analysis such as nodal, modified nodal, cutset, loop analysis for linear networks.</p> <p>Multiport representation for networks with particular emphasis on 2-ports.</p> <p>Time domain analysis of R, L, M, C, controlled sources, networks using state space methods.</p> <p>Introduction to s-domain methods.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. Jerome P. Levine, Omar Wing, Classical Circuit Theory, Springer, 2009.</li> <li>2. S. Ghosh, Network Theory: Analysis and Synthesis, Prentice Hall of India, 2005.</li> <li>3. N Balabanian and T.A. Bickart, Linear Network Theory: Analysis, Properties, Design and Synthesis, Matrix Publishers, Inc. 1981.</li> <li>4. L.O. Chua, C.A. Desoer, E.S. Kuh, Linear and Nonlinear Circuits, McGraw - Hill International Edition 1987.</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Electronic Devices</b> <b>(3-0-0-3)</b>
2	<b>Pre-requisite courses(s)</b>	EE 102
3	<b>Course content</b>	<ul style="list-style-type: none"> <li>● Introduction of Semiconductor Equations: Fermi-Dirac Distribution, Boltzmann's approximation</li> <li>● Semiconductor Diodes: Barrier formation in metal- semiconductor junctions, PN homo- and hetero- junctions; CV characteristics and dopant profiling; IV characteristics; Small signal models of diodes; Some Applications of diodes.</li> <li>● Field Effect Devices: JFET/HFET, MIS structures and MOSFET operation; JFET characteristics and small signal models; MOS capacitor CV and concept of accumulation, depletion and inversion; MOSFET characteristics and small signal models.</li> <li>● Bipolar transistors: IV characteristics and Ebers-Moll model; small signal models; Charge storage and transient response</li> </ul>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. D. A. Neamen, Semiconductor Physics and Devices, 4e Edition, McgrawHill, 13th reprint, 2016.</li> <li>2. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988.</li> <li>3. B.G. Streetman, Solid State Electronic Devices, 7<sup>th</sup> Edition, Pearson, 2016.</li> <li>4. J. Millman and A. Grabel, Microelectronics, II edition 34th reprint McGraw Hill, International, 2017.</li> <li>5. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.</li> <li>6. R.T. Howe and C.G. Sodini, Microelectronics : An integrated Approach, Prentice Hall International, 1997.</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Engineering Graphics Lab</b> <b>(1-0-3-5)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p>Engineering Graphics with mini drafter: Around half a semester and bit more with following topics to be covered.</p> <ul style="list-style-type: none"> <li>• Introduction to Engineering Graphics</li> <li>• Curves</li> <li>• Projections of Points</li> <li>• Projection of Lines</li> <li>• Projection of Planes</li> <li>• Projections on Auxiliary Planes</li> <li>• Projections of Solids</li> <li>• Sections of Solids</li> <li>• Intersections of Solids</li> </ul> <p>Engineering Graphics with 2D Drafting Software: 5 weekly computer laboratory sessions covering above using AutoCAD® as a drafting software, 5th session on Isometric Projections.</p>
4	<b>Texts/References</b>	<ol style="list-style-type: none"> <li>1. N. D. Bhatt, revised and enlarged by V. M. Panchal and P. R. Ingle, Engineering Drawing, 53rd Edition, 2014, Charotar Publishers, Anand.</li> <li>2. Warren J. Luzadder and Jon M. Duff, Fundamentals of Engineering Drawing, Prentice-Hall of India.</li> <li>3. Gopalakrishna K. R., Engineering Drawing Vol. I &amp; II Combined., Subhas Stores, 25th Edition, 2017.</li> <li>4. Narayana. K. L., and Kannaiah, P. E., Textbook on Engineering Drawing, 2nd Edition, 2013, Scitech Publications, Chennai.</li> <li>5. Venugopal K. and Prabhu Raja V., Engineering Drawing + AutoCAD, New Age International Publishers, 5th Edition, 2011.</li> </ol>

1	<b>Title of the course</b> (L-T-P-C)	<b>Hands on Engineering Lab</b> <b>(0-0-3-3)</b>
2	<b>Pre-requisite courses(s)</b>	--
3	<b>Course content</b>	<p><b>List of Experiments (Mechanical Workshop)</b></p> <ul style="list-style-type: none"> <li>● To make a Square-fit from the given mild steel pieces (Fitting)</li> <li>● To make a V-fit from the given mild steel pieces (Fitting)</li> <li>● To make a rectangular tray as per required dimensions (Sheet Metal)</li> <li>● To build a transition piece (Sheet Metal)</li> <li>● To make a Butt joint using the given two M.S pieces (Arc welding)</li> <li>● To make a lap joint using the given two M.S pieces (Arc welding)</li> <li>● To build a pipeline using fittings for given flow circuit (Plumbing)</li> </ul> <p><b>List of Experiments (Electrical Workshop)</b></p> <ul style="list-style-type: none"> <li>● To control one lamp by a one switch with provision for plug socket with switch control (Electrical wiring)</li> <li>● To do stair case wiring (i.e. control of one lamp by two switches fixed at two different places) (Electrical wiring)</li> <li>● Measurement of hot and cold resistance of filament</li> <li>● Improvement of Power Factor</li> <li>● Calibration of Energy meter</li> <li>● Measurement of Power using three ammeter/voltmeter method</li> </ul> <p><b>List of Experiments (Electronics)</b></p> <ul style="list-style-type: none"> <li>● Understanding breadboard, One-way traffic</li> <li>● Introduction to Arduino and Buzzer</li> <li>● Using Arduino speed measurement of motor/ glowing of LED</li> <li>● Control of water level using Arduino</li> </ul> <p>Line follower using Arduino</p>
4	<b>Texts/References</b>	<p>Elements of Workshop Technology Vol. 1 (2015), S. K. Hajra Choudhary, A. K. Hajra Choudhary and Nirjhar Roy, Media Promoters and Publishers Pvt. Ltd.</p> <p>W. A. J. Chapman, Workshop Technology, Vol. 1 (2006), Vol 2 (2007), and (1995), CBS Publishers.</p>