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Semester III						
Sr No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**
1	EE 221	Introduction to Probability	3	0	0	3
2	EE 227	Data Analysis	3	0	0	3
3	EE 229	Electronic Devices	3	0	0	3
4	EE 202	Introduction to Analog Circuits	3	0	0	3
5	EE 205	Network Theory	2	1	0	6
6	EE 210	Signals and Systems	2	1	0	6
7	MA 201	Complex Analysis	3	1	0	4
8	MA 203	Differential Equations – II	3	1	0	4
9	HS 201	Economics	3	0	0	6
		Total Credits				**38**

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1	Title of the course (L-T-P-C)	**Introduction to Probability** **(3-0-0-3)**
2	**Pre-requisite courses(s)**	Basic calculus
3	**Course content**	**Introduction**: Motivation for studying the course, revision of basic math required, connection between probability and length on subsets of the real line, probability-formal definition, events and σ-algebra, independence of events, and conditional probability, sequence of events, and Borel-Cantell Lemma. **Random Variables**: Definition of random variables, and types of random variables, CDF, PDF and its properties, random vectors and independence, brief introduction to transformation of random variables, introduction to Gaussian random vectors. **Mathematical Expectations**: Importance of averages through examples, definition of expectation, moments and conditional expectation, use of MGF, PGF and characteristic functions, variance and k-th moment, MMSE estimation. **Inequalities and Notions of convergence**: Markov, Chebyshev, Chernoff and McDiarmid inequalities, convergence in probability, mean, and almost sure, law of large numbers and central limit theorem. **A short introduction to Random Process:** Example and formal definition, stationarity, autocorrelation, and cross correlation function, definition of ergodicity.
4	**Texts/References**	1. **Robert B. Ash**, ``Basic Probability Theory,'' Reprint of the John Wiley & Sons, Inc., New York, 1970 edition. 2. **Sheldon Ross**, ``A first course in probability,'' Pearson Education India, 2002. 3. **Bruce Hayek**, ``An Exploration of Random Processes for Engineers,'' Lecture notes, 2012. 4. D. P. Bertsekas and J. Tsitisklis, "Introduction to Probability" MIT Lecture notes, 2000 5. (*link*:https://www.vfu.bg/en/e-Learning/Math-Bertsekas_Tsitsiklis_Introduction_to_probability.pdf)

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1	Title of the course (L-T-P-C)	**Data Analysis** **(3-0-0-3)**
2	Pre-requisite courses(s)	Introduction to Probability
3	Course content	The role of statistics. Graphical and numerical methods for describing and summarizing data. Sampling variability and sampling distributions, Estimation using a single sample, Hypothesis testing using a single sample, Comparing two populations or treatments, Simple linear regression and correlation, and Case studies.
4	Texts/References	Sheldon M. Ross, "Introduction to Probability and Statistics for Engineers and Scientists," Elsevier, New Delhi, 3rd edition (Indian), 1987. Papoulis and Pillai, "Probability, Random Variables and Stochastic processes," 4th Edition, Tata McGraw Hill, 1991. William Feller , "An Introduction to Probability Theory and Its Applications," Vol. 1, 3rd edition, John Wiley International, 1968.

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1	Title of the course (L-T-P-C)	**Electronic Devices** **(3-0-0-3)**
2	Pre-requisite courses(s)	EE 102
3	Course content	- Introduction of Semiconductor Equations: Fermi- Dirac Distribution, Boltzmann's approximation - 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. - 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. - Bipolar transistors: IV characteristics and Elers-Moll model; small signal models; Charge storage and transient response
4	Texts/References	1. D. A. Neamen, Semiconductor Physics and Devices, 4e Edition, McgrawHill, 13th reprint, 2016. 2. E.S. Yang, Microelectronic Devices, McGraw Hill, Singapore, 1988. 3. B.G. Streetman, Solid State Electronic Devices, 7th Edition, Pearson, 2016. 4. J. Millman and A. Grabel, Microelectronics, II edition 34th reprint McGraw Hill, International, 2017. 5. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991. 6. R.T. Howe and C.G. Sodini, Microelectronics: An integrated Approach, Prentice Hall International, 1997.

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1	Title of the course (L-T-P-C)	**Introduction to Analog Circuits** **(3-0-0-3)**
2	Pre-requisite courses(s)	Network theory, Electronic Devices
3	Course content	**Part 1: Linear circuits** • Introduction to feedback control – Integral control and proportional control • Linear circuits using Op-amps (amplifiers, arithmetic circuits, filters, and oscillators) **Part 2: Need for non-linearity for amplification** Single stage amplifiers, frequency response, Current mirror circuits, Differential amplifier.
4	Texts/References	1. J.V.Wait, L.P.Huelsman and GA Korn, Introduction to Operational Amplifier theory and applications, 2nd edition, McGraw Hill, New York, 1992. 2. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988. 3. Ramakant Gayakwad, Op-amps and Linear Integrated Circuit, 4th edition, Pearson, 2000. 4. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989. 5. Behzad Razavi, "Fundamentals of Microelectronics," John Wiley, 2013.

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1	Title of the course (L-T-P-C)	**Network Theory** **(2-1-0-6)**
2	Pre-requisite courses(s)	--
3	Course content	**Graphs of networks:** 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. Multiport representation for networks w i t h particular emphasis on 2-ports. Time domain analysis of R, L, M, C, controlled sources, networks using state space methods. Introduction to s-domain methods.
4	Texts/References	1. Jerome P. Levine, Omar Wing, Classical Circuit Theory, Springer, 2009. 2. S. Ghosh, Network Theory: Analysis and Synthesis, Prentice Hall of India, 2005. 3. N Balabanian and T.A. Bickart, Linear Network Theory: Analysis, Properties, Design and Synthesis, Matrix Publishers, Inc. 1981. 4. L.O. Chua, C.A. Desoer, E.S. Kuh, Linear and Nonlinear Circuits, McGraw - Hill International Edition 1987.

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1	Title of the course (L-T-P-C)	**Signals and Systems** **(2-1-0-6)**
2	Pre-requisite courses(s)	--
3	Course content	• Continuous-time and Discrete-time signal (and system) classification and properties. • Impulse response, LTI/LSI system and properties; Continuous-time and Discrete-time convolution. • Linear constant coefficient differential (and difference) equations. • Continuous–time Fourier series and Continuous–time Fourier Transform. Their properties. • Discrete–time Fourier series and Discrete – time Fourier Transform. Their properties. • Sampling and Aliasing in time and frequency. Discrete Fourier Transform. • Laplace Transform and its Properties. Z-Transform and its Properties.
4	Texts/References	1. Signals and Systems, Authors: Alan V. Oppenheim, Alan S. Willsky, Edition: 2, illustrated, Publisher: Pearson, 2013. 2. Signal Processing and Linear Systems, Author: Bhagawandas P. Lathi, Edition: 2, illustrated, Publisher: Oxford University Press, 2009. 3. Signals and Systems, Authors: Simon S. Haykin, Barry Van Veen, Edition: 2, illustrated, Publisher: Wiley, 2003.

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1	Title of the course (L-T-P-C)	**Complex Analysis** **(3-1-0-4)**
2	Pre-requisite courses(s)	Exposure to Calculus (MA 101)
3	Course content	Definition and properties of analytic functions. Cauchy- Riemann equations, harmonic functions. Power series and their properties. Elementary functions. Cauchy's theorem and its applications. Taylor series and Laurent expansions. Residues and the Cauchy residue formula. Evaluation of improper integrals. Conformal mappings. Inversion of Laplace transforms.
4	Texts/References	1. E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999) 2. R. V. Churchill and J. W. Brown, Complex variables, and applications (7th Edition), McGraw-Hill (2003) 3. Theodore Gamelin, Complex analysis – Springer Undergraduate texts in Mathematics (2003)

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1	**Title of the course (L-T-P-C)**	**Differential Equations – II** **(3-1-0-4)**
2	**Pre-requisite courses(s)**	Exposure to Calculus (MA 101) , Differential Equation-I (MA 104)
3	**Course content**	Review of power series and series solutions of ODE's. Legendre's equation and Legendre polynomials. Regular and irregular singular points, method of Fresenius. Bessel's equation and Bessel's functions. Strum- Liouville problems. Fourier series. D'Alembert solution to the Wave equation. Classification of linear second order PDE in two variables. Laplace, Wave, and Heat equations used. 1. separation of variables. Vibration of a circular membrane. Heat equation in the half space.
4	**Texts/References**	**1.** E. Kreyszig, Advanced engineering mathematics (10th Edition), John Wiley (1999) **2.** W. E. Boyce and R DiPrima, Elementary Differential Equations (8th Edition), John Wiley (2005)

1	Title of the course (L-T-P-C)	**Economics** **(3-0-0-6)**
2	Pre-requisite courses(s)	--
3	Course content	Basic economic problems. resource constraints and Welfare maximizations. Nature of Economics: Positive and normative economics; Micro and macroeconomics, Basic concepts in economics. The role of the State in economic activity; market and government failures; New Economic Policy in India. Theory of utility and consumer choice. Theories of demand, supply and market equilibrium. Theories of firm, production, and costs. Market structures. Perfect and imperfect competition, oligopoly, monopoly. An overview of macroeconomics, measurement, and determination of national income. Consumption, savings, and investments. Commercial and central banking. Relationship between money, output and prices. Inflation - causes, consequences and remedies. International trade, foreign exchange and balance payments, stabilization policies: Monetary, Fiscal and Exchange rate policies.
4	Texts/References	1. P. A. Samuelson & W. D. Nordhaus, Economics, McGraw Hill, NY, 1995. 2. A. Koutsoyiannis, Modern Microeconomics, Macmillan, 1975. R. Pindyck and D. L. Rubinfeld, Microeconomics, Macmillan publishing company, NY, 1989. 3. R. J. Gordon, Macroeconomics 4th edition, Little Brown and Co., Boston, 1987. 4. William F. Shughart II, The Organization of Industry, Richard D. Irwin, Illinois, 1990. 5. R.S. Pindyck and D.L. Rubinfeld. Microeconomics Th (7 Edition), Pearson Prentice Hall, New Jersey,2009. 6. R. Dornbusch, S. Fischer, and R. Startz. Macroeconomics (9th Edition), McGraw-Hill Inc. New York, 2004.