# Electrical Engineering

| Semester V | | | | | | |
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| **S. No** | **Course Code** | **Course Name** | **L** | **T** | **P** | **C** |
| **1** | MA412T | Numerical Analysis | 2 | 1 | 0 | 6 |
| **2** | EE301T | Microprocessors and Microcontrollers | 3 | 0 | 0 | 6 |
| **3** | EE302L | Microprocessors and microcontrollers lab | 0 | 0 | 3 | 3 |
| **4** | EE302C | Fundamentals of Digital Signal Processing | 2 | 0 | 2 | 6 |
| **5** | | Electives | | | | 18 |
| | **Total Credits** | | | | | **39** |

# Electrical Engineering

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| **1** | **Title of the course**<br>(L-T-P-C) | **Numerical Analysis**<br>**(2-1-0-6)** |
| **2** | **Pre-requisite courses(s)** | Calculus 1 and 2, Linear Algebra, DE 1, Ordinary Differential Equations or Instructor's consent |
| **3** | **Course content** | Linear Systems of Equation, LU decomposition, Classical iterative techniques and ill conditioned systems<br>Matrix eigenvalue problems, Power iteration, Jacobi and QR methods<br>Approximation theory, interpolation (Lagrange, Hermite and piecewise interpolation) and best approximations in inner product spaces<br>Nonlinear Equations and their iterative solution<br>Numerical Integration, interpolatory quadratures, Gauss quadrature, quadrature of periodic functions and Romberg integration<br>Finite Difference methods, convergence, stability and consistency, Lax equivalence theorem |
| **4** | **Texts/References** | 1. Rainer Kress, Numerical Analysis, 1st Edition, Springer-Verlag New York, 1998<br>2. Stoer and R. Bulirsch, Introduction to Numerical Analysis, 3rd Edition, Springer-Verlag New York, 2002<br>3. Atkinson and Weimin Han, Theoretical Numerical Analysis, A functional Analysis framework, 3rd Edition, Springer-Verlag New York, 2001<br>4. P. Deuflhard and A Hohmann, Numerical Analysis in modern scientific computing, An introduction, 2nd Edition, Springer-Verlag New York, 2003 |

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| 1 | **Title of the course (L-T-P-C)** | **Microprocessors and Microcontrollers**<br>**(3-0-0-6)** |
| 2 | **Pre-requisite courses(s)** | -- |
| 3 | **Course content** | Block diagram view of a general purpose processor; elements of hardware and software architectures; introduction to concepts of data and control paths, registers and memory organization. Instruction set basics and assembly language programming: instruction structure and addressing modes, instruction encoding, and study of 8085A instruction set, hardware architecture and interrupts. Introduction to microcontrollers. 8051 hardware and instruction set architecture, timers/counters, interrupts and serial interface (including multi-processor communication). Interfacing basics using examples of I/O devices: parallel port, serial ports, keypad, display, etc. Introductory discussion on processor performance evaluation and design using a RISC ISA (including concepts of pipelining, pipelining hazards, cache, virtual memory and parallelism). |
| 4 | **Texts/References** | • R.S. Ganorkar, Microprocessor Architecture, Programming, and Applications with the 8085, Penram International Publishing, Fifth Edition, 2011.<br>• J.H. Hennessy, and D.A. Patterson, Computer Architecture: A Quantitative Approch, Morgan Kaufmann Publishers, Fourth Edition, 2006.<br>• Kenneth J. Ayala, The 8051 Microcontroller, Architecture, Programming and Applications, Penram International Publishing, 1996. |

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| 1 | **Title of the course (L-T-P-C)** | **Microprocessors and microcontrollers lab (0-0-3-3)** |
| 2 | **Pre-requisite courses(s)** | -- |
| 3 | **Course content** | Software experiments using an 8085 Kit to learn its instruction set. Hardware experiments for the use of peripherals like 8251 (USART). Experiments using a development board to learn the instruction set and assembly programming for 8051 family of microcontrollers. Experiments to learn Port IO, control of on chip peripherals such as timers, interfacing with off chip peripherals such as LCD displays, Keyboards, Stepper motors and ADC chips. Experiments for the use of other microcontrollers such as PIC using development boards. |
| 4 | **Texts/References** | • R. S. Gaonkar, Microprocessor Architecture: Programming and Applications with the 8085/8080A, Penram International Publishing, 1996.<br>• Kenneth J. Ayala, The 8051 Microcontroller, Penram International Publishing, 1996. |

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| **1** | **Title of the course**<br>(L-T-P-C) | **Fundamentals of Digital Signal Processing**<br>**(2-0-2-6)** |
| **2** | **Pre-requisite courses(s)** | Signals and Systems (EE 210) |
| **3** | **Course content** | Lecture: Review of basic signal processing, and sampling, introductionto DSP, Z transform, DFT, FFT, Implementation of discrete time systems, and Introduction to digital filters.<br><br>Laboratory: Overview of DSP kit, generation of waveform, convolution and correlation, DFT and FFT, design of digital filters |
| **4** | **Texts/References** | 1. Proakis and Manolokis, "Digital Signal Processing," 4thedition, Prentice Hall, 2006.<br>2. S K Mitra, "Digital Signal Processing," McGraw Hill, Inc., 4thedition, 2017.<br>3. Alan V Oppenheim, "Digital Signal Processing," Prentice Hall,1975. |