M.Sc. ELECTRONICS

RULES & REGULATIONS AND SYLLABUS

(To come into effect from the academic year 2015-2016)

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M.Sc. (ELECTRONICS)-Revised Syllabus
(W.e.f 2015 – 2016 academic year onwards)
First Year

<table>
<thead>
<tr>
<th>I SEMESTER</th>
<th>(External)</th>
<th>(Internal)</th>
<th>Total</th>
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<tbody>
<tr>
<td>101 Analog and Digital Circuits</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>102 Microwaves, Radars and</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>Satellite Communications</td>
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<tr>
<td>103 Linear and Digital IC</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>Applications</td>
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<tr>
<td>104 C Programming and data</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>structures</td>
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<tr>
<td>105 Mathematical methods of</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>Signals and System Analysis.</td>
<td></td>
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<tr>
<td>Laboratoriees: Lab1.1-Computer</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>Simulation</td>
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<tr>
<td>(with P-Spice or Mat lab)</td>
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<tr>
<td>Lab 1.2 - Linear and digital</td>
<td>70</td>
<td>30</td>
<td>100</td>
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<tr>
<td>IC lab</td>
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II SEMESTER

| 201 Advanced Communication    | 70         | 30         | 100   |
| Systems                       |            |            |       |
| 202 Microcontrollers and      | 70         | 30         | 100   |
| interfacing                   |            |            |       |
| 203 Opto Electronic Devices   | 70         | 30         | 100   |
| and Applications              |            |            |       |
| 204 Control Systems           | 70         | 30         | 100   |
| 205 Test and Measuring        | 70         | 30         | 100   |
| Instruments                   |            |            |       |
| Laboratoriees: Lab2.1-        | 70         | 30         | 100   |
| Communication Lab.            |            |            |       |
| Lab 2.2 - Microcontroller lab | 70         | 30         | 100   |

Second Year

III SEMESTER

| 301 Digital Signal Processing | 70         | 30         | 100   |
| 302 Embedded Systems          | 70         | 30         | 100   |
| 303 Fiber Optic Communications| 70         | 30         | 100   |
| 304 PC Architecture and       | 70         | 30         | 100   |
| Interfacing                   |            |            |       |
| 305 Sensors and Signal        | 70         | 30         | 100   |
| Conditioners                  |            |            |       |
| Laboratoriees: Lab3.1-        | 70         | 30         | 100   |
| Instrumentation Lab.          |            |            |       |
| Lab 3.2 - PC Interfacing Lab. | 70         | 30         | 100   |

IV SEMESTER

| 401 VLSI Design (Verilog HDL)  | 70         | 30         | 100   |
| 402 Networking Technology     | 70         | 30         | 100   |
| Lab: Lab 4.1-VLSI Lab         | 70         | 30         | 100   |

Project work: - External / Internal Projects (Minimum -3 months or more.) 400 Marks
(300 Marks for Dissertation and 100 Marks for viva-voce by both external and Internals)

Total Marks: 2800 Marks
Paper –101: Analog and Digital Circuits

UNIT-1 : ELECTRONIC DEVICES
(a) Introduction to Semiconductors (b) General Semiconductor Devices - Diode, Transistor, Field Effect Transistor(FET), MOSFET, Zener Diode (c) Special Semiconductor Devices - Tunnel diode, Varactor diode, UJT, SCR, Diac, Triac, Thyristor

UNIT-2 : POWER SUPPLIES AND REGULATION (D.C & A.C)

UNIT-3 : AMPLIFIERS AND NEGATIVE FEEDBACK
Design of a two stage cascaded transistor and FET amplifier and determination of it’s frequency response with and without feedback.
Design of Complementary- Symmetry Power Amplifiers using transistors and MOS power FET’s.

UNIT-4 : OSCILLATORS
Design and analysis of a
(a) Wein-bridge and RC Phase shift oscillators.
(b) Hartley and Colpitt’s oscillator..
(c) Crystal Controlled Oscillators

UNIT-5. TTL & CMOS I.C’s.
Decade Counter, Seven segment decoder driver, CMOS crystal oscillator, Digital Phase meter, Digital Comparator.

BOOKS FOR STUDY AND REFERENCE

1. Op-Amps and Linear Integrated Circuit Technology Ramakant A, Gayakwad (EEE)
2. Electronic Devices and Circuit Theory Nishalisky and Robert Boylestad
3. Integrated Electronics –Millman and Halkias, Mc.Graw Hill company
4. Fundamentals of Electronic devices - David A.Bell
5. Integrated Circuits – Botkar K.R - Khanna Publishers, New Delhi
7. CMOS Integrated Circuits Learning by Experimenting: BPB publications.
Paper -102 Microwaves, Radars and Satellite Communications

Unit -1. Microwave Devices:
Klystrons, Magnetrons and traveling wave tubes. Velocity modulation basic principles of two cavity klystron and reflex klystron, principles of operation of magnetron. Helix traveling tubes. Wave modes. Effect, principles of operation, modes of operation. Read diode, IMPATT diode, Gunn, TRAPATT diode.

Unit -2. Microwave Diodes & Measurements:

Unit -3. Microwave communications:

Unit -4. Radar Systems:

Unit -5. Satellite communications:

TEXT BOOKS:
1. S.Y.LIAO Microwave Devices and circuits (PHI)
2. KENNEDY ‘ Electronic Communication Systems’.

REFERENCE BOOKS:
1. R.E.COLLIN ‘Foundation of Microwave Eng. (Mc.Grew Hill)
Paper- 103. Linear And Digital Ic’s And Applications.

Unit – I

Unit – II

Unit – III

Unit – IV

Unit – V

Reference Books
1. Integrated Circuits – Botkar K.R - Khanna Publishers, New Delhi (Unit I).
2. Linear Integrated circuits - D. Roy choudary Sahil Jain – (Unit II, III, IV, V)
3. Op-amps & Linear integrated Circuits – Ramakant, A. Gayakwood- PHI
Unit – 1:
Algorithm, flowchart, Program development steps, basic structures of C language, C tokens, data types, declaration of variables, assigning values, arithmetic, relational and logical operator, increment and decrement operator, control operator, bit-wise operator, expressions, evaluation, input-output operators, IF and SWTTCH statement, WHILE, DO-WHILE and FOR statements, C programs covering all the above aspects.

Unit – 2:
One dimensional and two dimensional arrays, initialization, string variables-declaration, reading, writing, sting handle function, user-defined functions, variables and storage classes, example C-Programs.

Unit – 3:
Structure definition, initializing, assigning values, passing of structures arguments, unions, declaring and initializing of pointers, pointer based expressions, arrays, functions and structures, C Program examples, file management in C, opening and Closing, I-O operations on files. File control specifications r,w,a,r+,w+,a+. The fopen(),fclose(), fgetc(), fputc(), feof(), fgets(), fputs(), fscanf(), fprintf(), fread() and fwrite() functions. rewind() function. getch();(wait for any key to be pressed)

Unit – 4:
Introduction to data structures, representing stacks and queues in C, Infix, Postfix and Prefix programs, Queue and its sequential representation, circular queue, Single linked list, Double linked list, Circular list.

Unit – 5:
Input, Output commands and programming. I/O addresses are accessed in Turbo C/C++ environment by using following Library functions
i) Inport
ii) Inportb
iii) Outport
iv) Outportb
Practical application examples like, Flashing LED, Reading Switch Position and displaying on the screen and storing in memory are to be discussed.

TEXT BOOKS:
1. “C” Programming and Data Structures by E.Balaguruswamy.

REFERENCE BOOKS:
1. C Programming & Data Structures by P.Padmanabham (B.S.P)
2. The C Programming Language - Brain W.Kernighan & Dennis M.Ritchie, PHI
PAPER –105: Mathematical Methods of Signal and System Analysis

UNIT-1. Functions of Complex Variables:

UNIT-2. Laplace Transforms:

UNIT-3. Fourier Transforms:

UNIT-4. The Z-Transforms:
Introduction to Z- Transforms - Inverse Z- Transform - properties of Z-Transform. Analysis and characterisation of LTI systems using Z-Transform. (Text Book 3 Chapter 10,10.1,10.2, 10.3, 10.5, 10.7)

UNIT-5. Random variables and processes:
introduction to probability - mutually exclusive events - Joint probability of related and independent events, statistical independence, Random variables, cumulative distribution function, probability density function. Relation between probability and probability density, Gaussian probability density - correlation between random variables - central limit theorem. Random processes - correlation function -Auto and cross correlations and their properties. 
(Text Book 4 Chapter 2, 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, 2.14, 2.19, 2.20,and Text Book 5)

TEXT BOOKS:
1. Introduction to Mathematical Physics by Charlie Harper (PHI).
2. Higher Engineering Mathematics by-B.S.Grewal (Khanna)
3. Singals and systems by A. V.Oppenheim, AS.Willsky, I.T. Young (PHI)
4. Principles of Electronic communications by Taub and PBSchilling. (TMH)
5. R.P.Singh and S.D.Spare communication system Analog and Digital

REFERENCE BOOKS:

Paper -201. Advanced Communication Systems


Unit -5. Satellite systems, Indian satellites and applications- Types of satellite systems, Characteristics of satellite systems, Satellite system infrastructures, Call setup, Global Positioning systems, INSAT satellites, Small Earth stations in India, IRS satellite program, Satellite applications- Different areas, Satellite Television, Telephone services, Data Communication Services, Satellites for Earth observations, Weather forecast, Scientific studies.

TEXT BOOKS:


REFERENCE BOOKS:

Paper 202: MICROCONTROLLERS AND INTERFACING

UNIT - 1
Introduction to Microcontrollers - Microcontrollers and Microprocessors, Embedded versus External Memory Devices, 8-bit and 16-bit Microcontrollers, CISC & RISC processors.
8051 Microcontrollers - MCS-51 architecture, Registers in MCS-51, 8051 pin description, pin connections, Parallel I/O ports and Memory organization.

UNIT – 2
8051 addressing modes, instructions and programming- 8051 addressing modes, Instruction Set, Assembly language Programming tools, Development Systems and Tools.
MCS—51 Interrupts, Timer/Counters, and Serial communications- Interrupts in MCS-51, Timers and Counters, Serial Communication.

UNIT - 3
Design with Atmel Microcontrollers- Atmel Microcontrollers, Architectural overview of Atmel 89C51 and Atmel 89C2051, Pin description of 89C51, and 89C2051, Using Flash Memory devices ATMELE 89CXX and 89C20XX, Power saving options.
Applications- Waveform generation- Sine, Square, Pulse, Ramp, Staircase, Pulse Width Measurement, Frequency Counter.

UNIT - 4
PIC Microcontrollers- Overview and features, PIC 16C6X/7X, PIC reset actions, Oscillator connection, Memory organization, PIC 16C6X/7X instructions, Addressing modes, I/O ports, Interrupts, PIC 16C61/71 timer and A/D converter.
PIC 16F8XX Flash Microcontrollers- Pin diagram of 16F8XX, STATUS Register, OPTION_REG Register, Power Control Register, PIC 16F8XX program memory, data memory, Data EEPROM and Flash Program EEPROM, Interrupts in 16F877, I/O ports and Timers.

UNIT – 5
Interfacing and Industrial Applications of Microcontrollers- Interfacing of Keyboard, 7-segment LED, LCD, ADC, and DAC, Optical Rotary shaft encoder, LVDT, Angular speed measurement, Digital thermometer, Load cell.
Automation and Control applications- Digital PID controller, Stepper motor.

Books for Study:

Reference Books:
PAPER -203. Optoelectronic Devices and Applications

UNIT -1
FUNDAMENTALS OF LASERS
The nature of light, Emission and Absorption, Spontaneous emission, Stimulated emission, Optical Cavity, Population Inversion, conditions for coherence, Time coherence, Space coherence, General Principles: Optical Cavity, Mirrors, . Semiconductor lasers

UNIT – 2
Modulation of light: - Electro optic modulation - Kerr modulators
Laser diode modulation

UNIT -3
Electro optic devices:

UNIT -4
OPTICAL FIBRES AND APPLICATIONS
Optical fibers and their types, Numerical aperture, bandwidth, transmission losses, step index and graded index fibers. Construction of fiber cables, splices, connectors and opto-couplers. Light sources and receivers for fiber optic communications.

UNIT -5.

Application of Infrared detector used for TV and other remote controllers. Optical shaft encoders. Opto-isolator applications for speed control of motors with slotted wheels. Light intensity (LUX) meter.

TEXT BOOKS:
1. William J & Hawkes.FB. Opto electronics: an introduction (PH)
2. Verdeyen JT.Laser electronics (PH)
3. Lasers and non-linear optic by B.B.Laud (WE)
4. EFY Project Books.
PAPER 204: CONTROL SYSTEMS

UNIT-1: INTRODUCTION TO CONTROL SYSTEMS
(a) Basic Components of a control system. Open loop and closed loop Control systems and their differences
(b) Classifications of control systems- Linear & non-linear, time-invariant & time-varying, continuous & sampled data and digital.
(c) Effects of feedback on overall gain, stability, sensitivity, bandwidth and noise.

UNIT-2: MATHEMATICAL MODELLING OF PHYSICAL SYSTEMS
(a) Differential Equation approach to electrical circuits and components.
(b) Transfer function approach to physical systems.
(c) Block diagram algebra.
(d) Signal flow graphs.

UNIT-3: TIME RESPONSE ANALYSIS AND STABILITY CRITERIA
(b) Basic control action. Proportional (P), proportional derivative (PD), proportional integral (PI) and proportional integral derivative (PID) controllers.

Ref: Nagrah and Gopal (Ch 2,4,5,6)
Kuo (Ch 3,4,7,8)
Ogata

UNIT-4: FREQUENCY RESPONSE ANALYSIS AND STABILITY CRITERIA

Ref: Nagrah and Gopal (Ch 8,9)
Ogata

UNIT-5: ROOT-LOCUS TECHNIQUE

Ref: Nagrah and Gopal (Ch 12)
Kuo (Ch 5)

TEXT BOOKS:
1. Control Systems Engineering --Nagrath ,LJ., and Gopal ,M(Welly-Eastern)
2. Automatic Control Systems--Benjamin C.Kuo (Prentice hall of India)
3. Modern Control Systems Engineering--Ogata (Prentice Hall of India)
PAPER 205: TEST & MEASURING INSTRUMENTATION.

UNIT-1: BASIC INSTRUMENTS
Analog Multimeter: Sensitivity, Loading, Measurement of D.C. Current, Voltage, Resistance, A.C. Voltage and currents; power and energy meters.

UNIT-2: CATHODE RAY OSCILLOSCOPES:
Introduction to special purpose CRO's - Dual trace, storage, and sampling CRO's Digital memory scopes.

UNIT-3: ELECTRONIC MULTIMETER
Working principle of Integrating type DVM Introduction to ICL 7106/7107 DVM I.C, Measurement of voltage and current (D.C& A.C) and resistance. Applications of DVM- Conversion of a DVM to measure Temperature, frequency, Capacitance.

UNIT-4: Function Generators and Wave Form Analyzers Basic waveform generator circuits - Function generator using ICL 8038, Digital Frequency Meter - Measurement of frequency Basic circuit, time base, start and step gates. Introduction to frequency counters ICs 74 HC 926 and ICM 7216.Basic circuit to measure up to 10 MHz and high frequency measurement Ratio and time interval measurement.

UNIT-6: Signal Recovery - Lock- in amplifier- Theory, block diagram, working principle and applications.

TEXT BOOKS:
1 IC data manuals and application notes.
2 Electronic Instrumentation and Measurement Techniques - William David Copper and Albert D.Helfriek
3 A Course in Electrical and Electronic Measurements and Instrumentation- A.K. Sawhney
301 - DIGITAL SIGNAL PROCESSING


2. Fourier & Z -Transforms:

3. DIGITAL FILTERS:

4. APPLICATIONS OF DSP:
   Applications of FFT in spectrum analysis and filtering. Application of DSP to speech processing & Radar signal processing.

5. INTRODUCTION TO DSP PROCESSORS:
   Difference between DSP and other Microprocessor architectures, their comparison, need for special DSP's RISC vs CISC. Overview of various DSP architectures.

TEXT BOOKS:

1. Digital Signal Processing - Oppenheim & Schafer (PHI)
2. Digital signal processing - S.K.Mitra (TMH)
3. Digital Signal Processing - D.Ramesh Babu (Scietech)

REFERENCE BOOKS

Paper -302. Embedded Systems

UNIT – I

UNIT – II

UNIT – III

UNIT – IV
Basic Design using a Real–Time operating systems– Overview, Principles, an Example, Encapsulating semaphores and Queues, Hard Real – Time Scheduling Considerations, Saving Memory Space, Saving Power.

UNIT – V


Paper 303. FIBER OPTIC COMMUNICATIONS

Unit -1 Fiber optical wave guides: Introduction, total internal reflection, planar dielectric wave guide, optical fiber wave guides - step index fibers, inter-modal dispersion, single mode fibers, graded index fibers, low dispersion fibers. (Chapter 8: Textbook 1)

Unit -2 Signal Degradation in optical fibers: Fiber materials and fabrication methods, Attenuation units, Absorption, scattering losses, Radioactive losses, core and cladding losses, signal distortion in optical wave guides, Information capacity determination, Group delay Material dispersion, Wave guide dispersion. (Chapters 2&3 of Text book 2)

Unit – 3 Power Launching and coupling:
Source to Fiber power launching - source output pattern, power - coupling calculation, power launching verses wavelength, equilibrium Numerical Aperture Lensing schemes for coupling improvement Nonimaging Microsphere. Laser diode - to - fiber coupling, Fiber-to-fiber joints, Mechanical Misalignment, Fiber-related losses, Fiber end face preparation, Fiber splicing, optical fiber connectors. (Chapter 5 Text book 2)

Unit -4. Transmission link Analysis:
Point-to-point links, System consideration, link power budget, rise time budget, Transmission distance for single mode links, wavelength division multiplexing (WDM), Passive Components - The 2x2 fiber coupler, the 2x2 wave guide coupler, star coupler, local area network.. (Text Book 1 & 2)

Unit -5. Measurements:
Attenuation Measurements - The cutback technique, Insertion loss method, optical time domain reflecto meter. Dispersion measurements-Intermodal Dispersion, time domain intermodal dispersion measurements, Frequency domain intermodal dispersion measurements. OTDR Field Applications - OTDR Trace, Attenuation Measurements, Fiber fault location. (Chapter 13, Text Book 2)

TEXT BOOKS:


Reference Books:

4. optical fiber communications- Subirkumar Sarkar, S.Chand company
Paper 304. PC Architecture and Interfacing

UNIT - I
Hardware Organization of IBM PC: Introduction, Components of IBM PC, Interfaces, Software Support.

UNIT – II
The Motherboard of IBM PC: Introduction, Motherboard Components; Microprocessor, Support Chips, Memory, Support Functions, I/O Buses, System Resources; Interrupt Requests, DMA Channels, I/O Addresses, Utilization of System Resources, ROM BIOS Services.

UNIT – III

UNIT – IV
PERIPHERALS: Introduction, Video Display System, Keyboard, Mouse, Printer.

UNIT – V

TEXT BOOK:
Microprocessors, PC Hardware and Interfacing – N. Mathivanan (Private Ltd.)

Reference Books:
2. B.Govindarajulu, IBM PC and Clones + Hardware, Trouble Shooting and Maintenance.
   George W Gorsline “Computer Organization, Hardware/Software” II edition PHI.
PAPER 305: SENSORS, SIGNAL CONDITIONERS.

Unit -1: GENERAL INTRODUCTION TO SENSORS/ TRANSDUCERS


Unit -2 : TEMPERATURE SENSORS


Unit -3: MEASUREMENT OF DISPLACEMENT, ACCELERATION, VIBRATION


Unit -4: PRESSURE TRANSDUCER


Unit -5: MEASUREMENT OF FORCE TORQUE, VELOCITY, FLOW, LEVEL

Different types of load cells- different types of torque measurement, regular twist speed measurement-revolution counter- D.C and A.C tacho generators-stroboscope- Different methods of flow measurements.

Text Books:
1. Instrumentation measurement and analysis Nakra and Chaudhry. Tata McGraw Hill.
2. Instrumentation – devices and systems Rangan, Mani and Sharma

Reference Books:
PAPER 401. VLSI DESIGN (Verilog HDL)

1. Overview of Digital Design with Verilog HDL, Hierarchical Modeling concepts, Basic concepts - Lexical conventions, Number Specifications, strings, Identifiers and keywords, Escaped Identifiers, Data Types, System tasks and compiler Directives, Modules and Ports. (CH.1 to 4)

2. Gate Level Modeling - Gate Types, Gate flow Modeling continuous Assignments, Delays, Expressions, Operators and Operands, Operator types, Examples, Behavioral Modeling - Structured Procedure, Procedural Assignments, Timing controls, conditional statement, multiway branching, loops, sequential and parallel Blocks, examples, (CH.5 to 7)

3. Tasks and functions - Difference between tasks and functions, tasks, functions, useful Modeling Techniques - Procedural continuous assignments, overriding parameters, conditional compilation and Execution, Time scales, useful system tasks. (CH 8 & 9)

4. Timing and Delays - Types of delay models, path delay modeling, timing checks, delay back, annotation, switch - level modeling, switch-modeling elements, examples, (CH-10 & 11)

5. User - Defined primitive - UDP basis, Combinational UDPs, sequential UDPs, UDP table shorthand symbols, guidelines for UDP Design, Programming. Language Interface - Uses of PLI, Linking and Invocation of PLI tasks, Internal Data representation, PLI library routines. (CH 14)

TEXT BOOKS:

Verilog HDL, A guide to digital design and synthesis - Samir Palintkar

REFERENCE BOOKS:

1. A Verilog HDL Primer - J.Bhasker.

UNIT – 1  
Fundamentals of Networking


UNIT – 2  
Packet Switched Networks:
OSI Model, Layers in the OSI MODEL, TCP/IP Protocol site. IEEE Standards- Ethernet (802.3), Token Ring (IEEE 802.5). FDDI, DQDB,Frame Relay, SMDS – Internetworking with SMDS.

UNIT – 3  
Internet and TCP/IP Networks:

UNIT – 4  
ATM and Wireless Networks:
Main features of ATM – addressing, signaling and Routing. ATM cell header structure-Adaptation layer, Management and Control. BISDN, Interworking with ATM, Wireless Channel, link level design, Channel access. Network design and wireless networks.

UNIT – 5  
Optical Networks and Switching:

TEST BOOKS:


REFERENCE:

