|| अंतरी पेटवू ज्ञानज्योत ||

'A' Grade
NAAC Re-Accredited (3rd Cycle)

NORTH MAHARASHTRA UNIVERSITY

JALGAON

SYLLABUS

FOR

M.Sc. ELECTRONICS

(SEMESTER I & II)

(For Affiliated College)

With Effective from June 2017

North Maharashtra University

M.Sc. Electronics

Objectives:

- To enhance the knowledge in multidisciplinary approach in the field of Basic Technologies in electronics, Embedded Systems and Advance Communication.
- To provide quality education through innovative teaching and learning processes
- To promote scientific and educational activities towards the advancement of the theory and practice of Electronics fields and related arts and sciences.

Syllabus Structure for M.Sc.-I (Semester I & II)

Semester	Course	Title of the course	Marks		Hours per week
			Internal	External	
I	ELE-101	Solid State Electronics	40	60	04
	ELE-102	VLSI Tools and Techniques	40	60	04
	ELE-103	Analog Circuit Analysis	40	60	04
	ELE-104	Industrial Automation and Process Control	40	60	04
	ELE-105	Practical * Lab I	40	60	04
II	ELE-201	Optoelectronic Devices	40	60	04
	ELE-202	Java Programming	40	60	04
	ELE-203	Microcontrollers and Application	40	60	04
	ELE-204	Advanced Communication System	40	60	04
	ELE-205	Practical * Lab II	40	60	04

*** indicates workload for one batch (10 students)**

Distribution of marks for theory exam would be as below:

External Examination : 60 Marks per Course
Internal Examination : 40 Marks per Course

Total : 100 marks

Distribution of marks for practical exam would be as below:

Experimental Performance : 40 marks
Record/Journal : 10 marks
Viva-voce : 10 marks
Internal : 40 marks

Total : 100 marks

ELE-101 Solid State Electronics

Unit 1: Basics of Semiconductor Electronics [12Hrs, 12M]

Energy bands and classifications, Bandgap: direct and indirect, Atomic bonds in semiconductors, Commonly used semiconductors, Effect of temperature on semiconductors, Intrinsic and Extrinsic semiconductors, Carrier Concentration Mobility and Resistivity, Carrier Generation and Recombination, compound semiconductors (III-V and IIVI group), properties of degenerate and non- degenerate semiconductors and their applications, measurement of energy gap, Measurement of effective mass of carriers by using cyclotron resonance experiment, measurement of carrier life time, Haynes-Shockley experiment.

Unit 2: Junction Devices [14Hrs, 14M]

P-n junction diode, breakdown mechanism in p-n junction diode, junction and diffusion capacitance. P-I-N diode, intrinsic layer, principle of operation, P-I-N diode, applications of P-I-N diode. Zener diode: phenomenon of reverse bias breakdown, principle of operation and applications, Schottky diode, Varactor diode: structure, principle of operation and applications, Tunnel diode: principle of operation, structure and applications, BJT: fabrication, working principles and applications, uni-junction transistor, Hetero-structure transistors and applications.

Unit 3: FET and MOSFET Devices [14Hrs, 14M]

JFET: principle of operation, working, applications, MOSFET: accumulation, depletion mode, inversion mode and C-V characteristics of MOS capacitor, constructional details I-V Characteristics, and principle of operation of depletion type and enhancement type MOSFET, equivalent circuit of MOSFET, short channel and narrow width effect, MOSFET scaling and hot electron effect, charged coupled devices (CCD) types of charged coupled device (SCCD and BCCD) application of charged coupled devices.

Unit 4: High frequency solid state Devices [8Hrs, 8M]

Frequency dependence of power gain and noise in BJT, Transit time effects in BJT, Transit time effect in FET, Structure, Principle of operation and application of high electron mobility transistor (HEMT),Principle of operation and application of ballistic transistors.

Unit 5: Microwave and other advanced devices [12Hrs, 12M]

Construction, Principle of operation and application of impact Avalanche Transit time (IMPATT) Diode, TRAPATT Diode, GUN Diode effect, the transferred electron mechanism, domain formation and various operating modes of GUN diode, TFT and Insulated Gate Bipolar transistor (IGBT), Basic concepts of Nano science and technology – Quantum wire – Quantum well – Quantum dot – Properties and technological advantages of Nano materials.

References:

1. Solid State Electronic Devices, B. G. Streetman and Sanjay Banerjee, IVth edition, Prentice-Hall of India, Pvt. Ltd., New Delhi.
2. Solid State and Electron Devices, Alton M. Ferendci, McGRAW-Hill Intrnational Editions, Electrical Engg. Series
3. Physics Of Semiconductor Devices, S. M. Sze, Willey Eastern Ltd.
4. Principles of Electronics, V. K. Mehta, R. Mehta, S. Chand.

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ELE-102 VLSI Tools and Techniques

Unit 1: Introduction to MOS Circuits [12Hrs, 12M]

Basic concept about VLSI: MOS Transistors-MOS Transistor Switches-CMOS Logic- Circuit and System Representations, **MOS Transistor Theory**: Introduction to MOS Device-Design Equations, **The Complementary CMOS Inverter:** dc and transfer characteristics, Static Load MOS Inverters, **Switch Logic:** Pass transistor-Transmission Gate-Tri State Inverter, **Bipolar Devices**.

Unit 2: Introduction to HDL [10Hrs, 10M]

Importance and evolution of hardware description languages (HDL) and VHDL Capabilities-hardware abstraction, **Using VHDL:** Basic terminology-design entity declaration-architecture body-configuration declaration-package declaration package body.

Unit 3: Basic Language Elements [10Hrs, 10M]

Identifiers and keywords-Escaped identifiers, **Data Objects:** Constants-Variables-Signal- File, **Data Types:** Scalar-Composite-Access-File, **Operators:** Logical-Relational-Shift- Adding-Multiplying-Miscellaneous

Unit 4: Modeling [12Hrs, 12M]

Behavioral Modeling: Entity Declaration-Architecture Body-Process Statement-Variable Assignment Statement-Signal Assignment Statement-Wait Statement-If Statement-Case Statement-Null Statement-Loop Statement-Exit Statement-Next Statement-Assertion Statement-More on Signal Assignment Statement-Inertial Delay Model-Transport Delay Model-Creating Signal Waveforms-Signal Drivers-Other Sequential Statements-Multiple Processes, **Dataflow Modeling**-Concurrent Signal Assignment Statement-Concurrent versus Sequential Signal Assignment-Delta Delay Revisited-Multiple Drivers-Conditional Signal Assignment Statement-Selected Signal Assignment Statement-Block Statement- Concurrent Assertion Statement **Structural Modeling:** Component Declaration-Component Instantiation-Resolving Signal Values.

Unit 5: Packages, libraries and Features [12Hrs, 12M]

Package Declaration-Package Body-Design Libraries-Design File-Order of Analysis- Implicit Visibility-Explicit Visibility, **Model Simulation:** Test Bench-Creation-Converting real and integer to time-Test bench example-Initializing a memory-variable file names, **Simulation examples**- Gates, flip-flops, multiplexer-de-multiplexer, shift register, ring counter, decade counter, synchronous counter, adder, multiplier.

Unit 6: Programmable Logic Devices [4Hrs, 4M]

FPGA, CPLD: Features and applications.

References:

1. **Digital Design**- Wakerly, PHI
2. **VHDL, (3/E**) Mcgraw Hill, Perry
3. **VHDL Primer**- J Bhasker, Pearson Education

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ELE-103 Analog Circuit Analysis

Unit 1: Bipolar junction Transistor circuits [10Hrs, 10M]

Common Emitter configuration, significance of input , output and transfer characteristic, load line concept, direct current and alternating current load line, Quiescent point, fixed bias, emitter bias ,voltage divider bias, maximum power dissipation in each bias.

Unit 2: Analysis and applications of transistor amplifier circuit [8Hrs, 8M]

Analysis of transistor amplifier, trans-conductance, small signal resistances, hybrid parameter analysis, current gain, voltage gain and power gain of an amplifier, switching characteristics and applications, circuits to improve switching time of transistor, applications, multistage amplifiers.

Unit 3: Frequency response of amplifier and applications [10Hrs, 10M]

Actual mid-band current gain of amplifier, selection criteria for coupling capacitor and bypass capacitors, low frequency response, mid-band frequency response and high frequency response of CE amplifier, effect of source resistance on degradation of gain of an amplifier, reasons for degradation of gain at low and high frequency.

Unit 4: Field effect transistor circuits and applications [8Hrs, 8M]

Output and transfer characteristics of FET, its significance, Biasing techniques; self bias, gate bias and voltage divider bias, FET as an amplifier MOSFET enhancement mode operation, depletion enhancement mode operation, output and transfer characteristics of MOSFET, its significance, biasing methods for MOSFET.

Unit 5: Feedback amplifier and oscillators [10Hrs, 10M]

Concept of feedback and types of feedback configuration and corresponding analog circuit, effect of negative feedback on gain, input impedance output impedance and bandwidth, frequency response of feedback amplifier, Single pole and double pole response, Oscillators; Classification, phase shift oscillator, analysis, Wein bridge oscillator, analysis.

Unit 6: Operational amplifier Circuits and applications [8Hrs, 8M]

Differential amplifier. Instrumentation amplifier, compensated integrator and differentiator, analog computation, Quadrature oscillator, active filters: First and second order low pass and high pass active filter, transfer function, phase shifters, voltage control oscillator, phase locked loop.

Unit 7: Tools for Analog Circuit Simulation (Actual Practice) [6Hrs, 6M]

Pspice Models for Transistors, Analysis of Analog Circuits Using PSPICE.

References:

1. Integrated Electronics - Millman Halkias
2. Microelectronics - Millman
3. Electronics circuits -Mottershed
4. Operational amplifier - Clayton
5. Electronics for Scientists –Brophy
6. SPICE – A guide to circuit simulation and analysis using PSPICE : Paul W. Tuinenga, PHI

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ELE-104: Industrial Automation and Process Control

Unit 1: Logic controllers **[8Hrs, 8M]**

Programmable logic controllers, types, Ladder programming and applications.

Unit 2: Basics of Mechatronics **[12Hrs, 12M]**

Evolution of Mechatronics, An overview of Mechatronics, Scope of Mechatronics, Transducers and Sensors (Mechanical switches, Proximity switches, Photoelectric sensors and switches, Encoders, Temperature sensors, Position / Displacement sensors, Strain gauges, Pressure sensors, Relay, Solid State Relay (SSR), Liquid level detectors), Signal conditioning theory, circuits and systems

Unit 3: Actuators and Mechanism **[10Hrs, 10M]**

Actuator types and application areas- Electromechanical actuators, Fluid power actuators and active material based actuators, Mechanism- Bearings, Belt, Chain, Pulleys, Gears, Rack and Pinion, Slider and Crank, Cams and Followers, Four-bar linkages.

Unit 4: CNC systems **[6Hrs, 6M]**

Principle of numerical control, types and features of CNC System, Constituent parts of CNC machines and assembly techniques, configuration, Interfacing, Monitoring and diagnostics.

Unit 5: Industrial drives **[12Hrs, 12M]**

Overview of servo control, Servo Hydraulic and Pneumatic Drive: Overview of Servo Hydraulic and Pneumatic Drive, Fundamentals of Hydraulic and Pneumatic Drives, Components of Fluidic Drives Systems, Basic Hydraulic Circuits, , Electric Drives: Overview of Electric Drives, Electric Motors, Power Electronics, Sensors.

Unit 6: Vacuum systems and controls **[12Hrs, 12M]**

Overview of vacuum, Classification of vacuum pumps, Types of vacuum pumps: Diaphragm pumps, Rotary (vane pumps and Oil sealed rotary displacement) pumps, Rotary plunger pumps, Roots pumps, Oil Diffusion pumps, Turbo-molecular pumps, Sorption pumps, Sputter-ion pumps, Cryopumps. Vacuum gauges: Classification of gauges, Penning, Pirani and capacitance gauges.

References:

1. Mechatronics, W. Bolton, Addition –Wesley Longman Ltd.
2. Mechatronics, Denny K. Miu, Springer- Verlag
3. Drives and Control for Industrial Automation, Tan Kok Kiong Andi Sudjana Putra, Springer.
4. Precision Motion Control Design and Implementation, Tan Kok Kiong, Lee Tong Heng, Huang Sunan, Springer.
5. Vacuum Science and Technology, V. V. Rao, T. B. Ghosh, K. L. Chopra, Allied Publishers Pvt. Ltd.
6. Electronics Instrumentation, H. S. Kalsi.

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ELE-105 Practical- Lab I

Part-A

1. Determination of Hall coefficient using Hall method.
2. Measurement of Eg of semiconductor.
3. Measurement of resistivity of sample at various temperatures by four probe method.
4. Measurement of threshold voltage in linear and saturation region of MOSFET.
5. Measurement of C-V characteristics of MOS capacitor.

Part-B

(using Altera/Xilinx tools and FPGA/CPLD kits)

6. Write VHDL code for full adder and simulate the waveforms and practically verification using circuit.
7. Write VHDL code for 8:1 Multiplexer/1:8 demux and simulate the waveforms and practically verification using circuit.
8. Write VHDL code for 3-bit binary counter and simulate the waveforms and practically verification using circuit.
9. Write VHDL code for feedback counter and simulate the waveforms and practically verification using circuit.
10. Write VHDL code for RAM and simulate the waveforms.

Part-C

11. Simulation of I-V characteristics of BJT (CE) using PSPICE and practically verification using circuit.
12. Simulation of I-V characteristics of JFET using PSPICE and practically verification using circuit.
13. Simulation of I-V characteristics of MOSFET using PSPICE and practically verification using circuit.
14. Simulation of second order active filters using PSPICE and practically verification using circuit.
15. Simulation of RC oscillators using PSPICE and practically verification using circuit.

Part-D

16. Study of PLC system.
17. Study of vacuum pumps and measurement of pumping speed.
18. Control the speed and direction of DC motor.
19. Control the speed and direction of AC motor.
20. Control the speed and direction of servo motor.

Note: *The student has to perform at least 04 practical's from each part.*

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ELE-201 Optoelectronic Devices

Unit 1: Heterostructures [8Hrs, 8M]

Hetrojunction, light – current relationship in spontaneous emission, stimulated emission and gain, optical gain in direct band gap semiconductor, the Febry-Perot cavity and threshold condition.

Unit 2: Laser diode and properties [12Hrs, 12M]

LASER as an amplifier of light, necessary condition for amplification, special properties of LASER , Study of three & four level LASERs, study of tunable and semiconductor LASER, applications of LASER, Carrier confinement and injected carrier utilization, threshold current density and differential quantum efficiency, Temperature dependence of Jth , optical anomalies and radiation confinement loss in asymmetric hetrojunction lasers.

Unit 3: Light Detectors [12Hrs, 12M]

Idea of light detectors, Natural and quantum specialized light detectors, Types of special light detector – thermal and quantum detectors, Types of quantum photo detectors- photo resistive, photovoltaicand photoelectric cell , photo multiplier tube, Important characteristics of light detectors-spectral response, efficiency material used for photodetectors.

Unit 4: Optical Display [12Hrs, 12M]

Necessity of optical displays, Different categories of optical displays-indicators, numeric, alphanumeric and special function displays, characteristics of displays view ability ,response time, power dynamic , static and field effect LCDs, Dynamic display—necessity and principle of operation, Contrast improvance ratio, Consideration of displays.

Unit 5: Optical Fiber: Theory and Applications [16Hrs, 16M]

Action of optical fiber as a waveguide, Advantages of optical fiber communications, Necessity condition for waveguide mechanism of optical fiber, Construction of a fiber, Material used for optical fibers, Construction of optical fiber cable, Role of strength materials, Types of optical fibers, step index and graded index ,comparison of waveguiding action, Numerical aperture, Time dispersion, Splicing and fiber connectors, Requirement and practical methods of splicing, Optical fiber connectors, Loss in optical fiber communication, Fiber losses, Intrinsic and extrinsic losses, comparison between losses, Modes of transmission and dispersion in optical fiber, Application of optical fiber.

References:

1. An Introduction of Optical Fiber: Cherin A.H, Mc. Graw Hill, Int. Student.
2. Optical Fiber Communication: Keiser G., Mc. Graw Hill.
3. Introduction of Optical Electronics: K.A. Jones, Harper and Row.
4. Optical Communication System: John Grower, Prentice, India.
5. The Laser: Hecth, Mc Graw Hill

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ELE-202 Java Programming

Unit 1: Introduction **[14Hrs, 14M]**

Java Evolution History, Java Features: Compiled and interpreted-Platform Independent and portable-Object Oriented-paradigm-Objects and classes, Robust and secure-Distributed- Simple small and familiar-Multi threaded and interactive-High Performance-Dynamic and extensible-Easy and development-Garbage Collected-Java support systems-Java environment-Java development kit-Java runtime environment, **Classification of Java Statement**, **Installation and Configuration of Java**, **Java virtual machine**, **Overview of Java language:** Class declaration-Main line-Output line-Simple java program, **Java Program Structure:** Documentation section-Package statement-Import statement-Interface statement-Class definitions-Java keywords.

Unit 2: Java components [**14Hrs, 14M]**

Constants, Variables and Data type: Declaration and initialization of constants & variables-Scope of variables-Data types, **Java Operators and Expression:** Arithmetic- Relational-Logical-Assignment-Increment & decrement-Conditional-Bitwise-Special, **Decision Making and Branching:** if statement-if else statement-Nesting of if else statement-else if ladder-switch statement-"? :" operator, **Decision Making and Looping:** while statement-do while statement-for statement-Jump in loop-Labeled loop, **Arrays and String:** One, two, multi dimensional array-Creating an array-Strings.

Unit 3: Object Oriented Programming, Inheritance and Interface Programming

[12Hrs, 12M]

OOPs: Defining class-Fields declaration-Method declaration-Creating object-Accessing class members-Invoking method-Member variables vs. Local variables-Passing Arguments to Methods-Returning multiple values from methods-Constructor-Method overloading- Static member-Nesting of method, Final variables and method-final class-finalizer methodabstract method and class-Dynamic method dispatch-Visibility control. **Inheritance:** Types of inheritance-Extending a class-Super class-Multilevel inheritance- final and abstract keyword-Overriding Methods, **Interfaces:** Implementing interfaces, Accessing interface variable.

Unit 4 Multithreaded Programming and Java Packages **[10Hrs, 10M]**

Multithreaded Programming: Creating threads-Extending the thread class-Stopping and blocking a thread-Lifecycle of a thread-Using thread methods-thread exceptions-thread priority-Synchronization, **Java Packages:** Java API packages-Using system package- Naming conventions-creating package-accessing package-Using package-adding a class to package-hiding classes-Static import.

Unit 5: Java in Web Technology **[10Hrs, 10M]**

Introduction to World Wide Web (WWW)-Development of WWW-Graphical user interface-Weaving the web-Introduction to Hyper Text Markup Language (HTML)- Preparing Java applets using the Abstract Windows Toolkit (AWT) framework-basic graphics features provided by Java Language.

References:

1. Computing concepts with java 2 essentials, CAY HORSTMANN 2 Edition
WILEY INDIA ISBN 81-265-0931-9.

2. Big java by CAY HORSTMANN, 2 Edition, WILEY INDIA ISBN 81-265-0879-5
3. Web Design, The complete reference, Thomas A. Powel, Tata McGraw Hill.
4. Programming with JAVA primer, E. Balagurusamy, Tata McGraw Hill.

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ELE - 203 Microcontrollers and Applications

Unit 1: Basics of Microcontrollers [8Hrs, 8M]

Architectural features of different types of architectures used in Microcontrollers, like Van Neumann, Harvard, CISC, RISC, SISC architectures. Special features like watchdog timer, digital signal processors, clock monitor, resident program, loader, monitor, General applications of Micro-controllers.

Unit 2: 16 bit MCS-96 Microcontrollers [16Hrs, 16M]

Architectural block diagram, features, Data types, addressing modes, Instruction set, Arithmetic, data transfer, logical and other types of instructions, Programming, simple programs and loop programs.

Unit 3: 32 bit Arm Microcontrollers [12Hrs, 12M]

Architectural block diagram, features, Data types, addressing modes, Instruction set and programming, simple programs and loop programs.

Unit 4: Interfacing Applications [10Hrs, 10M]

Interfacing Light Emitting Diodes, 7-segment display, keypad, stepper motor and Analog to Digital Converter to arm processor.

Unit 5: Robotics and Applications [14Hrs, 14M]

Introduction, physical configurations, Cartesian co-ordinate, polar co-ordinate, cylindrical and body and arm configuration, technical features, robotics motion, body and arm motions, wrist motions, programming languages, victors assembly language and machine control language, work cell control and interlocks, robotics sensors – vision sensors, touch sensors and voice sensors, Need of robotics in industries, material transfer, machine loading, spray painting, welding, processing operation, assembly and inspection.

References:

1. The 16 bit Intel 8096 Programming, Interfacing, applications by Ron Katz and Howard Boyet.
1. CAD/CAM-computer Aided Design and Manufacturing, M. P. Grover and E. W. Zimmers, Jr, PHI, New Delhi
2. Microcontroller: Architecture, implementation and Programming by Kenneth Hintz and Daniel Tabak, Tata McGraw Hill.
3. www.intel.com

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ELE-204 Advanced Communication Systems

Unit 1: Mobile Communication [14Hrs, 14M]

Cellular concept. Mobile radio propagation. Co-channel interference. Diversity. Multiple access. Cellular coverage planning. Wireless networking. Wireless systems and standards. Fading channels, spreading codes, power control. WAP and other protocols for internet access. Data transmission in GSM and UMTS, TCP in wireless environment, multi-user detection and its performance analysis. Blue-tooth and other wireless networks, system comparison. Spread spectrum concept. Basics of CDMA. Applications of CDMA to cellular communication systems. Second and third generation CDMA systems/ standards. Multicarrier CDMA. Synchronization and demodulation. Diversity techniques and rake receiver.

Unit 2: Telecommunication Switching and Networks [10Hrs, 10M]

Principles of circuit switching and signalling schemes, space time and space time division switching, single stage and multi stage switching network. Traffic engineering and teletraffic theory. Markov processes representing traffic, calculation of blocking probability,

Unit 3: Advanced Optical communication [14Hrs, 14M]

Analog and Digital communication link design. WDM, DWDM, optical couplers, Mach-Zehnder interferometer multiplexer, optical add/drop multiplexers, isolators, circulators, optical filters, tunable sources and tunable filters, arrayed waveguide grating, diffraction grating, optical amplifiers, optical integrated circuits, OTDR, SONET: frame format, overhead channels, payload pointer, multiplexing hierarchy. SDH: Standards,frame structure and features. Optical switching, WDM networks, Classification of optical sensors. Intensity modulated, phase modulated and spectrally modulated sensors.

Unit 4: Satellite communication [12Hrs, 12M]

Introduction: Orbital mechanics and launching, earth station and satellite sub systems, satellite link: design and analysis, multiplexing techniques, multiple accesses for satellite links: FDMA, TDMA CDMA and DAMA, propagation effects, DBS-TV, GPS. VSAT: Network architecture, access control protocol and link analysis

Unit 5: Internet Communication [10Hrs, 10M]

Modem, Modem-computer interfacing, modulation schemes, computer networks and different topologies, application layer protocols, transport layer protocols, network layer and routing, link layer and local area networks, security in computer networks.

References:

1. **An introduction to fiber optic systems (IInd edition)** By John Powers, Irwin Publications, Chicago (1993 & 1997)
2. **Understanding fiber optics(IInd edition)** By Jeff Hecht (BPB publications) 1997
3. **Principles and Applications of Optical Communications**, By Max Ming-Kang Liu, Irwin Publications, Chicago
4. **Mobile cellular Telecommunications: Analog and Digital Systems (IInd edition)** By William C.Y. Lee, McGraw-Hill, Inc. New York, 1995
5. **Optical Communication System**, John Gower, Prentice Hall, India

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ELE - 205 Practical- Lab II

Part-A

1. Characterization of Photodiode and phototransistor.
2. Measurement of NA and attenuation in optical fiber.
3. Study of Manchester coding and decoding
4. Study of pulse amplitude, width, position modulation
5. Study of time division multiplexing for analog and Digital Signals

Part-B

6. Write Java program for performing arithmetic operations.
7. Write Java script for performing string operations.
8. Write Java script for performing operations over file.
9. Write Java program for multidimensional array handing.
10. Write Java script for writing static web page.
11. Write Java script for writing web page with animation.

Part-C

12. Writing arithmetic programs using 80196.
13. Writing code conversion programs using 80196.
14. Interfacing of LED display/7-segment display to arm processor.
15. Interfacing of ADC to arm processor.
16. Interfacing of stepper motor to arm processor.
17. Study of ARM processor kit.

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Equivalent

Following table shows equivalent subject codes and title from old syllabus

M.Sc. I Electronics (Old)			M.Sc. I Electronics (New)		
SEM	**Code**	**Title**	**SEM**	**Code**	**Title**
I	ELE-101	Solid State Electronics Devices	**I**	ELE-101	Solid State Electronics
	ELE-102	Analog Circuits Analysis		ELE-102	VLSI Tools and Techniques
	ELE-103	Digital Communication		ELE-103	Analog Circuit Analysis
	ELE-104	Embedded Systems and Robotics		ELE-104	Industrial Automation and Process Control
	ELE-105	Electronics Practical – I		ELE-105	Practical * Lab I
II	ELE-201	Optoelectronics Devices	**II**	ELE-201	Optoelectronic Devices
	ELE-202	Linear Integrated Circuits Applications		ELE-202	Java Programming
	ELE-203	Industrial Automation and Process Control		ELE-203	Microcontrollers and Application
	ELE-204	PIC and RTOS		ELE-204	Advanced Communication System
	ELE-205	Electronics Practical – II		ELE-205	Practical * Lab II

(Mr. L. B. Patle)
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(Dr. K. D. Gaikwad)
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(Prof. Dr. A. L. Chaudhari)
(Convener & Principal)