**ALAGAPPA UNIVERSITY, KARAIKUDI**

**NEW SYLLABUS UNDER CBCS PATTERN (w.e.f.2017-18)**

**M.Sc. ELECTRONICS – PROGRAMME STRUCTURE**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Sem.** | **Course**  **Code** | **Name of the Course** | **Credit** | **Hrs/**  **week** | **Max. Marks** | | |
| **Int** | **Ext.** | **Total** |
| I | 7MEL1C1 | **Core – I** – Continuous Time Systems and Signal Processing | 4 | 5 | 25 | 75 | 100 |
| 7MEL1C2 | **Core – II** - Analog And Digital Communication Systems | 4 | 5 | 25 | 75 | 100 |
| 7MEL1C3 | **Core – III** – PIC Microcontroller and Embedded System | 4 | 5 | 25 | 75 | 100 |
| 7MEL1C4 | **Core – IV** – Nanoelectronics | 4 | 5 | 25 | 75 | 100 |
| 7MEL1P1 | **Core – V** – Communication and PIC Embedded LAB | 4 | 6 | **40** | **60** | 100 |
| 7MELE1A/  7MELE1B/ 7MELE1C | **Elective – I –**  **(A)** Instrumentation Control Techniques **(or)**  **(B)** Photonics and Optoelectronics **(or)** **(C)** Numerical Techniques with C Programming | 4 | 4 | 25 | 75 | 100 |
|  |  | **Total** | **24** | **30** |  |  | **600** |
| II | 7MEL2C1 | **Core – VI** – Discrete Time Systems and Signal Processing | 4 | 5 | 25 | 75 | 100 |
| 7MEL2C2 | **Core – VII** - VLSI Design | 4 | 5 | 25 | 75 | 100 |
| 7MEL2C3 | **Core –VIII** – AVR Microcontroller and Embedded System | 4 | 6 | 25 | 75 | 100 |
| 7MEL2P1 | **Core – IX** – DSP, VLSI and AVR Embedded Lab | 4 | 6 | 40 | 60 | 100 |
| 7MELE2A/  7MELE2B /  7MELE2C | **Elective –II**  **(A)**PC–Based Instrumentation**(or)**  **(B)**Wireless Communication **(or)** **(C)** Programming in C++ | 4 | 4 | 25 | 75 | 100 |
| 7MELE3A/  7MELE3B /  7MELE3C | **Elective –III –**  **(A)**Biomedical Instrumentation **(or)** **(B)** Mobile satellite Communications **(or) (C)** Introduction to MATLAB | 4 | 4 | 25 | 75 | 100 |
|  |  | **Total** | **24** | **30** |  |  | **600** |
| III | 7MEL3C1 | **Core – X** – Digital Signal Processor Programming and Applications | 4 | 5 | 25 | 75 | 100 |
| 7MEL3C2 | **Core – XI** – ARM Microcontroller and Embedded System | 4 | 5 | 25 | 75 | 100 |
| 7MEL3C3 | **Core – XII** – Digital Image Processing | 4 | 6 | 25 | 75 | 100 |
| 7MEL3P1 | **Core – XIII** – Embedded Software and Hardware Lab | 4 | 6 | 40 | 60 | 100 |
| 7MELE4A/  7MELE4B /  7MELE4C | **Elective –IV –**  **(A)** Biometric System **(or)**  (B)Fiber Optics and Laser Instruments **(or)**  (C) Programming with Java | 4 | 4 | 25 | 75 | 100 |
| 7MELE5A /  7MELE5B /  7MELE5C | **Elective–V**  **(A)**Networking Technology **(or)** **(B)** Mechatronics **(or)**  **(C)**Virtual Instrumentation Using  Lab VIEW | 4 | 4 | 25 | 75 | 100 |
|  |  | **Total** | **24** | **30** |  |  | **600** |
| IV | 7MEL4PR | **Core – XIV** – PROJECT | 18 | 30 | 50 | 150 | 200 |
|  |  | **Total** | **18** | **30** |  |  | **200** |
|  |  | **Grant Total** | **90** | **120** |  |  | **2000** |

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**M.SC. ELECTRONICS**

**I YEAR – I SEMESTER**

**COURSE CODE: 7MEL1C1**

**CORE COURSE – I – CONTINUOUS TIME SYSTEMS AND SIGNAL PROCESSING**

**Unit – I: Signals and Systems**

Signal Classification – Signal Processing Systems – Standard Continuous Time Signals - Classification of Continuous Time Signals – Basic Operations on Continuous Signals.

**Unit – II: Continuous Time Systems**

Classification of Continuous Time Systems – Linear Time Invariant Continuous Systems – Properties of Convolution – Connection of LTI Systems – Inverse System and De convolution Process – Differential Equation Representation for LTI Systems.

**Unit – III: Fourier series Analysis of Continuous Time Signals**

Frequency Domain Representation of a Sinusoidal Signal – Fourier series Representation of Continuous Time Periodic Signals – Properties of Continuous Time Fourier Series.

**Unit – IV: Fourier Transform Analysis of Continuous Time Signals**

Fourier Transform Representation of Continuous Time Non-Periodic Signals – Properties of Fourier Transform – Fourier Transform for Periodic Signals – Analysis of LTI Continuous Time System Using Fourier Transform.

**Unit – V: Laplace Transform Method for Analysis of CT Signals and Systems**

Definition and Derivation of the LT – The Existence of LT – The Region of Convergence – Properties of Laplace Transform – Laplace Transform of Periodic Signals – Inverse Laplace Transform – Solving Differential Equation – Time Convolution Property of the Laplace Transform – Connection between LT and FT.

**Text Books:**

1. V. Udayashankara- Modern Digital Signal Processing- Second Edition- Prentice Hall of India Pvt. Ltd- 2012.
2. S. Palani- Signals and Systems- First Edition- Ane Books Pvt. Ltd-2009.

**Books for Reference:**

1. A. Anand Kumar- Signals and Systems- Second Edition- Prentice Hall of India Pvt. Ltd – 2012
2. I-J. Nagrath- S.N.Sharan- Rakesh Ranjan- Signals and Systems- Second Edition- Tata McGrawHill Education Private Ltd- New Delhi – 2011.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MEL1C2**

**CORE COURSE II – ANALOG AND DIGITAL COMMUNICATION SYSTEMS**

**Unit – I: Amplitude and Angle Modulation Systems**

DSB Full Carrier - DSB Suppressed Carrier – Single Side Band Modulation - VSB modulation – Generation of AM wave – Demodulation of AM Wave – AM Transmitters and Receivers – Frequency Division Multiplexing – Narrow Band FM – Wide Band FM – Phase Modulation – FM modulators and Transmitters – FM Demodulation and Receivers – Comparison Between AM and FM – PLL FM Demodulator.

**Unit – II: Pulse width- Coding and Digital Modulation**

Pulse Amplitude Modulation – Pulse Time Modulation – PCM system – Time Division Multiplexing – Line Codes – Band width of the PCM System – Delta Modulation – Adaptive Delta Modulation – Differential PCM(DPCM) - ASK- FSK - BFSK- BPSK – QPSK – Mary PSK – DPSK - Base Band Signal Receiver – Correlator.

**Unit – III: Generation and Detection of Digital Signals**

Quantization of the Sampled Signal – Digital to Analog Conversion – Adaptive or optimal Quantizer –Encoding of Quantized Sampled Signals – Symbols- Binits- Bytes and Bauds – Channel Capacity – Encoding the Binary Pulse Train – Detection of Digital Signal – Pulse Shaping and the Raised Cosine Pulse – M-Ary Encoding – Eye diagram – Matched Filter – Companding.

**Unit – IV: Information theory- Coding and Spread Spectrum Modulation**

Information theory – Entropy- Rate of Information – Shennon’s Theorem – Continuous Channel -Coding Efficiency – Shannon-Fano Coding – Huffman Coding – Error-Control Coding – Block Code – Cyclic Code – Convolutional Code – Direct-Sequence Spread Spectrum – Frequency Hopping Spread-Spectrum – Applications of Spread Spectrum.

**Unit – V: Important Applications in Communication**

The Public Switched Telephone Network – Terminal Devices and Links in PSTN – Switching Concept in Telephone Network – Digital Space Switching – Digital Time Switching – Signaling in Telephone Network – Telephone Exchanges – Satellite Communication Principle – Satellite Communication Network – Satellite Link Design – The Ground Segment – The Space Segment.

**Text Books:**

1. R.P. Singh- S.D.Spare- Communication Systems: Analog and Digital- Third Edition- Tata McGraw Hill Education Private Limited- New Delhi- 2013.(Unit I- II and III)
2. Sudakshina Kundu- Analog and Digital Communications- Pearson – 2010 (Unit IV and V)

**Books for Reference:**

1. K. Sam Shanmugam- Digital and Communication Systems- Wiley-India-2012
2. P.Ramakrishna Rao- Analog Communication- McGraw-Hill – 2011.
3. P.Ramakrishna Rao- Digital Communication- McGraw-Hill – 2011.
4. B.P. Lathi Modern Digital and Analog Communication Systems- Oxford University Press – 2002
5. John G. Prokins- Digital Communication- Mc.Graw Hill- III international edition-1995.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MEL1C3**

**CORE COURSE - III – PIC MICROCONTROLLER AND EMBEDDED SYSTEM**

**Unit – I: PIC 18 Architecture and Assembly Language**

Architecture – WREG – File Register – Default Access Bank – Status Register – Program Counter - Program ROM Space – Introduction to PIC Assembly Programming – Arithmetic and Logical Instructions – Branch – Call – Time Delay Loop – Bank Switching and Table Processing. Embedded C for PIC.

**Unit – II: Parallel I/O Port- Serial Port and Timer Programming in Assembly and C**

I/O Port Programming in PIC 18 – I/O Bit Manipulation Programming – Serial Port Programming- Basics of Serial Communication – PIC 18 Connection to RS 232 – PIC 18 Serial Port Programming - Programming Timer 0 and 1 – Counter Programming – Programming Timers 2 and 3.

**Unit – III: Interrupt Programming**

PIC 18 Interrupts – Programming Timer Interrupts – Programming External Hardware Interrupts – Programming the Serial Communication Interrupts – PORT B Change Interrupt – Interrupt Priority in PIC 18.

**Unit – IV: CCP and ECCP Programming**

Standard and Enhanced CCP Modules – Compare Mode Programming – Capture Mode Programming – PWM Programming – ECCP Programming – PWM Motor Control with CCP – DC Motor Control with ECCP.

**Unit – V: Embedded System Design**

LED interfacing – DIP Switch Interfacing – Seven Segment Display Interfacing –ADC Programming - DAC Interfacing- Sensor Interfacing – Relays and Optoisolators - Stepper Motor Interfacing – LCD and Matrix Key Board Interfacing.

**Text Book:**

1. Muhammad Ali Mazidi- Rolind D.Mckinlay- Danny Causey- PIC Microcontroller and Embedded Systems using Assembly and C for PIC 18- Pearson -2013.

**Books for Reference:**

1. Myke Predko- PIC Microcontroller- Tata McGraw Hill Edition-2008.
2. J.B. Peatman- Design with PIC Microcontroller- Prentice Hall of India – 2009.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MEL1C4**

**CORE COURSE - IV– NANOELECTRONICS**

**Unit – I: Quantum Mechanics of Electronics**

Introduction to Nano Electronics – Top –Down Approach – Bottom – Up approach General postulates of Quantum Mechanics – Operators – Eigen values and Eigen functions – Hermitian Operators – Operators for Quantum Mechanics - Time Independent Schrodinger’s Equation – Electrons in Potential Well – Photon Interacting with Electrons in Solids – Multiple particle Systems – Spin and Angular Momentum.

**Unit – II: Materials for Nano Electronics**

Semiconductors – Crystal Lattices -Bonding in Crystals – Electron Energy Bands – An Electron in a Crystalline Potential – Direct Band Gap and Indirect Band Gap Semiconductors - Band Structure of Semiconductor Alloys – Semiconductor Hetrostructure – Graded Semiconductors – Lattice –Matched and Pseudomorphic Hetrostructure – Organic Semiconductors –Carbon Nanomaterials.

**Unit – III: Growth- Fabrication- and Measuremet Techniques for Nanostructures**

Bulk Crystal and Hetrostructure Growth – Single Crystal Growth – Epitaxial Growth – Molecular Beam Epitaxy – Clusters and Nanocrystals – Methods of Nanotube Growth – Arc-Discharge and Laser Ablation – Chemical Vapor Deposition – Directed Growth of Single Walled Nanotube – Self Assembly of Nanostructures – Biological methods – Die-pen Nanolithography – NEMS.

**Unit – IV: Electron transport in Semiconductors**

Time and Length Scales of the electrons in solids – Statistics of the electron in solids and Nanostructres - The Density of States of Electrons in Nanostructure – Electron transport in Nanostructres – Electrons in Quantum Well – Electrons in Quantum Wires – Electrons in Quantum Dots.

**Unit – V: Nanoelectronic Devices**

Resonant-tunneling Diodes – Field-effect Transistor – Single Electron Transistor – Potential-effect Transistor – LEDs and Lasers – Quantum-dot Cellular Automata – Nanoelectromechanical System Devices.

**Text Books:**

1. Valdimir V.Mitin- Viatcheslav A. Kochelap and Michal A. Stroscio- Introduction to Nanoelectronics- Cambridge University Press – 2008.
2. Georage W. Hanson- Fundamentals of Nanoelectronics- Pearson Education -2008.
3. K.Goser- P.Glosekottter and J.Dienstuhl- Nanoelectronics and Nanosystems - Springer – 2008.

**Books for Reference:**

1. T. Pradeep- Nano the Essentials- Tata McGraw Hill – 2009.
2. Massimiliano Di Ventra- Electrical Transport in Nanoscale Systems- Cambridge University Press – 2008.
3. Vishal Sahni and DebabrataGoswami-Nanocomputing- Tata McGraw Hill – 2008.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MEL1P1**

**CORE COURSE – V –** **COMMUNICATION AND PIC EMBEDDED LAB**

**(Any 14 Experiments)**

1. Study of DSB AM Modulation and Demodulation
2. Study of SSB AM Modulation and Demodulation
3. Study of FM Modulation and Demodulation
4. Study of Pulse Width Modulation and Demodulation
5. Study Encoding and Decoding
6. Study of ASK modulation and Demodulation
7. Study of FSK modulation and Demodulation
8. Study of BPSK modulation and Demodulation
9. BCD and ASCII Conversion
10. Testing PIC I/O Ports using LED and DIP switches
11. Interfacing Traffic Light Controller
12. Interfacing Seven Segment Display
13. Interfacing Relay and Buzzer
14. Interfacing LCD to PIC
15. Timer Program
16. PIC serial Interfacing
17. ADC Programming in PIC
18. Interfacing Temperature Sensor to PIC
19. Interfacing Stepper Motor to PIC
20. Interfacing N x M Key Board to PIC
21. Event Counter Programmer
22. DAC Interfacing to PIC
23. Interrupt Programming
24. Interfacing a DC Motor to PIC .

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MELE1A**

**ELECTIVE COURSE- I (A) –** **INSTRUMENTATION CONTROL TECHNIQUES**

**Unit – I: Industrial Control Systems**

Classification of Instruments - Industrial Control Classification –Elements of Open and Closed Loop Systems – Feedback Control – Interfacing Devices - Practical Feedback Applications – Dynamic Response of a Closed Loop System – Feed Forward Control - Control Modes – On-Off Control – Proportional Integral Control – Proportional Integral Derivative Control – Time Proportioning Control – Time proportioning Circuit.

**Unit – II: Industrial Detection Sensors and Interfacing**

Limit Switches – Proximity Detectors – Inductive Proximity Switches – Capacitive Proximity Switches – Hall Effect Sensor –IC Temperature Sensor – Optical Shaft Encoder Displacement Sensor - Photoelectric Sensor – Methods of Detection – Photoelectric Package Style – Operating Specifications – Ultrasonic Sensors – Sensor Interfacing.

**Unit – III: DC Motor and Variable Speed Drive**

DC Motor: Principles of Operation – Rotary motion – Practical DC Motor – Control of Field Flux – Counter electromotive Force – Armature Reaction – Motor Selection – Basic Motor Construction – Motor Classification – Coil terminal Identification – DC Servo Motor – Stepper Motor – Permanent Magnet Stepper Motor – Variable Reluctance Stepper Motor DC drive Fundamental – Variable Voltage DC drive – Motor Breaking .

**Unit – IV: AC motor and Variable Speed Drive**

Fundamental operation – Stator Construction and Operation – Types of AC Motors – Single Phase Induction Motor– AC Servo Motor – AC drive Fundamentals – AC Drive Systems – Drive Controller Internal Circuitry – Circuit operation of AC Drive – PWM Control Methods – Motor Breaking – AC Drive Selection – Motors Driven by AC Drives.

**Unit – V: Process Control- Techniques and Control Methods**

Pressure Control system - Temperature Control System– Flow Control System – Level Control System – Analytical Instrumentation – Non Destructive Testing – Open Loop Control – Closed Loop Control – Single Variable Control – Selecting a Controller – On-Off Control – Case Study – Continuous Control – Tuning the Controller.

**Text Books:**

1. Terry Bartelt- Industrial Electronics Circuits- Instruments and Control Techniques- Cengage Learning – 2006
2. B.C. Nakra and K.K.Chaudhry- Instrumentation- Measurement and Analysis- Tata McGraw Hill Second Edition – 2004

**Books for Reference:**

1. I.J. Nagrath and M.Gopal- Control Systems Engineering- New Age International Pvt. Ltd- 1995
2. Bimal K. Bose Modern Power Electronics and AC Drives- Pearson Education – 2004
3. S.N. Biswas- Industrial Electronics- Dhanpat Rai & Co-2000
4. Biswanath paul- Industrial Electronics and Control- Prentice Hall of India – 2005
5. N. Mathivanan- PC – Based Instrumentation Concept and Practice- Prentice Hall of India- 2009.

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MELE1B**

**ELECTIVE COURSE - I (B) – PHOTONICS AND OPTOELECTRONICS**

**Unit – I:** **Introduction to LASER**

Basic principle of lasers – Absorption – Spontaneous Emission - stimulated emission - Einstein’s Relation – Condition for Stimulated Emission – Condition for Light Amplification – Population Inversion – Pumping – Pumping Methods – Metastable State – The Principle Pumping Scheme - Laser rate equations for Two- Three and Four level Laser Systems.

**Unit – II: Amplification - Oscillation- Types And Control of** **LASER**

Optical Resonator – Action of Optical Resonator – Threshold Condition – Condition for Steady State Oscillation – Cavity Resonance Frequencies – Cavity Gain saturation – Cavity Gain Bandwidth – Resonator Configurations – Laser Modes – Solid State Laser – Gas Laser - Methods of Q‐Switching – Mode Locking – LIDAR – Lasik Surgery and Holography.

**Unit – III**: **LED and Semiconductor LASER**

LED‐ Basic Principle of Operation - Radiative Recombination Process - The internal quantum efficiency – External Quantum Efficiency -Double Hetrostructure- Response time of LED – ELED - SLED design – LASER Diode Principles – Threshold current – Heterojunction Lasers – Distributed Feedback Laser - Quantum Well Laser – Liquid Crystal Display ‐ Construction - Basic principle of emission - Plasma Display‐ Construction - Basic principle of emission.

**Unit – IV: Optical Detector**

Photo Conductors – Junction Photodiodes‐ General principles - quantum efficiency - silicon P‐N photodiodes- Hetrojunction photodiodes - schottkey barrier diode - P‐I‐N photodiodes- Avalanche Photo diode.

**Unit – V: Photovoltaic Systems Analysis and Design:**

P-N Junction and formation of Solar Cells – Solar Cell Characteristics and Measurement – General Photo Voltaic Systems – PV Module – PV Array – The Diode – The Power Conditioning Unit – MPPT – Battery Charger/ Discharger – Inverter for AC Loads – Mounting of Panels for an Array – Sun Tracking – Concept of MPPT – Topology of MPPT.

**Text Books:**

1. Nityanand Choudhary Richa Verma – Laser Systems and Applications - Prentice Hall of India – 2011.( Unit I &II )
2. Pallab Bhattacharya- Semiconductor Optoelectronic Devices- Second Edition- Prentice Hall of India – 2005 (Unit III and IV)
3. A.K. Mukerjee- Nivedita Thakur- Photovoltaic System Analysis and Design- Prentice Hall of India – 2011 ( Unit -V)

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**I YEAR – I SEMESTER**

**COURSE CODE: 7MELE1C**

**ELECTIVE COURSE-I (C)-NUMERICAL TECHNIQUES WITH C PROGRAMMING**

**Unit – I: C Language Preliminaries and Statements**

Keywords and Identifiers – Constants – Variables – Data Types – Input-Output Operations – Operators and Expressions – Simple-if statement – if-else – Nested if-else – else –if Ladder – Switch Statement – Goto statement – while Loop – do-while Loop – for Loop – Jumps in Loop – Nesting Loop.

**Unit – II: Functions- Recursion and Storage Classes**

Classification of Function – Function with No Arguments and No Return Value – Functions with Arguments and No Return Value – Functions with Arguments and Return Value – Function Returning Non Integer Value – Return Statement Versus exit( ) – Recursion – Storage Classes.

**Unit – III: Arrays and Strings**

Definition of an Array – One-dimensional Arrays – Multidimensional Arrays – Arrays and Functions – Initialization of Arrays of char Type – scanf( ) – printf( ) – Arithmetic and Relational operations on Characters – String Manipulations – Two-dimensional Array of char Type – Strings and Functions.

**Unit – IV: Structure- Pointer and File Handling in C**

Definition of Structure Template – Declaration of Structure Variables – Initialization of Structure Variables – Operations on Structures – Arrays and Structures – Structure with in Structure – Structure and Functions – Union – Pointer Operators – Pointer and Arrays – Pointers and Structure – Pointer and Functions – Pointers to Pointers – File Handling in C.

**Unit – V: Applications of Numerical Techniques with C**

Linear Least Square Fitting – Trapezoidal Rule – Simpson Rule – Newton Raphson Method – Gauss Elimination Method – Gauss Jordon Method – Matrix Multiplication – Runge-Kutta Method.

**Text Books:**

1. M.T. Somashekara- Programming with C- Prentice Hall of India – 2012.
2. C. Xavier- C Language and Numerical Methods - New Age International Publishers- 1999.
3. Suresh Chandra- Applications of Numerical Techniques with C.

**Books for Reference:**

1. E.Balagurusamy-Programming in ANSI C-Tata McGraw–Hill-Third Edition-2004.
2. V. Rajaraman- Computer Oriented Numerical Methods- Prentice Hall of India- Third Edition- 2004.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MEL2C1**

**CORE COURSE - VI – DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING**

**Unit – I: Discrete Time Signals and Systems**

Standard Discrete Time Signals – Classification of Discrete Time Signals – Basic Operations on Discrete Time Signals – Discrete Time Systems – LTI Systems – Convolution – Classification of DT LTI Systems – De convolution - Difference Equation Representation for LTI System – Solution of Difference Equation – Correlation.

**Unit – II: Fourier series and Fourier Transform of Discrete Time Signals**

Fourier series for Discrete Time Periodic Signals – Properties of Discrete Time Fourier Series – Fourier Transform of Discrete Time Non-Periodic Signal – Properties of Discrete Time Fourier Transform- Discrete Time Fourier Transform of Periodic Signals – Transform Analysis of LTI Systems – Z-Transform – Z-Transform Properties – Pole-Zero model – Region of Convergence – Inverse Z Transforms.

**Unit – III: Sampling of Continuous Time Signals**

Periodic Sampling – Frequency Domain Representation of Sampling – Reconstruction of a Band limited Signal from its Samples – Discrete Time Processing of Continuous-Time Signals – Continuous-Time Processing of Discrete Time Signals – Changing the Sampling Rate Using Discrete-Time Processing.

**Unit – IV: Discrete Fourier Transform and Computation**

Discrete Fourier Transform – Matrix Relation for Computing DFT and IDFT – Properties of Discrete Fourier Transform – Linear Convolution using the DFT – Discrete Cosine Transform – Fast Fourier Transform – Radix – 2 FFT – Radix – 2 Inverse FFT – Composite Radix FFT – Practical Consideration – Implementation of the DFT using Convolution.

**Unit – V: Filter Design Techniques**

Digital Filters - FIR Filters – The Kaiser Window Filter Design Method – Linear Phase FIR Low Pass Filter – High Pass Filter and Band Pass Filter - Design of Discrete-Time IIR Filters from Continuous-Time Filters.

**Text Books:**

1. V. Udayashankara- Modern Digital Signal Processing- Prentice Hall of India Pvt. Ltd. New Delhi – 2012.
2. S. Palani- D.Kalaiyarasi- Digital Signal Processing- Ane Books Pvt. Ltd.-2013.

**Books for Reference:**

1. S.Palani- D.Kalaiyarasi- Discrete Time Systems and Signal Processing- Ane

Books Pvt. Ltd – 2015.

2. Alan V. Oppenheim- Ronald W.Schafer- John R. Buck- Pearson Education-2013.

3 M.N. Bandyopadhyay- Introduction to Signals and Systems and Digital Signal

Processing- Prentice Hall of India Pvt. Ltd – 2011.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MEL2C2**

**CORE COURSE – VII – VLSI DESIGN**

**Unit – I: CMOS Technology**

Introduction – MOS Transistor – Ideal V-I Characteristics – C-V Characteristics – Non Ideal I-V Effects – DC Transfer Characteristics – CMOS Technologies – Layout Design Rules – CMOS Process Enhancements – Technology related CAD issues.

**Unit – II: Circuit Characterization and Simulation**

Delay Estimation – Logical Effort and Transistor Sizing – Power Dissipation – Interconnect – Design Margin – Reliability – Scaling.

**Unit – III: Combinational and Sequence Circuit Design**

Circuit Families – Low Power Logic Design – Comparison of Circuit Families – Sequencing Static Circuits – Circuit Design of Latches and Flip-Flops – Static Sequencing Element Methodology – Sequencing Dynamic Circuits – Synchronizers.

**Unit – IV: CMOS Testing**

Need for Testing – Testers- Text Fixtures and Test Programs – Logic Verification Principles – Silicon Debug Principles – Manufacturing Test Principles – Design for Testability – Boundary Scan.

**Unit – V: Specification Using VHDL**

Features of VHDL – Basic Concepts – Gate Level Modeling – Data Flow Modeling – Behavioral Modeling – Switch-Level Modeling – Structural Gate Level Modeling.

**Text Book:**

1. Jose Anand- VLSI Design- Vijay Nicole Imprints Private Limited- Chennai-2014

**Books for Reference:**

1. Douglas A. Pucknell- Kamran Eshraghian- Basic VLSI Design- Prentice Hall of India Pvt. Ltd. -2011
2. Kamran Eshraghian- Douglas A. pucknell- Sholeh Eshraghian-Essentials of VLSI Circuits and Systems- Prentice Hall of India Pvt. Ltd.-2011
3. Randall L.Geiger- Phillip E.Allen- Noel R.Strader- VLSI Design Techniques for analog and Digital Circuits- Tata McGraw Hill Education Pvt. Ltd. – 2010
4. Douglas L. Perry- VHDL Programming By Example- Tata McGraw Hill Education Pvt. Ltd. –2012.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MEL2C3**

**CORE COURSE – VIII – AVR MICROCONTROLLER AND EMBEDDED SYSTEM**

**Unit – I : AVR Architecture and Assembly Language Programming**

AVR General Purpose Registers – Data Memory – Status Register – Program Counter – Program ROM Space – RISC Architecture in the AVR - Introduction to AVR Assembly Language Programming – Using Instructions with the Data Memory – Arithmetic- Logic Instructions and Programs – Branch- Call and Delay Loop - I/O Port Programming – I/O Bit Manipulation Programming – Advanced Assembly Language Programming.

**Unit – II : AVR Programming in C**

Data Types- Operators and Expressions – Control flow – Input and Output – Functions – Pointers – Arrays – Structures – Unions – Type Definition - Time Delays in C – I/O Programming in C – Logic Operations in C – Data Conversion Program in C – Data Serialization in C - Memory Allocation in C – ATMEGA 32 Pin Connection – AVR Fuse Bits – Hex File for AVR – AVR Studio IDE to Develop C Programs.

**Unit – III: Timer- Interrupt and PWM Programming in C**

Programming Timers 0- 1 and 2 – Counter Programming – Programming Timers in C – AVR interrupt – Programming Timer Interrupts – Programming External Hardware Interrupts – Interrupt Priority – Interrupt Programming in C –Wave Generation using Time1 – Input Capture Programming - PWM Modes in 8 bit Timers – PWM Modes in Timer 1.

**Unit – IV: AVR Serial Port Programming in C- SPI and I2C Protocol**

Basic of Serial Communication – ATMEGA32 Connection to RS232 – AVR Serial Port Programming in C – AVR Serial Port Programming in C using Interrupts – SPI Bus Protocol – SPI Programming in AVR – I2C Bus Protocol – TWI (I2C) in the AVR – AVR TWI Programming in C.

**Unit – V: Interfacing With AVR**

LCD Interfacing – Keyboard Interfacing – ADC Interfacing – DAC Interfacing – Sensor Interfacing – Relays and Optoisolators Interfacing – Stepper Motor Interfacing – DC motor Control using PWM – MAX 7221 Interfacing and Programming – DS 1307 RTC Interfacing and Programming – TWI Programming with Checking Status Register.

**Text Book:**

# 1. [Mazidi / Naimi / Naimi](http://www.amazon.in/s/ref=dp_byline_sr_book_1?ie=UTF8&field-author=Mazidi+%2F+Naimi+%2F+Naimi&search-alias=stripbooks)- The AVR Microcontroller and Embedded Systems: Using Assembly and C- Pearson Education India; 1st edition – 2013.

**Book for Reference:**

1. HAN – WAY HUANG- The ATMEL AVR Microcontroller MEGA and XMEGA in Assembly and C- CENGAGE Learning- 2014

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MEL2P1**

**CORE COURSE - IX** – **DSP,VLSI AND AVR EMBEDDED LAB**

(Any Fourteen Experiments)

1. Linear Convolution of two Sequences
2. Circular Convolution of two Sequences
3. Auto Correlation of a given sequence
4. Cross Correlation of a given sequence
5. Half and Full Adder
6. Half and Full Subtractor
7. Flip-flops
8. Counters
9. Registers
10. Multiplexer
11. De multiplexer
12. Encoder
13. Decoder
14. Testing AVR I/O Ports using LED and DIP switches
15. Interfacing Seven Segment Display
16. Interfacing LCD
17. AVR Timer Programming
18. AVR Serial Communication Programming
19. Interfacing Temperature Sensor to AVR
20. Interfacing Stepper Motor to AVR
21. Interfacing N x M Key Board to AVR
22. Event Counter Programmer
23. Interrupt Programming
24. Interfacing a DC Motor using PWM

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE2A**

**ELECTIVE COURSE II (A) – PC – BASED INSTRUMENTATION**

**Unit – I: Signal Conditioning and Op-Amps Circuits and Sensors**

PC- Based Instrumentation System – Amplifiers – Bridge Circuits – Filters – Other Op-amp Circuits – Noise and Noise Reduction Techniques – IC Temperature Sensors – Comparing Temperature Sensors – Piezoelectric Sensor – Electrical Type Pressure Sensor – Flow Sensors.

**Unit – II: Principles of Data Acquisition**

Sampling Concepts – Digital to Analog Converters – Analog to Digital Converters- Data Acquisition Systems – Data Acquisition Configurations.

**Unit – III: Hardware Organization of IBM PC and Interfacing to IBM PC**

Mother Board Components – System Resources – System and Peripheral Control Chips – Expansion Buses ISA Bus – EISA Bus – PCI Bus - I/O Ports – Peripherals – ADC Board – DAC Board – Digital I/O Board – Timing I/O Board – General Purpose Plug-in DAQ Board – PCI Plug-in DAQ Board.

**Unit – IV: Data Acquisition Using GPIB and Serial Interface**

Over View of GPIB – GPIB commands – GPIB Programming – Expanding GPIB – IEEE-488.2 –SCPI Command Structure – HS488 Protocol – Serial Communication – Serial Interface Standards – PC Serial Port.

**Unit – V: Networked Data Acquisition**

Network Data Communication – Local Area Networks – HART Communication – Fieldbuses.

**Text Book:**

1. N. Mathivanan- PC-Based Instrumentation Concepts and Practice- Prentice Hall of India Pvt. Ltd- New Delhi – 2009

**Books for Reference:**

1. A. Gayakward- Op-Amps and Linear Integrated Circuits- Prentice Hall of India-2005.
2. Albert D. Helfrick- William D.Cooper- Prentice Hall of India- 2012
3. Rangan- Mani- Sharma- Instrumentation Devices and Systems- Tata McGraw Hill
4. Kalasi H.S- Electronic Instrumentation- Tata McGraw Hill.
5. B. Govinda Rajulu- IBM Clones- Tata McGraw Hill
6. Behrouz A Forouzan- Data Communications and Networkings- Tata McGraw Hill

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE2B**

**ELECTIVE COURSE - II (B) –** **WIRELESS COMMUNICATION**

**Unit - I: Introduction to Wireless Communication Systems**

Evolution of Mobile Radio Communications – Paging Systems – Cordless Telephone Systems – Cellular Telephone Systems - Comparison of Common Wireless Communication Systems – Trends in Cellular Radio and Personal Communications – 2G Cellular Networks – 3G Wireless Network – Wireless Local Loop and LMDS – WLANs – Blue Tooth – PANs.

**Unit - II: Cellular Concept System Design Fundamentals**

Frequency Reuse – Channel Assignment Strategies – Hand off Strategies – Interference and System Capacity – Trunking and Grade of Service – Improving Coverage and Capacity in Cellular Systems.

**Unit - III: Mobile Radio Propagation: Large Scale Path Loss**

Introduction to Radio Wave Propagation – Free Space Propagation Model – Relating Power to Electric Field – The Three Basic Propagation Mechanisms – Reflection – Ground Reflection Model – Diffraction – Scattering – Practical Link Budget Design using Path Loss Model – Outdoor Propagation Models – Indoor Propagation Models. Signal Penetration into Building – Ray Tracing and Site Specific Modeling.

**Unit - IV: Mobile Radio Propagation: Small-Scale Fading and Multipath**

Small Scale Multipath Propagation – Impulse Response Model of Multipath Channel – Small Scale Multipath Measurement – Parameters of Mobile Multipath Chanels – Types of Small Scale Fading – Fading Effects Due to Doppler Spread – Rayleigh and Ricean Distributions – Statistical Models for Multipath Fading Channel – Theory of Multipath Shape Factors for Small – Scale Fading Wireless Channels.

**Unit - V: Multiple Access Techniques for Wireless Communications**

Introduction to Multiple Access – FDMA – TDMA – Spread Spectrum Multiple Access – FHMA – CDMA – Hybrid Spread Spectrum Techniques – Packet Radio – Pure ALOHA – Slotted ALOHA – CSMA – Reservation Protocols – Reservation ALOHA – PRMA – Capture Effect in Packet Radio - Capacity of Cellular Systems – Capacity of Cellular CDMA – Capacity of CDMA with Multiple Cells – Capacity of Space Division Multiple Access.

**Text Books:**

1. Theodore S. Rappaport- Wireless Communications Principles and Practice- Pearson Education – 2010.
2. K.Feher-Wireless digital communications-PHI-New Delhi-1995
3. William C.Y. Lee- Mobile Communications Engineering Theory and Applications- McGraw-Hill- Second Edition-2012.

**Books for Reference:**

1. Simon Haykin - Michael Moher adopted by David Koilpillai- Modern Wireless Communications- Pearson Education- 2011.
2. Dharma Prakash Agrawal and Qing-An Zeng- Introduction to Wireless and Mobile Systems- Cengage Learning- Third Edition – 2012
3. William C.Y.Lee- Mobile Cellular Telecommunications Analog and Digital Systems- Tata McGraw-Hill- Second Edition – 2012
4. Schiller-Mobile Communications;Pearson Education Asia Ltd.-2000
5. David Tse and Pramod Viswanath- Fundamentals of Wireless Communication- Cambridge University Press- 2005
6. Edited by Jack M. Holtzman and David J. Goodman-Wireless and Mobile Communications- Allied Publishers Ltd.- 1994.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE2C**

**ELECTIVE COURSE - II (C) – PROGRAMMING IN C++**

**Unit – I: Principles of Object Oriented Programming**

Introduction – keywords and Identifiers – Constants – Variables – Data types – Operators and Expressions – goto statement – if statement – if-else Statement – nested if-else Statement – The else –if Ladder – Switch Statement – While Loop – for Loop – do While Loop – Jumps in Loop – Functions – Arrays – C Strings.

**Unit – II: Structures- Union and Pointers**

Definition of Structure Template – Declaration of Structure Variable – Initialization of Structure Variables – Operation on Structures – Arrays and Structure – Structure and Functions - Union – Pointer Operators – Pointer Arithmetic – Pointers and Arrays – Pointers and Strings – Pointers and Structures – Pointers and Union – Pointers and Functions – Pointers to Pointers

**Unit – III: Inheritance**

Introduction – Single Level Inheritance – Multiple Inheritance – Multilevel Inheritance – Hierarchical Inheritance – Multipath Inheritance and Virtual Base Class – Pointers to Derived Classes and Virtual Functions – Pure Virtual Function and Abstract Class – Object Slicing – Constructors- Destructors and Inheritance – Virtual Destructor – Private Inheritance – Protected Inheritance - Accessibility of Base Class Members in Derived Classes

**Unit – IV: I/O Streams- File and String Handling**

Built-in Classes Supporting I/O – Unformated I/O operations – Formating of Outputs - Built-in classes for File I/O Operations – Types of Data Files – Opening and Closing a Text File – Detecting End of a File – Text Files – Binary Files – Sending Data to a Printer – String Class and its tConstructors – The Assignment Operator – The Extraction Operator – The Relational Operator – Concatnation – Member Functions of String Class.

**Unit – V: Exception Handling**

Exception Handling Mechanism – throwing in One Function and Catching in the Other – Single Try Block and Multiple Catch Blocks – Catching All the Exceptions in a Single Catch Block – Re-throwing an Exception – Specification of Exceptions – Exception and Handling and Overloading – Exception Handling and Inheritance.

**Text Book:**

1. M.T. Somashekara- D.S. Guru- H.S Nagendraswamy and K.S. Munjunatha- Object Oriented Programming with C++- Prentice Hall of India – 2012.

**Books for Reference:**

1. E. Balagurusamy- “Object Oriented Programming with C++”- McGraw Hill

Company Ltd.- 2007.

1. B.Chandra- “Object Oriented Programming Using C++”-Narosa Publishing House.- Second Edition – 2005.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE3A**

**ELECTIVE COURSE - III (A) – BIOMEDICAL** **INSTRUMENTATION**

**Unit – I: X-Ray Computed Tomography**

Properties of X-rays – Photo Electric Effect – Compton Effect – Bremsstrahlung – X –ray tube – X-ray Equipment Block diagram – CT Scanners and Detectors – Image Processing for Computed Tomography – Spiral/helical Computed Tomography – Multislice Spiral Computed Tomography – Clinical Applications of Computed Tomography.

**Unit – II: Nuclear Imaging Systems**

Instrumentation: The gamma Camera – Image Characteristics – Clinical applications of Nuclear Medicine – Position Emission Tomography – Radioisotops and Radiopharmaceuticals – Radiation Dose.

**Unit – III: Magnetic Resonance Imaging**

Nuclear Magnetism – Vector Description of Magnetic Resonance – Signal Excitation and Detection – NMR Spectrum – Factors affecting Image Appearance – Pulse Sequences and Image Contrast – Effect of flow on Magnetic Resonance Images.

**Unit – IV: Ultrasonic Imaging Systems**

Therapeutic and Diagnostic Equipment – Therapeutic Ultasonic Equipment – Ultrasonic Imaging Equipment – Ultrasonic Waves – Ultrasonic Blood flow Equipment – Obstetrics and Gunecology – Cardiac Disease.

**Unit – V : Biomedical LASERs**

CO2 LASER – Argon LASER Surgical Unit – Interaction and Effects of UV-IR LASER Radiation on Biological Tissues – Penetration and Effects of UV-IR LASER Radiation into Biological Tissues – Effects of Mid- IR LASER Radiation – Effects of near- IR LASER Radiation – Effects of Visible-Range LASER Radiation – Effects of UV LASER Radiation – Biomedical LASER Beam Delivery Systems.

**Text Book:**

1. K.N.Scott- A.K. Mathur- Textbook of Biomedical Instrumentation- CBS Publishers and Distributors- New Delhi- First Edition-2007.

**Books for Reference:**

1. Joseph J.Carr- Introduction to Biomedical Equipment Technology- Pearson Education- Fourth Edition – 2001
2. S.K.Vengata Ram- Biomedical Electronics and Instrumentation- Galgotia Publications Pvt. Ltd- First Edition – 2000.
3. Leslie Cromwell- Biomedical Instrumentation and Measurements- Prentice Hall of India Pvt. Ltd.- Second Edition – 2013

4. R.S. Khanpur- Hand Book of Biomedical Instrumentation- Tata McGraw Hill- Second Edition – 2003.

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE3B**

**ELECTIVE COURSE III (B) - MOBILE SATELLITE COMMUNICATIONS**

**Unit – I:  Introduction to Mobile Telecommunications**

Evolution of Mobile Telecommunications -Terrestrial Systems - Satellite Systems -Satellite System Architecture -Radio Frequency Environment -Orbit -Tolerable Delay in Data Delivery - Handover -Mobility Management -Satellite Access -Spectrum Management -Radio Link Reliability - Mobile Systems -Related Satellite Systems- System Architecture.

**Unit – II: Satellite Constellations**

Satellite Orbits - Orbital Mechanics Basics – Satellite Coverage - Space Environment - Eclipse on Satellites -The Sun’s Interference - Doppler Effect - Orbital Debris- Satellite Constellations -Considerations in Constellation Design - Polar Constellations - Inclined Orbit Constellations -Hybrid Constellations - Regional Coverage -Constellations for Non-Real-Time Systems -Use of Spot Beams -Availability Considerations for Non-Geostationary Satellites

**Unit – III: Radio Link- Modulation- Coding and Multiple Access**

General Propagation Characteristics- Land Mobile Channel -Modulation -MSS Requirements - Schemes - Performance Comparison of Conventional Digital Modulation Schemes -Coded Orthogonal Frequency Division Multiplexing (COFDM) Modulation Systems-Spread Spectrum Modulation -Coding -Trellis-Coded Modulation (TCM) -Automatic Repeat Request -Multiple Access Schemes.

**Unit – IV: Fixed Earth Stations- User Terminals- Spacecraft and Standards**

Introduction -Gateways - User Terminals -Antennas - Hand-Held UT -Mobile Terminals **-** Satellites for MSS -Transponders -Antenna Systems - Effect of Orbital Characteristics on Spacecraft Design –Inter satellite links -Frequency Bands -Launching Satellite Constellations - Satellite Radio Interface Standards - GMR - Satellite Component of UMTS/IMT-2000 -Interactive Mobile Broadband Broadcast Standard - DVB-S2/RCS+M 407.

**Unit – V: Mobile Satellite Broadcast Systems**

Introduction -Mobile Broadcast System Requirements -Service Requirements - Receiver Types -System Configuration - Space Segment-Transmission Technology - OSI Architecture in a Broadcast Context -Prevalent Transmission Systems - Receiver Architecture - DVB-SH System Architecture - Multimedia Broadcast and Multicast Services -DBS Reception on Mobile Terminals.

**Text Book:**

1. [Madhavendra Richharia](http://as.wiley.com/WileyCDA/Section/id-302477.html?query=Madhavendra+Richharia)-Mobile Satellite Communications: Principles and Trends- 2nd Edition-Wiley -2014.

**Books for Reference:**

1. Roger Cochetti- Mobile Satellite Communications Hand Book- 2nd Edition-

Wiley-2015

2. Dennis Roddy- Satellite Communications- Mc Graw Hill- 3rd Edition - 2006

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**I YEAR – II SEMESTER**

**COURSE CODE: 7MELE3C**

**ELECTIVE COURSE - III (C) – INTRODUCTION TO MATLAB**

**Unit – I: Numeric- Cell- and Structure Arrays**

An overview of MATLAB – One and Two Dimensional Numeric Arrays – Multidimensional Numeric Arrays – Element – by – Element Operations – Matrix Operations – Matrix Methods for Linear Equations – Polynomial Operations Using Arrays – Cell Arrays – Structure Arrays.

**Unit – II: Functions- Files and Decision Making Programs**

Elementary Mathematical Functions – User Defined Functions – Additional Function Topics – Working With Data Files – Relational Operators – Logical Variables – Logical Operators and Functions – Conditional Statements – Loops – The Switch Structure – Debugging MATLAB programs.

**Unit – III: Advanced Plotting and Model Building**

xy Plotting Functions – Additional Commands and Plot Types – Interactive Plotting in MATLAB – Function Discovery – Regression – The Basic Fitting Interface – Three Dimensional Plots.

**Unit – IV: Applications in Numerical Analysis**

Interpolation – Numerical Integration – Numerical Differentiation – First order Differential Equations – Polynomials – Curve Fitting.

**Unit – V: Symbolic Processing**

Symbolic objects and Symbolic Expressions – Changing the Form of an Existing Symbolic Expression – Solving Algebraic Equations – Calculus – Differential Equations – Laplace Transforms – Symbolic Linear Algebra.

**Text Book:**

1. William J. Palm III- A Concise Introduction to MATLAB- Tata McGraw Hill Edition -2012

**Books for Reference :**

1. Amos Gilat- MATLAB An Introduction With Applications- Wiley- Fourth Edition 2013.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MEL3C1**

**CORE COURSE - X– DIGITAL SIGNAL PROCESSOR PROGRAMMING AND APPLICATIONS**

**Unit – I: Introduction to Digital Signal Processing**

Digital Signal Processing Systems – Digital Filters – Fixed Point Format – Double Precision Fixed Point Format – Floating Point Format – Dynamic Rang and Precision – Sources of Error in DSP Implementations – A/D conversion Errors – DSP Computational Errors – D/A Conversion Errors – Compensating Filter.

**Unit – II: Architecture for Programmable DSP Devices**

DSP Computational Building Blocks –Bus Architecture and Memory – Addressing Capabilities – Address Generation Unit – Program Control – Program Sequence – Hardware Architecture – Parallelism – Pipelining – Features for External Interfacing.

**Unit – III: Architecture of TMS320C54XX DSP Processor**

Bus Structure – CPU – Internal Memory – Memory Mapped Registers – Addressing Modes – Memory Space – Program Control – Instruction Sets – Programming – On-chip Peripherals – Interrupts - Pipeline – DSP Development Tool – DSP System Design Kit – Software for Development – The Assembler and the Assembly Source File – The Linker and Memory Allocation – C/C++  Compiler – The Code Composer Studio.

**Unit – IV: Interfacing Memory and Parallel I/O Devices**

Memory Space Organization – External Bus Interfacing Signals – Memory Interface – Timing Sequence for External Memory Access – Wait States – Parallel I/O Interface – Programmed I/O – Interrupts and I/O – DMA Operation – Synchronous Serial Interface – McBSP – McBSP programming – A CODEC Interface Circuit – CODEC.

**Unit – V: Applications of Programmable DSP Devices**

DSP System – DSP Base Biotelemetry Receiver – Speech Processing – An Image Processing – Position Control System for Hard Disk Drive – DSP Based Power Meter.

**Text Books:**

1. V. Udayashankara- Modern Digital Signal Processing includes Signals and Systems- Prentice Hall of India- Second Edition - 2012.
2. Avtar Singh and S.Srinivasan- Digital Signal Processing Implementations- Cengage Learning – 2004

.**Books for Reference:**

1. Andrew Bateman and Iain Paterson – Stephens- The DSP Hand Book- Algorithms- Applications and Design Techniques- Pearson Education- 2009
2. C.Britton - Rorabaugh- DSP Primer- Tata McGraw-Hill – 2005
3. Emmanuel Ifeachor and Barrie W. Jervis- Digital Signal Processing A Practical Approach-- Pearson Education - Second Edition – 2002
4. Charless Sohule and Mahesh Chugani- Digital Signal Processing A Hand Book Approach - Tata McGraw-Hill – 2005
5. S.Salivahanan and C.Gnanpriya- Digital Signal Processing- McGraw-Hill- Second Edition – 2012
6. Oppenheim alen V.and Schafer Ronald . W. Digital Signal Processing- Prentice Hall of India-
7. B.Vengatramani and M.Bhaskar- Digital Signal Processors Architecture- Programming and Applications- Tata McGraw-Hill- 2002
8. Vinay K. Ingle and John G.Proakis- Digital Signal Processing A MATLAB Based Approach – 2008. ♣♣♣♣♣♣♣♣♣

**II YEAR – III SEMESTER**

**COURSE CODE: 7MEL3C2**

**CORE COURSE - XI – ARM MICROCONTROLLER AND EMBEDDED SYSTEM**

**Unit – I: ARM7 Microcontroller Architecture**

Introduction to the ARM Microcontrollers – ARM Processor Family – Applications of ARM Processor – LPC2148 ARM 7 Microcontroller – Features of LPC2148 – Block Diagram of LPC2148 – Pin Diagram of LPC2148 – Architectural Overview – On-Chip Flash Program Memory – On-Chip Static RAM.

**Unit – II: System Control- Memory Map- Pin Connect Block- GPIO**

Crystal Oscillator – PLL – Reset and Wake-Up Timer – Brownout Detector – Code Security – External Interrupt Input – Memory Mapping Control – Power Control- VPB – Memory Map – Pin Connect Block – General Purpose I/O Features.

**Unit – III: Timer- Interrupt and Serial Communication**

General Purpose Timer – External Event Counters: Features – Interfacing Timer and Counter Operation – Interrupts on the ARM 7 – Interrupt Sources – External Interrupt – UART s Features – Serial Communication – RS 232 – RS 485 – USB Hardware – USB Device Software.

**Unit – IV: I2C- SPI- PWM- Watchdog Timer and Memory Card Interfacing**

I2C Bus Serial I/O Controller – Interfacing With AT24C1024 – SPI Port Operation – Interfacing with 25LC040 – Pulse Width Modulator – Watchdog Timer – Real Time Clock – SD Memory Card Basics – SPI Memory Card Operation in SPI Mode - LPC 2148 Interfacing with SD Memory Card.

**Unit – V: Interfacing Digital Input and Output**

Interfacing LEDs and Switches – Interfacing Keypads – Interfacing Seven Segment Display – Interfacing LCD – Interfacing Relay- Optocoupler and Buzzer - Interfacing DC Motor – Interfacing Stepper Motor – 10 bit ADC Features Interfacing Temperature Sensor LM35 – 10bit DAC Features - Interfacing DAC – PWM Audio.

**Text and Reference Books:**

1. Steve Furber- ARM System-on-Chip Architecture- Second Edition- Pearson-2012.

2. Wayne Wolf- Computer as Components: Priciples of Embedded Computing System Design- Third Edition-Morgan Kaufmann Publication.

3. J.R.Gibson- ARM Assembly Language- Second Edition- Cengage Learning

4. Trevor Martin- Hitex- ARM7-Based Microcontrollers-The Insider’s Guide To The Philips.

5. Warwick A.Smith- ARM Microcontroller Interfacing Hardware and Software- Elektor (www.elecktor.com)

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MEL3C3**

**CORE COURSE XII – DIGITAL IMAGE PROCESSING**

**Unit – I: Digital Image Representation and Transforms**

Fundamental of Digital Image Processing – Digital Image Representation – Sampling and Quantization – Basic Relationship between Pixels– DFT- FFT- Discrete Cosine Transform- Walsh Transform – Hadamard Transform – Haar Transfrom – Slant Transform – Hotelling Transform.

**Unit – II: Image Enhancement**

Introduction – Spatial and Frequency Domain approaches – Spatial Domain Techniques – Spatial Filtering - - Frequency Domain Techniques – Frequency Domain Filtering – Gray Level to Color Transformation – Filter Approach for Color Coding.

**Unit – III: Image Compression**

Introduction – Coding Redundancy – Inter-Pixel Redundancy – Image Compression Models – Source Encoder and Decoder – Channel Encoder and Decoder – Information Theory – Classification – Huffman Coding – Lossy Compression Techniques – Threshold Coding – Vector Quantization – Image Compression Standard(JPEG) – Image Compression Using Neural Networks.

**Unit – IV: Image Segmentation- Representation and Description**

Introduction – Detection of Isolated Points – Line Detection – Edge Detection – Edge Linking and Boundary Detection – Region-Orientated Segmentation – Segmentation Using Threshold – Accumulative Difference Image - Boundary Representations – Shape Number – Fourier Descriptors – Regional Descriptors – Topological Descriptors – Texture – Relational Descriptors.

**Unit – V: Image Restoration- Representation and Description**

Degradation Model – Degradation Model for Continuous Functions – Discrete Degradation Model – Estimation of Degradation Function – Estimation by Experimentation – Estimation by Modelling – Inverse Filtering Approach – Least Mean Square Filter – Interactive Restoration – Constrained Least Squares Restoration.

**Text Book:**

1. S.Annadurai and R.Shanmugalakshmi- Fundamentals of Digital Image Processing- Pearson – 2015.

**Books for Reference:**

1. Rafael. C. Gonzalez & Richard E.Woods. - Digital Image Processing- 2/e Pearson- New Delhi – 2006.

2. W.K.Pratt.-Digital Image Processing -3/e Edn.- John Wiley & sons- Inc. 2006.

3. M. Sonka et.al Image Processing- Analysis and Machine Vision- 2/e- Thomson- Learning- India Edition- 2007.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MEL3P1**

**CORE COURSE - XIII – EMBEDDED SOFTWARE AND HARDWARE LAB** (Any Fourteen Experiments)

1. Implement Linear Convolution
2. Implement Circular Convolution
3. Implement FFT
4. Implement FIR Filter
5. Implement IIR Filter
6. Interface LED and DIP Switches with ARM
7. Interface Relay and Buzzer
8. Interface Traffic Light Controller.
9. Interface Seven Segment Display with ARM
10. Interface LCD with ARM
11. Interface Keypad with ARM
12. Interface Stepper Motor with ARM
13. Interface DC Motor with PWM
14. Interface LM 35 using ADC with ARM
15. Interface DAC to generate Waveforms
16. ARM Timer Programming
17. ARM Counter Programming
18. ARM Interrupt Programming
19. ARM Serial Communication Programming
20. SPI Port Programming
21. Real Time Clock Programming
22. Watchdog Timer Programming
23. Interfacing With AT24C1024
24. PWM Audio

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE4A**

**ELECTIVE COURSE - IV (A) – BIOMETRIC SYSTEM**

**Unit – I: Biometric Introduction**

History of Biometrics – Types of Biometrics – General Architecture of Biometric Systems – Basic Working of Biometric Matching – Biometric System Error and Performance Measure – Design of Biometric Systems – Application of Biometrics -Benefits of Biometrics.

**Unit – II: Face Biometrics**

Background of Face Recognition – Design of Face Recognition System – Neural Network for Face Recognition Training of Neural Network – Face Detection in Video Sequences – Challenges in Face Biometrics – Face Recognition Methods – Advantages and Disadvantages.

**Unit – III: Retina and Iris Biometrics**

Performance of Biometrics – Design of Retina Biometrics – Design of Iris Recognition System – Iris Segmentation Method – Determination of Iris Region – Experimental Results of Iris Localization – Applications of Iris Biometrics – Advantages and Disadvantages.

**Unit – IV: Fingerprint Biometrics**

Finger Print Sensors – Useful Features of the Fingerprint - Fingerprint Recognition Systems – Histogram Equalization – Fingerprint Image Enhancement Using Fourier Transform – Binarization – Image Segmentation - Minutiae Extraction – Finger Print Indexing – Advantages and Disadvantages.

**Unit – V: Biometric Standards and Applications**

Standard Development Organizations – API – Information Security and Biometric Standards – Biometric Template – Biometrics in Border Security – Smart Card Technology – RFID Biometrics.

**Text Book:**

1. G.R. Sinha- Sandeep B. Patil- Biometrics: Concepts and Applications- Wiley 2013

**Books for Reference:**

1. Samir Nanavati- Michael Thieme- Raj Nanavati- “Biometrics – Identity

Verification in a Networked World”- Wiley-dreamtech India Pvt Ltd -2003

1. Paul Reid- “Biometrics for Network Security”- Pearson Education- New Delhi- 2004
2. John R Vacca- “Biometric Technologies and Verification Systems”- Elsevier Inc- 2007
3. Anil K Jain- Patrick Flynn- Arun A Ross- “Handbook of Biometrics”- Springer- 2008.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE4B**

**ELECTIVE COURSE - IV (B) – FIBER OPTICS AND LASER INSTRUMENTS**

**Unit – I: Optical Medium**

Types of fiber – Wave propagation in SI fiber – NA – Multipath time dispersion – Wave propagation in GI fiber – Numerical Aperture – Multipath time dispersion – Attenuation.

**Unit – II: Industrial Application of Optical Fibers**

Fiber Optic Sensor – Fiber Optics Instrumentation System – Different Types of Modulators – Interferometric Method of Measurement of Length – Measurements Using Fiber Optic Sensor.

**Unit – III: Industrial Application of LASERS**

Laser for measurement of Distance – Laser for Measurement of Length – Laser for Measurement of Velocity – Laser for Measurement of Acceleration – Laser for Measurement Current and Voltage – Laser for Measurement of Atmospheric effect.

**Unit – IV: Laser Instruments for Material Processing and Surgery**

Laser Instrumentation for Material Procissing – Laser Heating – Laser Welding – Laser Melting – Trimming of Material – Material Removal and Vapourisation -Laser and Tissue Interaction - Vocal Chord Surgery – Brain Surgery – Plastic Surgery – Oncology – Laser in Gynocology.

**Unit – V: Holography**

Basic Principle – Difference between Conventional Photography and Holograohy –Principles of Hologram Recording – Reconstruction of Hologram – Conditions during Reconstruction Methods of Holographic Interferometry – Non Destructive Testing Using Holography.

**Text Books:**

1. R.P.Khare- Fiber Optics and Optoelectronics- Oxford-2004.
2. B.Nagaraj- S.Renuka- B. Rampriya- Fiber Optics and Laser Instruments Anuradha Publications- Chennai-2009.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE4C**

**ELECTIVE COURSE - IV (C) – PROGRAMMING** **WITH JAVA**

**Unit – I: Principles of Object Oriented Programming**

Fundamental of OOP – Java Evolution – Overview of Java Language – Constants – Variables – Data Types – Operators – Expressions – Decision Making and Branching Statements – Decision making and Looping Statements – Arrays – Strings and Vectors -Classes – Objects – Constructors – Methods.

**Unit – II: Interfaces And Packages**

Defining Interfaces – Extending Interfaces – Implementing Interfaces – Implementing Interfaces – Accessing Interface Variables - Java API Packages – Using System Packages – Naming Conventions – Creating Packages – Accessing a Package – Using a Package – Adding a Class to a Package – Hiding Classes – Static Import.

**Unit – III: Multithread Programming And Managing Errors And Exceptions**

Creating Threads – Extending the Thread Class – Stopping and Blocking a Thread – Life Cycle of a Thread – Using Thread Methods – Thread Exceptions – Thread Priority – Synchronization – Implementing the ‘Runnable’ Interface – Inter-thread Communication – Types of Errors – Exceptions – Syntax of Exception Handling Code – Multiple Catch Statements - Using Finally Statement – Throwing Our Own Exceptions – Using Exceptions for Debugging.

**Unit – IV: Applet Programming**

Introduction – How applets Differs from Applications – Preparing to write Applets – building Applet Code – Applet Life Cycle – Creating an Executable Applet – Designing a Web Page – Applet Tag – Adding Applet to HTML File – Running the Applet – More about Applet Tag – Passing Parameter to Applet – Aligning the Display – More about HTML Tag – Displaying Numerical Values – Getting Input from the User – Event Handling.

**Unit – V: Managing Input / Output Files In Java**

Concept of Streams – Stream Classes – Byte Stream Classes – Using Streams – Other Useful I/O Classes – Using the File Class – Input/Output Exceptions – Creation of Files – Reading / Writing Characters – Reading / Writing Bytes – Handling Primitive Data Types – Concatenating and Buffering Files – Random Access Files – Interactive Input and Output – Other Stream Classes.

**Text and Reference Book:**

1. E. Balagurusamy- programming with Java a Primer- Fourth Edition Tata McGraw Hill- 2011

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE5A**

**ELECTIVE COURSE - V (A) – NETWORKING TECHNOLOGY**

**Unit – I: Fundamentals of Networking**

Data Communication: Components - Representation & Flow - Networks- -Working on a Networked Environment - Network Topology - LAN - WAN – MAN - Concept of Email - uses of Internet. - Network node components – Hubs – Bridges – Routers - Gateways and switches -ISDN – Transmission Technology - Communication Protocols and Standards.

**Unit – II: 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 – III: Internet and TCP/IP Networks**

Overview – Internet Protocol- TCP and UDP- Performance of TCP/ IP networks. Circuit switched networks: SONET- DWDM- Fiber to home- DSL- Intelligent networks- CATV.

**Unit – IV: ATM and Wireless Networks**

Main features of ATM – addressing - signaling and Routing - ATM cell header structure-Adaptationlayer - Management and Control – BISDN - Interworking with ATM - Wireless Channel - link level design - Channel access - Network design and wireless networks.

**Unit – V: Optical Networks and Switching:**

Optical Links – WDM Systems - Cross – Connects - Optical LAN’s - optical Paths and Networks. **Circuit switches**: TDS and SDS - Modular switch designs - Packet Switches - Distributed shared input and output buffers.

**Text Books:**

1. Mani Subramanian - “Network Management Principles and Practice”.Addision Wisely- New York- 2000.
2. Guide to Networking Essentials- Fourth Edition (0619215321) Greg Tomsho- Ed Tittel- Greg Johnson- ISBN: 0-619-21532-1© 2004.
3. Networking Concepts and Technology: A Designer’s Resource By John Berger Distributedby: Prentice Hall.
4. Jaiswal.S.- Networking Technologies- Galgotia Publication- 1997.

**Books for Reference:**

1. Jean Warland and Pravin Varaiya- High Performance Communication networks- 2nd Edition- Harcourt and Morgan Kauffman- London- 2000.
2. Sumit Kasera- Pankaj Sethi- ATM Networks- Tata McGraw Hill- New Delhi- 2000.
3. Behrouz a. Forouzan- Data Communication and Networking- Tata Mc Graw Hill- New Delhi- 2000.
4. Lakshmi G Raman- “Fundamentals of Telecommunication Network Management”- Eastern Economy Edition IEEE Press- New Delhi- 1999.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE5B**

**ELECTIVE COURSE V (B) –MECHATRONICS**

**Unit – I: Introduction**

Definition of Mechatronics- Mechatronics in Manufacturing- Products and Design- Comparison between Traditional and Mechatronics Approach.

**Unit – II: Review of fundamentals of electronics**

Data conversion devices- Sensors – Microsensors- Transducers- Signal Processing Devices- Relays- Contactors and Timers. Microprocessors- Controllers and PLCs.

**Unit – III: Drives**

Stepper Motors Servo Drives. Ball Screws- Linear Motion Bearings- Cams- Systems Controlled By Camshafts- Electronic Cams- Indexing Mechanisms- Tool Magazines-

Transfer Systems.

**Unit – IV: Hydraulic systems**

Flow, Pressure and Direction Control Valves- Actuators- And Supporting Elements- Hydraulic Power Packs- Pumps. Design Of Hydraulic Circuits. Pneumatics: Production- Distribution And Conditioning Of Compressed Air- System Components And Graphic Representations-Design of Systems - Description

**Unit – V: Description of PID controllers.**

CNC Machines and Part Programming. Industrial Robotics.

**Text Books:**

1. HMT ltd. Mechatronics- Tata Mcgraw-Hill- New Delhi- 1988.
2. G.W. Kurtz- J.K. Schueller- P.W. Claar . II- Machine design for mobile and industrial applications- SAE- 1994.
3. T.O. Boucher- Computer automation in manufacturing - an Introduction- Chappman and Hall- 1996.
4. R. Iserman- Mechatronic Systems: Fundamentals- Springer- 1st Edition- 2005
5. Musa Jouaneh- Fundamentals of Mechatronics- 1st Edition- Cengage Learning- 2012.

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**II YEAR – III SEMESTER**

**COURSE CODE: 7MELE5C**

**ELECTIVE COURSE - V (C) – VIRTUAL INSTRUMENTATION USING LAB VIEW**

**Unit – I: Introduction to Lab VIEW**

Introduction - Graphical System Design Model (GSD) – Design Flow with GSD – Virtual Instrument – Hardware and Software in virtual Instrumentation – Advantages of Lab VIEW – Software Environment – Creating and Saving a Virtual Instrument – Front Panel Tool Bar – Block Diagram Tool Bar – Palettes – Short Cut Menus – Property Dialog Boxes – Front Panel Controls and Indicators – Block Diagram – Data Types – Data Flow Diagram – Lab VIEW Documentation Resources – Key Board Shortcuts.

**Unit – II: Modular Programming**

Modular Programming in Lab VIEW – Build a Virtual Instrument Front Panel and Block Diagram – Icon and Connector Pane – Displaying Sub VIs and Express VIs as Icons or Expandable Nodes – Creating Sub VIs form Section of a VI – Opening and Editing Sub VIs – Placing Sub VIs on Block Diagram – Saving Sub VIs- Creating a Stand-Alone Application.

**Unit – III: Repetition and Loops**

Introduction –FOR Loop –WHILE Loop – Structure Tunnels – Terminals Inside or Outside Loops – Shift Registers – Feed Back Nodes – Control Timing – Communicating Among Multiple Loops – Local Variables – Global Variables – Creating One Dimensional Array – Two Dimensional Array – Multidimensional Arrays - Deleting and Inserting Elements- Rows- Columns and Pages within Arrays – Array Functions – Auto Indexing – Creating Two Dimensional Arrays Using Loops – Identification of Data Structure ( Scalar and Array) using Wires – Using Auto Indexing to Set the FOR Loop Count – Matrix Operations with Array

**Unit – IV: Clusters and Structures**

Creating Cluster Controls and Indicators – Creating Cluster Constant – Order of Cluster Elements – Cluster Operations – Assembling Clusters – Disassembling Clusters – Conversion between Arrays and Clusters – Error Handling – Error Cluster - Case Structures – Sequence Structures – Customizing Structure – Timed Structure – Formula Nodes – Event Structure – Lab VIEW Math scripts - Plotting Data - Types of Waveforms – Waveform Graphs – Waveform Charts – Waveform Data Type XY Graphs – Intensity Graphs and Charts

**Unit – V: Strings and File I/O and Instrument Control**

Creating String Control and Indicators – String Functions – Editing- Formatting and Passing Strings – Formatting Strings – Configuring String Controls and Indicators – Basic File Input/ Output – Choosing a File I/O Format – Lab VIEW Data Directory – File I/O VIs – Creating a Relative Path - GPIB Communication – Hardware Specifications – Software Architecture – Instrument Input Output Assistant – VISA – Instrument Drivers – Serial Port Communications – Using other Interfaces – Motion Control.

**Text Book:**

1. Jovitha Jerome- Virtual Instrumentation Using Lab VIEW- Prentice Hall of India-2011.

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**II YEAR – IV SEMESTER**

**COURSE CODE: 7MEL4PR**

**CORE COURSE – XIV: PROJECT**

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