॥ सा विद्या या विमुक्तये ॥

स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ, नांदेड

'ज्ञानतीर्थ', विष्णुपुरी, नांदेड – ४३१ ६०६ (महाराष्ट्र राज्य) भारत

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

'Dnyanteerth', Vishnupuri, Nanded - 431 606 (Maharashtra State) INDIA

Established on 17th September, 1994, Recognized By the UGC U/s 2(f) and 12(B), NAAC Re-accredited with'B++' grade

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संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरिल M. Sc. Electronics II year चा अभ्यासक्रम शैक्षणिक वर्ष २०२२–२३ पासून लागू करणे बाबत.

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प रि प त्र क

या परिपत्रकान्वये सर्व संबंधितांना कळविण्यात येते की, दिनांक २३ मे २०२२ रोजीच्या विज्ञान व तंत्रज्ञान विद्याशाखेच्या बैठकीतील शिफारशी नुसार व **मा. विद्यापरिषदेच्या दिनांक २५ जून २०२२ रोजीच्या बैठकीतील विषय क्रमांक १६/५४–२०२२ च्या** ठरावानुसार संलग्नित महाविद्यालयातील विज्ञान व तंत्रज्ञान विद्याशाखेतील पदव्युत्तर स्तरावरील M. Sc. Electronics II year चा अभ्यासक्रम शैक्षणिक वर्ष २०२२–२३ पासून लागू करण्यात येत आहे.

सदरील परिपत्रक व अभ्यासक्रम प्रस्तुत विद्यापीठाच्या **www.srtmun.ac.in** या संकेतस्थळावर उपलब्ध आहेत. तरी सदरील बाब ही सर्व संबंधितांच्या निदर्शनास आणून द्यावी. ही विनंती.

स्वाक्षरित

सहा.कुलसचिव

शैक्षणिक (१–अभ्यासमंडळ) विभाग

जा.क्र.:शैक्षणिक–१/परिपत्रक/अभ्यासक्रम/N-२०२२–२३/४२९

दिनांक : १२.०७.२०२२

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) मा. मा अधिष्ठाता, विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
२) मा. संचालक, परीक्षा व मूल्यमापन मंडळ यांचे कार्यालय, प्रस्तुत विद्यापीठ.
३) प्राचार्य, सर्व संबंधित संलग्नित महाविद्यालये, प्रस्तुत विद्यापीठ.
५) अधीक्षक, परिक्षा विभाग विज्ञान व तंत्रज्ञान विद्याशाखा, प्रस्तुत विद्यापीठ.
६) सिस्टम एक्सपर्ट, शैक्षणिक विभाग, प्रस्तुत विद्यापीठ याना देवून कळविण्यात येते की, सदरील परिपत्रक व अभ्यासक्रम विद्यापीठ संकेतस्थळावर प्रसिध्द करण्यात यावे.

SWAMI RAMANAND TEERTH MATHAWADA UNIVERSITY,
NANDED

Syllabus of M.Sc. in Electronics (CBCS)

M.Sc. Second Year

Course Structure and Marking Scheme of M.Sc. Electronics Second Year

M. Sc. Second Year (Semester III)									
Course code	**Course Type**	**Name of the theory Course**	**Credits**	**Contact hours Per Week**			**Assessment pattern (Marking Scheme)**		
				L	**P**	**Total Hrs**	**CA**	**ESA**	**Total Marks**
ELE 301	Core	Industrial Process Control	04	04	--	60	25	75	100
ELE 302	Core	Network Analysis and Synthesis	04	04	--	60	25	75	100
ELE 303	Core	Python Programming for Electronics	04	04	--	60	25	75	100
ELE 304	Core	**Elective Paper**	04	04	--	60	25	75	100
		A-Virtual Instrumentation & Programming in Lab VIEW B- Signal & System	--	--	--	--	--	--	--
ELE 305	Skill	Seminar / PCB Design / **MOOC: NPTL / SWAYAM	01	--	--	--	25	--	25
		Total Theory Course Credits -III	**17**	**--**	**--**	**240**	**125**	**300**	**425**
M. Sc. Second Year (Semester IV)									
ELE 401	Core	Programmable Logic Controller	04	04	--	60	25	75	100
ELE 402	Core	Measurement & Instrumentation	04	04	--	60	25	75	100
ELE 403	Core	Advance Embedded System	04	04	--	60	25	75	100
ELE 404	Core	**Elective Paper**	04	04	--	60	25	75	100
		A- Digital Image Processing **B-** Introduction to JAVA	--	--	--	--	--	--	--
ELE 405	Skill	Seminar / Simulation Software / **MOOC: NPTL/SWAYAM	01	--	--	--	25	--	25
		Total Theory Course Credits -IV	**17**	**--**	**--**	**240**	**125**	**300**	**425**
Laboratory Course (Annual)									
ELE 306	Practical Core	Laboratory Course-V	04	--	04	60	25	75	100
ELE 307	Practical Core	Laboratory Course-VI	04	--	04	60	25	75	100
ELE 406	Practical Core	Major Project	08	--	08	120	50	150	200
		Total Laboratory Course	**16**	**--**	**--**	**240**	**100**	**300**	**400**
Total for M.Sc. II Year: Sem. III+ Sem. IV + Lab Course work (Annual)			**50**	**--**	**--**	**720**	**350**	**900**	**1250**
Grand Total Credits/Marks			**100**	**--**	**--**	**1440**	**700**	**1800**	**2500**

** For Skill paper, student may opt for 1 seminar of 1 credit for Semester-III, and 1 seminar of 1 credit for Semester-IV.

OR

** Student can opt for 1 MOOC: SWAYAM/NPTEL of 2 Credits for MSc Second Year (Sem-III & Sem-IV together).

ELE 301-: Industrial Process Control

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Fundamentals of Process Control **15 hours**

Closed loop control and functional elements in it open-loop control, continuous and discrete state control, control strategies such as feedback, feed forward and adaptive control, steady state optional control concept of DCS, evolution of process control,

Unit II: Introduction to Control System **15 hours**

Mathematical models of systems, concept of transfer function and its use, method of obtaining transfer function, block diagram of control system, rules of block diagram reductions and examples thereof. Concept of stability, Routh stability criterion, Roth- Hurwitz criterion, Root locus steps in drawing root locus, Use of root locus and examples thereof. Frequency response methods of control system analysis, Bode-plots method to plot and examples thereof, Nyquist plots, method to plot and examples

Unit III: Introduction to Process Controllers **15 hours**

Classification of controllers, Controller terms Discontinuous controllers: On-OFF Controller, three position controller Continuous controllers: Proportional, Integral and Derivative control Composite control modes: PI, PD and PID controllers. Derivative overrun and integral windup in PID control mode Design of analog controller circuits for above modes characteristics and applications DCS hardware and software

Unit IV: Applications of Process Controllers **15 hours**

Principle and characteristics of control values, synchro-servo motors, Solenoids, actuators, annunciators, alarms, recorders, Standard Graphics Symbols for Process Control and Instrumentation Control system examples: Speed control system, position control systems, temperature and level control systems, reel drives, tension control system for paper

References:

1. Process Control Instrumentation Technology, Curtis D. Johnson, Eighth Edition, (2008)
2. Control System-I, U.A. Bakshi, V.U. Bakshi, Technical Publications, 3rd Edition, (2012)
3. Programmable Logic Controllers, W. Bolton,4th Edition, 2006
4. Practical SCADA for Industry David Bailey BEng, Bailey and Associates, Perth, Australia (2003)

ELE 302 - Network Analysis and Synthesis

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [MSA: 25 (T1+T2+HA); ESA=75]

Unit I: Introduction to Network Theorem **15 hours**

Network Analysis Mesh analysis, mesh equations, super-mesh analysis; nodal analysis, nodal equations; source transformation technique; graph theory and network equations: graph of a network, trees and co-trees, twigs and links, incidence matrix, tie set matrix, cut set matrix; state variable analysis; time domain analysis: steady state and transient response, DC response of RL, RC and RLC circuit, sinusoidal response of RL, RC and RLC circuit

Unit II: Network Analysis **15 hours**

Network Theorems and Applications Star-delta transformations; network theorems: superposition, maximum power transfer, Thevenin's, Norton's and reciprocity, duals and duality, Tellegen's and Millman's theorem with suitable examples

Unit III: Laplace Transform for Circuit Analysis **15 hours**

Laplace Transform and Properties of Laplace transformation, properties of Laplace transforms, partial fraction expansion, Inverse Laplace transforms, Heaviside's expansion theorem: illustrative examples, application of the Laplace transform in circuit analysis.

Unit IV: Network Parameters **15 hours**

Network Functions and synthesis Techniques One-port and two-port networks, of synthesis of RC and LC networks two-port network parameters: open circuit impedance, short circuit admittance, transmission, inverse transmission, hybrid, inverse hybrid parameters, interrelationship of different parameters, interconnection of two port networks.

References:

1. Network Analysis: M. E. Van Valkenberg, PHI, New Delhi.
2. Circuits and Networks: Analysis and Synthesis: A. Sudhakar and S. P. Shyammohan, Tata McGraw Hill, New Delhi.
3. Networks and Systems: D. Roy Choudhuri, New Age International (P) Limited, Publishers, New Delhi.

ELE 303 - Python Programming for Electronics

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Basics of Python **15 hours**

Python Basics Python installation and scripts – IDLE, Interactive sessions – basic syntax – Writing and executing simple program – Basic data types, declaring variables – Operators – Conditional Statements – Looping and Control statements – Lists – Tuples – Sets – Dictionaries

Unit II: **Functions in python** **15 hours**

Functions, Modules Functions: Defining a function – Calling a function – Types of functions – Function Arguments – Anonymous functions – Global and local variables Modules: Importing modules – Packages – Custom modules

Unit III: File Format **15 hours**

Files and Exception Files: Reading and writing binary data – Reading and Parsing text files – Reading and parsing xml files – format operator; command line arguments Exception: Errors and exceptions – handling exceptions – except clause – Try? Finally, clause – user defined exceptions

Unit IV: GUI Programming **15 hours**

GUI Programming (using Tkinter and Qt) Using Tkinter: GUI and its advantages – GUI Library – Grid layout – call-backs and event binding – Creating widgets with Tkinter/Qt such as Frame, Label, Button, Checkbox, Entry, List-box, Dialog boxes, Radio-button, Text, Canvas, Bitmap graphics Using Qt: Setting up code base, Building UI with Qt designer – Writing the UI – Launching the UI – packaging the code Database connectivity and Internet Programming Database Access: Python's Database Connectivity – Types of Databases used with Python

Reference:

1. Mark Summerfield, "Programming in Python 3: A Complete Introduction to the Python Language ", Pearson Education India/Addison Wesley, 2018(2nd Edition), ISBN: 9789352869176
2. Paul Gries, Jennifer Campbell, Jason Montojo, "Practical Programming: An Introduction to Computer Science Using Python 3.6", The Progmatic Bookshelf U.S., 2017(3rd Edition),
3. Allen B. Downey, "Think Python", O'Reilly U.S./Green Tea Press (Online Publishers), 2nd Edition

ELE 304 A- Virtual Instrumentation & Programming in Lab VIEW(Elective)

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Introduction to Virtual Instrument **15 hours**

Traditional instruments: basic block diagram, disadvantages; Virtual instruments: basic block diagram (architecture), advantages, applications; text based programming language; graphical programming language; Lab VIEW programming concepts: data flow, polymorphism; introduction to LabVIEW: advantages, front panel window, block diagram windows, icon/connector pane, palettes, data types

Unit II: Lab VIEW Programming **15 hours**

Modular programming: build a VI front panel & block diagram, icon and connector pane, creating sub VI; repetition and loops: *for* loop, *while* loop, shift registers, feedback nodes; control timing, communicating among multiple loops, local and global variables; array: one dimensional, two dimensional, multidimensional, array control, array indicators, array constants; cluster: creating cluster control, creating cluster indicators, order of cluster elements, assembling clusters, disassembling clusters, conversion between arrays and clusters, error handling, error cluster;

Unit III: Instrument Control **15 hours**

Plotting data: types of waveforms, graphs, charts and their types; structures: case, sequence, timed, events, formula nodes, math script; strings and file I/o; creating string controls and indicators, string function, formatting strings, basics of file I/o, choosing a file I/o format. Instrument control: Instrument I/o Assistant, VISA, instrument drivers, serial port communication, serial port standard RS-232; other interfaces: GPIB, USB, firewire, IEEE-1394 controllers and ethernet

Unit IV: Processing and Tool Kits **15 hours**

Processing and Tool Kits in Lab VIEWIMAQ vision: vision basics, image processing and analysis, particle analysis, machine vision, machine vision application areas; motion control: components of motion control system, motion controller, move type, motor amplifiers and drivers, motor fundamentals; Control design and simulation tools: Design of temperature and pressure controller using PID controller, light intensity measurement system, digital filter design and modulation tool kits, simulation of ECG signal, power spectrum analysis, FFT analysis, wavelet transform.

References:

1. Virtual Instrumentation using Lab VIEW : Jovitha Jerome, PHI Learning Pvt. Ltd., New Delhi
2. Virtual Instrumentation using Lab VIEW : Sanjay Gupta and Joseph John, TMH, New Delhi\
3. Lab VIEW for Everyone: Jeffrey Travis and Jim Kring, Pearson Education, New Delhi
4. NI Lab VIEW user manual

ELE 304 B - Signal & System (Elective)

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Introduction to Signal & Systems **15 hours**

Definitions of a signal, classification of signals, basic operations on signals, elementary signals, discrete time signals, sampling process and Nyquist rate. Definition of a system, systems viewed as interconnections of operations, properties of systems.

Unit II: Time-domain Representations for LTI systems **15 hours**

Convolution integral and convolution sum and their properties, properties of LTI systems, impulse and step response, differential and difference equation representations and their block diagram representations.

Unit III: Fourier Series Representation for Signals **15 hours**

Introduction, discrete time and continuous time Fourier series and their properties, problems. Discrete and continuous time Fourier transforms and their properties. parseval's relationship, time bandwidth product, duality property.

Unit IV: Laplace Transform **15 hours**

The Laplace transform, unilateral Laplace transform and its inversion, properties, solving differential equations, properties of bilateral Laplace transform and ROC, inversion of bilateral Laplace transform, analysis of LTI systems using Laplace transforms, transfer function, causality and stability, frequency response from poles and zeros.

References:

1. Signals and Systems: Simon Haykin, Barry Van Veen, John Wiley India, 2ndEdn, 2008.
2. Signals and systems: Alan V Oppenheim, Alan SWillsky and Hamid Nawab, ,PHI, 2nd edition, 2002.

ELE 401 -Programmable Logic Controller

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Architecture of PLC **15 hours**

PLC hardware, Types of PLC, CPU unit architecture, The I/O section, Discrete I/O Modules, Analog I/O Modules, Special I/O Modules, I/O specifications, The CPU, Memory design, Memory Types, Programming Devices, Selection of wire types and size. Memory classification, Input/output devices and it's interfacing, Digital-Analog modules, Communication modules, Special function modules.

Unit II: PLC Programming-I **15 hours**

Timers programming, Counter programming PLC INSTRUCTIONS Bit Logic Instructions: NO, NC, Set, Reset, rising edge Pulse, Falling Edge Pulse, RS, SR, NOP, OUTPUT etc. Clock: READ RTC, SET_RTC. Different Logical operation Instructions: Different Integer Math Instructions: Addition, Subtraction, Multiplication, Division, Increment, Decrement- Integer, Different Conversion Instructions: Byte – Integer, Integer To Byte, Integer To Double Integer,

Unit III: PLC Programming-II **15 hours**

Processor Memory Organization, Program Scan, PLC Programming languages, Relay type instructions, Instruction addressing, Branch Instructions, Internal Relay Instructions, Programming Examine if Closed and examine If Open instructions, Entering the ladder diagram, Modes of operation. Creating Ladder Diagrams from Process Control Descriptions. Ladder diagram & sequence listing; large process ladder diagram construction, flow charting as programming method, Industrial Examples,

Unit IV: PLC operation **15 hours**

Various INPUT /OUTPUT Devices and its interfacing with PLC.

Different types of Input devices : Switches: Push button Switches, Toggle Switches, Proximity switches, Photo switches, Temperature Switch, Pressure Switch, and Level Switch,Flow Switches,

manually operated switches, Motor starters, Transducers and sensors, Transmitters etc. Their working, specification and interfacing with PLC. Different types of Output devices : Electromagnetic Control Relays, Latching relays, Contactors, Motors, Pumps, Solenoid Valves etc. Their working, specification and interfacing with PLC.

References:

1. Programmable logic controller by Frank D. Petrusella, Tata McGraw-Hill publication
2. Introduction to programmable logic controller by Gary dunning, Thomson Asia Pte Ltd. Publication, Singapore
3. Programmable Logic Controllers: Principles and Applications by John W. Webb and Ronald A. Reis, Prentice – Hall India publication, 5th edition
4. Programmable Logic Controllers by W. Bolton, Elsevier Newnes publication, 4th edition
5. Programmable Controllers An engineer's guide by E.A.Parr, Elsevier Newnes publication 3rd edition

ELE 402 – Measurement & Instrumentation

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Introduction to Transducers **15 hours**

Transducers, Methods of transduction, primary sensing elements and transducers, electrical transducers, classification of transducers types of transducers- Resistance, Inductance, Capacitance, Piezoelectric, Thermometric, Hall effect, Photoelectric

Unit II: Measurement of Physical Quantities **15 hours**

Measurement of different physical parameters and their sensors and transducers of displacement, velocity, acceleration, force, torque, strain, temperature, pressure, flow, humidity, thickness, pH

Unit III: Measuring Equipments **15 hours**

Measuring Equipment -Measurement of R, L and C, Bridge and potentiometer, voltage, current, power, energy, frequency/time, phase, Digital Multi meters, CRO, Digital Storage Oscilloscope, Spectrum Analyzer

Unit IV: Biomedical Instruments **15 hours**

Biomedical Instruments- ECG, EEG, Blood Pressure Measurements, MEMS and its applications Sensors for IoT applications.

References:

1. A Course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co (2007)
2. Electronic Instrumentation, Kalsi, TMH (2009)
3. Bio medical Instrumentation, R.S. Khandpur, 2nd edition, Tata McGraw hill (2004)
4. Sensors and transducers, principles and applications, R.Y.Borse (2012).

ELE 403- Advance Embedded System

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Overview of PIC controllers **15 hours**

Overview of PIC Micro controllers, Introduction to PIC micro controllers -Advantage of PIC micro controllers –Types and products of PIC. Comparison between 8051 and PIC micro controller, architecture of PIC, Introduction to MPLAB & Micro C.

Unit II: Architecture of PIC 16 **15 hours**

Introduction to PIC16, Pin diagram, Pic 16 family overview, Architecture of Pic 16, Basic I/O programming using C, Timer Programming, sensor interface using ADC . Proximity sensor interfacing: IR , Ultrasonic sensor. LED Blinking

Unit III: Introduction of Raspberry Pi platform **15 hours**

Introduction of Raspberry Pi 3, Raspberry Pi 3 Hardware. Raspberry Pi 3 OS, prepare sd card for PI , Powering Up and Running. Connecting to a Network. Raspberry Pi Programming method

Unit IV: Raspberry Pi Programming **15 hours**

Programming the Raspberry Pi ,Compiling C Programs · Wiring Pi Library-Installation · Using Wiring Pi for GPIO Programming · LCD (16*2) Interfacing to pi · Study GPIO Pins, Configuring GPIO Pins, Python programming on Pi ,basic GPIO program Using Python

References:

1. Programming the Raspberry Pi, 2nd Edition: Getting Started with Python.
2. Exploring Raspberry Pi: Interfacing Real World with Embedded Linux.
3. Raspberry Pi For Kids-Dummies.
4. Raspberry Pi Electronic Projects for Evil Genius.

ELE 404 A- Digital Image Processing(Elective)

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I : Basic Components of Image Processing **15 hours**

Introduction to Digital Image Processing Basic components of image processing system, image sensing and acquisition, digital camera working principle; image sampling and quantization; representation of digital images, matrix, pyramid, quad-tree; elements of color image processing, hue, saturation and intensity, chromaticity diagram

Unit II: Image Enhancement **15 hours**

Image Enhancement, Filtering and restoration Enhancement in spatial domain; pixel grey level transformation, image negatives, logarithmic transformation; bit-plane slicing, histogram processing; enhancement in frequency domain; image smoothing (low pass filter), image sharpening (high pass filter), selective filtering (band pass and band reject filters); noise models for images, signal-to-noise ratio, image restoration in the presence of noise using spatial filtering, periodic noise reduction by frequency domain filtering; estimating the degradation function, inverse filtering

Unit III: Image Processing and segmentation **15 hours**

Color Image Processing and Image Segmentation Color fundamentals, color models, RGB, CMY and CMYK color models, HSI model; pseudo-color image processing, basics of full color processing, color transformations, smoothing and sharpening; noise in color images, grey level to color transformation; Image Segmentation: fundamentals, edge-based segmentation; image thresholding, intensity thresholding; basic global thresholding, multi-variable thresholding

Unit IV: Image Compression and Watermarking **15 hours**

Image compression and Digital Image Watermarking Pixel and data redundancy, fidelity criteria, image compression models; Image file formats and compression standards, BMP, GIF, TIFF, JPEG, CDR; types of compression, lossless coding techniques, LZW coding, Lossy transform coding, DCT. Wavelet coding, discrete wavelet transform, Haar wavelets, digital image watermarking, need for image watermarking; visible and invisible watermarks, a typical watermarking system, water mark insertion and extraction methods

Reference :

1. Rafel C. Gonzalez and Richard .E. Woods, Digital Image Processing, Third Edition, Pearson (2008)

2. Malay K. Pakhira: Digital Image Processing and Pattern Recognition. PHI (2011)

3. Rafel C. Gonzalez, Richard .E. Woods and Steven L. Eddins, Digital Image Processing using MATLAB, Pearson 2004

4. Anil K. Jain, Fundamentals of Digital Image Processing, Pearson, 2002

5. Keenneth R Castleman, Digital Image Processing, Pearson Education, 1995

6. Soman K. P. and Ramachandran K. I., Wavelet Transform: From Theory to Practice, PHI, 2008

ELE 404 B -Introduction to Java (Elective)

Credits: 04	Contact Hours: 60 Hrs (L+T+R)	Total Marks: 100 [CA: 25 (T1+T2+HA); ESA=75]

Unit I: Overview of Java language **15 hours**

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 run time 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 II: Data types and Variables of Java **15 hours**

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-Bit wise-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 III: Object Oriented Programming **15 hours**

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 method abstract 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 IV: Multi-threaded Programming **15 hours**

Multi threaded Programming: Creating threads-Extending the thread class-Stopping and blocking a thread-Life cycle 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.

References:

1. Computing concepts with java 2 essentials, CAY HORSTMANN 2 Edition
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.

ELE 306 -Laboratory course- V

Credits: 04	Contact Hours: 60 Hrs (Hands On)	Total Marks: 100 [CA=25(Test+Viva+Journal), ESA=75]

At least 12 experiments be completed by a student for each lab course.

1. Verification of principle of superposition with dc and ac sources.
2. Verification of Thevenin, Norton and Maximum power transfer theorems
3. Verification of Tellegin's theorem for two networks of the same topology.
4. Transmission and hybrid parameters
5. Running instructions in Interactive interpreter and a Python Script
6. Write a program to compute distance between two points taking input from the user
7. (Pythagorean Theorem)
8. Write a Program for checking whether the given number is a even number or not.
9. Write a program using a while loop that asks the user for a number, and prints a countdown from that number to zero.
10. Write a program to compute the number of characters, words and lines in a file.
11. Find mean, median, mode for the given set of numbers in a list.
12. Write a script that imports requests and fetch content from the page. Eg. (Wiki)
13. Write a GUI for an Expression Calculator using tk
14. Write a test-case to check the even numbers
15. Data acquisition using virtual instrumentation from temperature transducer
16. Data acquisition using virtual instrumentation from pressure transducer
17. Stepper motor control using virtual instrument
18. Study of PI, PID Controller
19. Locus Diagrams of RL and RC Series Circuits
20. Simulation of DC Circuits
21. Reciprocity and Millmann's Theorems
22. Characteristics of I/P and P/I converters

ELE 307 -Laboratory course- VI

Credits: 04	Contact Hours: 60 Hrs (Hands On)	Total Marks: 100 [CA=25(Test+Viva+Journal), ESA=75]

At least 12 experiments be completed by a student for each lab course.

1. Study of some discrete- time signals
2. Design and study of some FIR filters
3. Study of triangular and Blackman windows
4. Design of FIR filters using windowing technique
5. Design of filters based on pole-zero placements
6. Introduction to Software Tools MPLAB, PROTEUS, and PIC programmer.
7. Some Logic Functions Design using PIC 16
8. Write the program for PIC16 to create delay using Timer Register
9. Study of implementation of DC Motor control using PWM method
10. Write the program to Transmission and Reception of data through serial port using PIC 16
11. Write the program to blink LED using PIC 12
12. Write the program for PIC 12 to rotate dc motor clockwise and anticlockwise using Button
13. Write the program to interface Bluetooth with Pi and send the data to smart phone
14. Write the program to control the dc motor using smart phone
15. Design smart home automation system using raspberry Pi
16. Automatic indication of water tank level using PLC
17. Study of Traffic lights indication using PLC
18. Study of Logic Gates using PLC
19. Forward and Reverse direction control of Motors using PLC
20. Calibration of thermocouple/ for temperature measurement.
21. Study and calibration of a rotameter for flow measurement.

ELE 406 - Project

M. Sc.-II (Electronics)/Semester IV students will have project of 200 marks.

The Projects will be evaluated at the time of final examination, jointly by the external and internal examiners, by conducting viva and demonstration of the project work.

[Note:- Not more than 6 to 8 projects be evaluated by a single external examiner]

A copy of the project work be made available to the external examiner at least a day before the actual date of examination.

GUIDELINES FOR PROJECTS:

1. The Project experiment should be open ended
2. It may be based on any topics of the syllabus
3. It may be based on collection of data and then analysis leading to some meaningful conclusion
4. It may be based on review of a suitable research topic
5. It may be based on development of a new idea and design/fabrications
6. It may consist of hardware and software

PRESENTATION OF THE PROJECT:

Actual presentation format of the project may be decided by the teacher and the student. However, the following guidelines are given for general consideration.

1. At least four copies of the project be submitted.
2. It should be typed on sunlit bond A4 paper, single side with one and half/double - spacing.
3. The project should be of 30 to 40 pages.
4. It should be duly certified by the project supervisor and countersigned by the Head of the Department.
5. The project record should include information under the following/suitable heads:

(a) Introduction
(b) Theory (Related to the project)
(c) Experimental details
(d) Observations and Graphs, if any
(e) Results and discussion
(f) References