Shri Rawatpura Sarkar University, Raipur

Scheme of Teaching, Examination

& Syllabus

for

M.TECH (INSTRUMENTATION & CONTROL)

Semester-(II)

(Effective from the session: 2022-23)

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Two Years M.Tech. Programme

Scheme of Teaching and Examination

M.Tech. Second Semester Instrumentation & Control

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

(Effective from the Academic Year 2022-2023)

S.No.	Course Code	Course Title	Hours / Week			Credits	Maximum Marks			Sem End Exam Duration (Hrs)
			L	T	P		Continuous Evaluation	Sem End Exam	Total	
1	MENIC201T	Microcontroller & Embedded Systems	3	1	-	4	30	70	100	3
2	MENIC201P	Microcontroller & Embedded Systems	-	-	2	1	15	35	50	-
3	MENIC202T	Optimal Control Systems	3	1	-	4	30	70	100	3
4	MENIC203T	Process Control & Industrial Automation	3	1	-	4	30	70	100	3
5	MENIC204T	Industrial Electronics & Power Control	3	1	-	4	30	70	100	3
6	MENIC205T	Elective – II	3	1	-	4	30	70	100	3
7	MENIC206P	Computer Simulation Lab	-	-	2	1	15	35	50	-
						22			600	

Elective-II

(A) Fuzzy - Neural Control.
(B) Computer Numerical Control & Programming.
(C) AI & ES in Industrial Systems.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">MICROCONTROLLER & EMBEDDED SYSTEMS</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC201T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic of microprocessor and microcontroller</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To understand the concepts of Hardware of various microcontrollers to enable Programming and Interfacing of microcontroller.
• To Introduce Bus Communication in processors, Input/output interfacing.
• To introduce the Building Blocks of Embedded System.
• To introduce Basics of Real time operating system and example tutorials to discuss on one real time operating system too.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-1
Microcontroller Architecture: 8 bit and 16 bit micro-controllers, Architecture, support devices, Signal Levels Timing and State Analysis, Programming Model.

UNIT-2
Programming and Modes: Instruction Sets, Addressing Models, Programmed I/O Interrupt System, Operation under Synchronous And Asynchronous Modes.

UNIT-3
Development and Applications: Microcomputer Based System-Programming Techniques, Microcontroller Development System. Advance Microcontrollers, some applications of Microcontroller Based Systems, Case Studies.

UNIT-4
Embedded Systems: Introduction to the Embedded Systems, Processor Structure, registers and memories, the Parallel and Serial communication ports, the timers, the Interrupts, Programming an Embedded System.

UNIT-5
OS for Embedded Technology: Operating Systems and Real Time Operating Systems, Programming Tools for the Embedded Devices and Handheld Embedded Devices, Recent advances in Embedded Systems Technology, Development and design of Embedded Software.</td></tr>
</table>

Course Outcomes	**At the end of this subject student is able to:** • Acquire a basic knowledge about fundamentals of microcontrollers. • Acquire a basic knowledge about programming and system control to perform a specific task. • Acquire knowledge about devices and buses used in embedded networking. • Develop programming skills in embedded systems for various applications • Acquire knowledge about basic concepts of circuit emulators.
Text Books	1. Microcontroller, Mazidi; Prentice Hall 2. Programming and Customizing the 8051 Microcontroller, Predko; Tata McGraw Hill
Reference Books	1. Embedded Systems, Raj Kamal; Tata McGraw Hill 2. Handbook of Microcontrollers, Myke Predko; McGraw Hill

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Course Title	**OPTIMAL CONTROL SYSTEMS**				
Course Code	**MENIS102T**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**		**4**	
Prerequisites	Basic control system				
Course Objectives	• Power-system protection deals with the protection of electrical power systems. • Protection from the faults through the disconnection of faulted parts from the rest of the electrical network. • To make power system efficient and economical.				
Course Contents	**UNIT-I** **Basics of Optimal Control**: Introduction. Statement of the optimal control problem. Dynamic programming. Bellman equations. **UNIT-II** **Variational calculus:** Introduction, Dynamic optimization without constraints. Euler Lagrange equation and transversality conditions. The problems. The problems of Bolza, Mayer and their solution. **UNIT-III** **Computational methods in optimal control:** Pontryagin's maximum principle. Rayleigh-Ritz method. Parametric expansion method. State increment dynamic programming. Gradient method. Method of steepest descent. Quasi-linearization and invariant embedding. **UNIT-IV** **Optimal Regulators:** Basic theory of the optimal regulator, standard regulator problem, tracking systems, properties and application of the optimal regulator, properties of optimal regulator systems with a classical control interpretation. **UNIT-V** **Estimation Techniques:** Asymptotic properties and Quadratic weight selection, state estimator design, systems design using state estimators, frequency shaping, controller reduction.				

Course Outcomes	**At the end of this subject student is able to:** • Mastering the concept and principle of the optimal control system based on quadratic performance index for regulator and tracking problems. • Able to solve the optimal control problem for the linear (nonlinear) plant to minimize the quadratic performance index and to design an optimal control system for real plant. • Able to do a computer simulation using MATLAB /Simulink. • Demonstrating attitude of responsibility on work in his/her field of expertise independently.
Text Books	1. . Modern Control System, M. Gopal; Prentice Hall 2. Optimal Control: Linear Quadratic Methods, Brian D.O. Anderson, John B. Moore; Prentice Hall
Reference Books	1. Introduction To Optimal Control, George Leitmann; Mcgraw Hill Publishing Company 2. Optimal Control: Theory, Algorithms, and Applications (Illustrated), Panos M. Pardalos, William W. Hager; Kluwer Academic Pub

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">PROCESS CONTROL & INDUSTRIAL AUTOMATION</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC103T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic automation</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• To develop the mathematical model of the physical system.
• To analyse the interdependency of multivariable controller.
• To design a controller for practical systems under different condition.
• Explain the different processes involved in process industry with special reference to Power production.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Introduction to Process Control: elements of process loop, controller principles, pneumatic indicators, receivers, transmitters, indicating controllers. Analog Controller, Digital Controller, Microprocessor and personal, Smith predictor.

UNIT-II
Actuators: Hydraulic, pneumatic, electric and electronic actuators and controllers, final control system. Control modes. Tuning procedures. Special feedback techniques.
UNIT-III
Digital control: Principles, Microprocessor controllers. Industrial telemetering techniques, soft computing techniques.

UNIT-IV
Advanced Control: Direct Synthesis and Adaptive Control. Multiple feedback controllers. Decoupling and feed-forward methods.

UNIT-V
Dynamic Control: Fault tolerance and optimizing processes. Process control computers. Dynamic Analysis of industrial processing systems, control schemes, synthesis of multivariable control configurations for single units and complete process plants.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this subject student is able to:
1. Analyze a physical system and develop the mathematical model of the physical system
2. Design a controller for practical systems under different condition.</td></tr>
</table>

	3. Explain the operation of different complex control schemes. 4. Analyze the optimization technique for dynamic control system 5. Justify the need of process control in different plants and industries
Text Books	1. Process Control Instrumentation Technology- C. Johnson; Prentice Hall, 7th Ed. 2. Process Control Systems, F.G. Shinskey, McGraw Hill,
Reference Books	1. Chemical Process Control : An Intro. to Theory and Practice, G. Stephanopoulos; Prentice Hall 2. Design for Manufacturability Handbook, James G. Bralla

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">INDUSTRIAL ELECTRONICS & POWER CONTROL</td></tr>
<tr><td>Course Code</td><td colspan="5">MENPIC204T</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic power electronics</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• This course gives a comprehensive coverage of various control electronics used in the industries.
• This combines the analog and digital concepts together with Power Electronics for the design of the controllers.
• Further an overview of stepper motor with associated control circuits is given.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Basics of Industrial Electronics: Industrial Safety, Understanding Industrial Electrical Diagrams, Four Layer Devices, Power Transistor, characteristics, triggering techniques, commutation circuits.

UNIT- II
Converters and Transformers: Thyristor controlled power rectifiers, converters, Transformers and Power Distribution Systems, Industrial Control Devices.

UNIT-III
Inverters, Choppers and Motor Control: Inverters, chopper circuits, Industrial Motors and generators, Relays, Contactors and Motor Starters, Speed control of AC/DC motors, Motor Control Circuits, Types of control, Control of electronic motors.

UNIT-IV
Computer Control of Motors: Computer Controlled Machines and Processes, PAM, PWM, PPM techniques, soft starting techniques.

UNIT-V
Power Supplies and Heat Sinks: Single phase and three-phase uninterrupted power supplies, Regulated Power Supplies, Heat sink design.</td></tr>
<tr><td>Course Outcomes</td><td colspan="5">At the end of this subject student is able to:
At the end of this subject student is able to:
1. Understand the working of various power electronic circuits and components used in industrial applications.</td></tr>
</table>

	2. Analyze various analog controllers and signal conditioning circuits. 3. Design control circuits for UPS and other industrial applications.
Text Books	1. Power Electronics, Khanchandani; Prentice Hall 2. Industrial Power Control, Rashid; Prentice Hall
Reference Books	1. Electronic Power Control, Gottlieb; Prentice Hall 2. Industrial Electronics, Frank D. Petruzella, Tata McGraw Hill 3. Handbook of Electric Motor Control Systems, Eswar; Tata McGraw Hill

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">FUZZY- NEURAL CONTROL</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC205TA</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Fundamental of Computing</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• Provide an understanding of the basic mathematical elements of the theory of fuzzy sets.
• Provide an emphasis on the differences and similarities between fuzzy sets and classical sets theories.
• Explain the concepts of neural networks, fuzzy logic, and genetic algorithms.
• Enable students to Solve problems that are appropriately solved by neural networks, fuzzy logic, and genetic algorithms.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Basics of Neuroscience and Artificial Neuron Models: Graphs, Algorithms, Deed Forward Networks, Perceptions and LMS Algorithm, Multilayer Networks, Complexity of Learning using Feed Forward Networks, Adaptive Structure Networks, Recurrent Networks, Competitive Learning and Self-Organizing Networks.

UNIT-II
Fuzzy Logic: Classical Sets and Fuzzy Sets, Classical Relations and Fuzzy Relations, Membership Functions, Fuzzy-to-Crisp conversions, Fuzzy Arithmetic, Numbers, Vectors, Extension Theorem, Classical Logic and Fuzzy Logic.

UNIT-III
Fuzzy Systems: Fuzzy Rule-Based Systems, Fuzzy Non-linear Simulation, Fuzzy Decision Making, Fuzzy Classification, Fuzzy Pattern Recognition, Fuzzy Control Systems, Fuzzy Measures - Belief, Plausibility, Evidence, Probability and Possibility.

UNIT-IV
Approximate Reasoning and Learning: A unified Approximate reasoning Approach, Multivariable Blood Pressure Control: an application of approximate reasoning, Constructing rule-bases by self-learning: system structure and learning algorithm, Rule-base formation and application, Neural Network based approximate reasoning, principles and implementation.

UNIT-V
Fuzzy Controllers: BNN Network based Fuzzy controller with Self Learning</td></tr>
</table>

	Teacher, A Hybrid Neural Network based Self-organizing Fuzzy Controller, CPN Network based Fuzzy controller: explicit representation and self construction of rule bases, Fuzzified CMAC and RBF network based self-learning controllers .
Course Outcomes	**At the end of this subject student is able to:** • Understand basic knowledge of fuzzy sets and fuzzy logic. • Apply basic fuzzy inference and approximate reasoning. • Understand principles of neural networks. • Apply basic fuzzy system modelling methods.
Text Books	1. Neural Network Fundamentals with Graphs, Algorithms and Applications, Bose, Tata Mcgraw Hill
Reference Books	1. Neural Networks: A Comprehensive Foundation, Simon Haykin, Prentice Hall, 2nd Ed. 2. Fuzzy-Neural Control: Principles, Algorithms and Applications, Junhong Nie, Derek Linkes; Prentice Hall 3. Fuzzy Logic with Engineering Applications, Timothy Ross; Pearson Education

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Course Title	**COMPUTER NUMERICAL CONTROL & PROGRAMMING**				
Course Code	**MENIC205TB**				
Course Credits	**L**	**T**	**P**	**TC**	
	3	**1**		**4**	
Prerequisites	Basic of CNC				
Course Objectives	• Introduces the basic programming skills used with Fanuc (G&M compatible) controlled CNC turning centers. • Student will understand programming for CAD • Understanding of different CNC tools.				
Course Contents	**UNIT-I** **Introduction:** NC/CNC, CNC machines, Industrial applications of CNC, economic benefits of CNC. **UNIT-II** **CNC Machine Tools:** Classification of machine tools, CNC machines tool design, control systems. **UNIT-III** **Control and Input:** Position control velocity control and machine tool control, Interpolation and electronics. Data Input: Punched tape, manual data input, tape punch, reader error checking. **UNIT-IV** **CNC tooling:** Qualified and pre-set tooling, tooling systems, tool setting, automatic tool changers, work holding and setting. **UNIT-V** **Programming:** Part programming language, programming procedures, proving part programmes, computer aided part programming. Advances: Advances in CNC programming, integration with CAD, material handling in CNC machines, manufacturing systems.				
Course Outcomes	**At the end of this subject student is able to:** • Understand the basic procedures and concepts of programming, set up and operation of a CNC Machining Center. • Identify and understand the basic programming codes. • Create geometry and toolpaths from the specifications on a blueprint for simple parts using Mastercam programming software. • Identify and define the functions of the CNC machine control. • Set up the CNC machining center for manufacturing simple parts				

	• Manufacture simple parts on the CNC machining center.
Text Books	1. CNC Technology and Programming, Krar, S., and Gill, A., McGraw Hill 2. Introduction to Computer Numerical Control, Barry Leatham - Jones, Pitmans, London
Reference Books	1. Numerical control and Computer Aided Manufacturing, T.K. Kundra, P.N. Rao and N.K. Tewari, Tata McGraw Hill 2. Computer Numerical Control, Concepts and Programming, W.S. Seames, Delmar Publ. Inc 3. Essentials of Numerical Control, R.G. Rapello, Prentice Hall, 4. Numerical Control Programming, G.C. Stanton, John Wiley and Sons, New York

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">AI & ES IN INDUSTRIAL SYSTEMS</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC205TC</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>3</td><td>1</td><td></td><td>4</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Basic of computer</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• The aim of Artificial Intelligence & Machine Learning course is to prepare students for career in computer science & engineering where knowledge of AI & ML techniques leading to the advancement of research and technology.
• Artificial Intelligence and Machine Learning are the terms of computer science.Machine learning in which machinecan learn by its own without being explicitly programmed.
• It is an application of AI that provide system the ability to automatically learn and improve from experience.</td></tr>
<tr><td>Course Contents</td><td colspan="5">UNIT-I
Introduction to Artificial Intelligence: Overview of AI, LISP and other AI programming Languages

UNIT-II
Knowledge Representation: Formalized Symbolic Logics, Dealing with Inconsistencies and Uncertainties, Probabilistic Reasoning, Structured Knowledge, Graphs, Frames and related structures, Object Oriented Representations.

UNIT-III
Knowledge organization and manipulation: search and control strategies, Parallel and Distributed AI, Matching Techniques, Knowledge Organization and Management, Perception.

UNIT-IV
Communication and Expert Systems: Natural Language Processing, Pattern Recognition, Visual Image Understanding, Expert Systems Architectures; Problems, problem spaces and search, Heuristic search techniques, Using Predicate Logic, Representing knowledge using rules, symbolic reasoning under uncertainty, statistical reassigning, weak slot-and-filter structures, strong slot-and-filter structures, game playing, understanding

UNIT-V
Knowledge Acquisition: Machine Learning, connectionist models, common sense, perception and action, Learning by Induction, Analogical and Explanation-based Learning.</td></tr>
</table>

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

Course Outcomes	**At the end of this subject student is able to:** • Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems. • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate proficiency in applying scientific method to models of machine learning. Discuss the awareness of ANN and different optimizations techniques • Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning. • Demonstrate proficiency in applying scientific method to models of machine learning. • Discuss the basics of ANN and different optimizations techniques.
Text Books	1. Introduction to Artificial Intelligence and Expert Systems, Dan W. Patterson; Prentice Hall 2. Artificial Intelligence, Rich; Tata Mcgraw Hill
Reference Books	1. AI - A Modern Approach, Stuart Russell, Peter Norvig; Pearson Ed. 2. Artificial Intelligence, George F. Luger; Pearson Ed. 3. An Introduction to Expert Systems, James P. Ignizio; Mcgraw Hill

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">MICROCONTROLLER & EMBEDDED SYSTEM</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC201P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td>0</td><td>0</td><td>2</td><td>1</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Microprocessor and microcontroller</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• Identify hardware and software components to build an embedded system.
• Demonstrate the interfacing of peripherals with 8051/ARM microcontroller.
• Porting of OS on to ARM processor board.
• Demonstrate Deadlock situation in RTOS.</td></tr>
<tr><td>Course Contents</td><td colspan="5">List of Experiments:
1. Write a microcontroller 8051 program to transfer the bytes into RAM locations starting at 50H, assuming that ROM space starting at 240H contains CHHATTISGARH by using – a) a Counter, b) null char for end of string .
2. Write a microcontroller 8051 program to get hex data on the range of 00-FFh from port 0 and convert it to decimal. Save the digits in R7, R6 and R5, where the least significant digit is in R7.
3. Write a microcontroller 8051 program to add two 16 Bit unsigned numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
4. Write a microcontroller 8051 program to subtract an unsigned 16 Bit number from another. Operands are two RAM variables. Results to be in R1-R0 pair.
5. Write a microcontroller 8051 program to add two unsigned 32-bit numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
6. Write a microcontroller 8051 program to add two 16 Bit signed numbers.
7. Write a microcontroller 8051 program to convert a binary number to equivalent BCD
8. Write a microcontroller 8051 program to convert a packed BCD number to two ASCII numbers and place them in R5 and R6.
9. Write a microcontroller 8051 program to calculate the square root of an 8-bit number using iterative method.
10. Write a microcontroller 8051 program to add two floating-point numbers.
11. Write a microcontroller 8051 program to multiply two floating-point numbers.
12. Write a microcontroller 8051 program that generates 2kHz square wave on pin P1.0, 2.5 kHz on pin P1.2 and 25 Hz on pin P1.3.
13. Write a microcontroller 8051 program for counter 1 in mode 2 to count the pulses and display the state o the TL1 count on P2. Assume that the clock pulses are fed to pin T1.
14. Write a microcontroller 8051 program to transfer letter “N” serially at 9600 baud, continuously. Assume crystal frequency to be 11.0592 MHz.</td></tr>
</table>

	15. Write a microcontroller 8051 program to transfer word "CSVTU" serially at 4800 baud and one stop bit, continuously. Assume crystal frequency to be 11.0592 MHz. 16. Write a microcontroller 8051 program to receive bytes of data serially, and put them in P1. Set the
Course Outcomes	**At the end of this subject student is able to:** • Learn basic hardware of various microcontrollers. • Assembly and programming concepts, jump and call instructions. = • Hardware interfacing of microcontroller with led's, seven segment, sensors.
Text Books	8051 Programming, Interfacing and Applications, K.J. Ayala; Penram Publ.

SHRI RAWATPURA SARKAR UNIVERSITY, RAIPUR, CHHATTISGARH
FACULTY OF ENGINEERING

<table>
<tr><td>Course Title</td><td colspan="5">COMPUTER SIMULATION LAB</td></tr>
<tr><td>Course Code</td><td colspan="5">MENIC202P</td></tr>
<tr><td rowspan="2">Course Credits</td><td>L</td><td>T</td><td>P</td><td>TC</td><td></td></tr>
<tr><td></td><td></td><td>2</td><td>1</td><td></td></tr>
<tr><td>Prerequisites</td><td colspan="5">Power system protection</td></tr>
<tr><td>Course Objectives</td><td colspan="5">• Knowledge of SIMULATION.
• Students learn 2D design and modeling in MATLAB
• Students learn modeling 3d Drawings
• Students learn writing commands</td></tr>
<tr><td>Course Contents</td><td colspan="5">List of Experiments:
1. Write a computer simulation program to generate, analyze and display various waveforms.
2. Write a computer simulation program to generate multiple waveforms and waveform properties on the same waveform graph.
3. Write a computer simulation program to simulating alarm conditions and generating an alarm.
4. Write a computer simulation program to write instrumentation data to a file.
5. Write a computer simulation program for controlling the saving of data to a data file.
6. Write a computer simulation program to generate a signal, reduce the number of samples in the signal, and display the resulting data in a table in the front panel.
7. Write a computer simulation program to prepare a virtual instrument for use as a sub- virtual instrument. Let the virtual instrument convert measured temperature in °C to °F.
8. Write a computer simulation program that generates random numbers until the number generated matches a number we specify. The number of iterations should be counted and displayed.
9. Write a computer simulation program to run a virtual instrument loop a specified number of times.
10. Write a computer simulation program to add a shift register to a virtual instrument loop for averaging data points.
11. Write a computer simulation program to use a shift register in a virtual instrument loop for accessing values from previous iterations in a loop.
12. Write a computer simulation program to build a virtual instrument that displays two plots, a random plot and a running average of the last four points, on a wave display in sweep update mode.
13. Write a computer simulation program for creating array controls, indicators and</td></tr>
</table>

	constants. 14. Write a computer simulation program to generate a random linear signal. 15. Write a computer simulation program to set up annunciation using a random linear signal
Course Outcomes	**At the end of this subject student is able to:** • Understand the main features and importance of the MATLAB • Solve, Simulate and Analyse various AC circuits. • Solve, Simulate and Analyse simple Transformer and DC Generator circuits
Text Books	1 Manuals of the Simulation software used