BIT, DURG

Chhattisgarh Swami Vivekanand Technical University, Bhilai, CG

SCHEME OF MASTER OF TECHNOLOGY

Electronics & Telecommunication Engineering (Instrumentation & Control)

M.Tech. [Second Semester]

S. No.	Board of Studies	CODE	SUBJECT	Weekly Teaching Hrs.			Scheme of Examination			GRAND TOTAL	Credits
				L	T	P	ESE	TA	CT		
1	Electronics & Telecomm.	528211(28)	Microcontroller & Embedded Systems	3	1	-	100	20	20	140	4
2	Electronics & Telecomm.	528212(28)	Optimal Control Systems	3	1	-	100	20	20	140	4
3	Electronics & Telecomm.	528213(28)	Process Control & Industrial Automation	3	1	-	100	20	20	140	4
4	Electronics & Telecomm.	528214(28)	Industrial Electronics & Power Control	3	1	-	100	20	20	140	4
5	Electronics & Telecomm.	Refer Below Elective – II		3	1	-	100	20	20	140	4
6	Electronics & Telecomm.	528221(28)	Microcontroller & Embedded Systems Lab	-	-	3	75	75	-	150	2
7	Electronics & Telecomm.	528222(28)	Computer Simulation Lab	-	-	3	75	75	-	150	2
			TOTAL	**15**	**5**	**6**	**100**	**250**	**650**	**1000**	**24**

Table-II

ELECTIVE - II			
S.No.	**Board of Study**	**Subject Code**	**Subject**
1	Electronics & Telecomm.	528231(28)	Fuzzy - Neural Control
2	Electronics & Telecomm.	528232(28)	Computer Numerical Control & Programming
3	Electronics & Telecomm.	528233(28)	AI & ES in Industrial Systems

Note (1) – ***1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.***

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Microcontroller & Embedded System** Code: **528211 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

UNIT-I

Microcontroller Architecture: 8 bit and 16 bit micro-controllers, Architecture, support devices, Signal Levels Timing and State Analysis, Programming Model.

UNIT-II

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

UNIT-III

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

UNIT-IV

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-V

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.

Names of Text Books:

1. Microcontroller, *Mazidi*; Prentice Hall
2. Programming and Customizing the 8051 Microcontroller, *Predko*; Tata McGraw Hill

Name of Reference Books:

1. Embedded Systems, *Raj Kamal*; Tata McGraw Hill
2. Handbook of Microcontrollers, *Myke Predko*; McGraw Hill

Further Reading:

1. EDN's 2005 Microprocessor/Microcontroller Directory

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Optimal Control Systems** Code: **528212 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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.

Names of 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

Name of 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

Further Reading:

1. The Control Handbook, *William S. Levine*
2. Handbook of Intelligent Control Neural, Fuzzy, and Adaptive Approaches, White D.A., Sofge D.A., eds., Van Nostrand

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Process Control & Industrial Automation** Code: **528213 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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.

Names of Text Books:

1. **Process Control Instrumentation Technology- *C. Johnson*;** Prentice Hall, 7th Ed.
2. **Process Control Systems, *F.G. Shinskey***, McGraw Hill,

Name of Reference Books:

1. **Chemical Process Control : An Intro. to Theory and Practice, *G. Stephanopoulos***; Prentice Hall
2. **Design for Manufacturability Handbook, James G. Bralla**

Further Reading:

1. Advanced Practical Process Control, Brian Roffel
2. Handbook of Intelligent Control Neural, Fuzzy, and Adaptive Approaches, White D.A., Sofge D.A., eds., Van Nostrand

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Industrial Electronics & Power Control** Code: **528214 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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.

Names of Text Books:

1. **Power Electronics, *Khanchandani***; Prentice Hall
2. **Industrial Power Control, *Rashid*;** Prentice Hall

Name of 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

Further Reading:

1. Analog Signal Processing, Ramon Pallas-Areny & John G. Webster
2. The Art of Electronics, Paul Horowitz & Winifield Hill
3. Active Filter Cookbook, Don Lancaster

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Fuzzy- Neural Control** Code: **528231 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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 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 .

Names of Text Books:

1. **Neural Network Fundamentals with Graphs, Algorithms and Applications, *Bose*,** Tata Mcgraw Hill

Name of 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

Further Reading:

1. Intelligent Sensor Systems, John Brignell & Neil White
2. Handbook of Fuzzy Computing, W. Pedrycz, E. Ruspini and P. Bonnisone; Oxford University Press
3. Handbook of Neural Computation, K. J. Cios, W. Pedrycz, Neuro-fuzzy systems, IOP Publishing and Oxford University Press
4. Handbook of Intelligent Control Neural, Fuzzy, and Adaptive Approaches, White D.A., Sofge D.A., eds., Van Nostrand

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Computer Numerical Control & Programming** Code: **528232 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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.

Names of 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

Name of 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

Further Reading:

1. Assembly Automation: A management handbook, *Frank Riley*
2. Machining and CNC Technology, Activities Manual; McGraw-Hill

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **AI & ES in Industrial Systems** Code: **528233 (28)**
Total Theory Periods: **40** Total Tutorial Periods: **12**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted**: 02**

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.

Names of Text Books:
1. **Introduction to Artificial Intelligence and Expert Systems**, ***Dan W. Patterson***; Prentice Hall
2. **Artificial Intelligence**, ***Rich***; Tata Mcgraw Hill

Name of 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

Further Reading:
1. Encyclopedia of Artificial Intelligence, Hapiro, Stuart C., John Wiley & Sons, New York,
2. The Handbook of Artificial Intelligence, Avron Barr and Edward A. Feigenbaum, Volumes 1-4, Addison-Wesley

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Microcontroller & Embedded System Lab** Code: **528221 (28)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **75**
Minimum number of class test to be conducted: 02

Experiments to be performed:

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 8bit 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.
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 baud rate at 2400 baud, 8-bit data, and 1 stop bit. Assume crystal frequency to be 11.0592 MHz.

List of Equipments/Machine Required:
Microcontroller kit, Interfacing kit, Keyboard, Monitor, SMPS for Microcontroller

Recommended Books:
8051 Programming, Interfacing and Applications, *K.J. Ayala*; Penram Publ.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. II** Branch: **Electronics & Telecom**
Subject: **Computer Simulation Lab** Code: **528222 (28)**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **75**
Minimum number of class test to be conducted: **02**

Experiments to be performed:

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 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.

List of Equipments/Machine Required:
PC, Virtual Instrumentation Simulation Software

Recommended Books:
Manuals of the Simulation software used