SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 4			Theory Paper
			L	T	P	
DE-4	Embedded System	EI-1871(A)	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

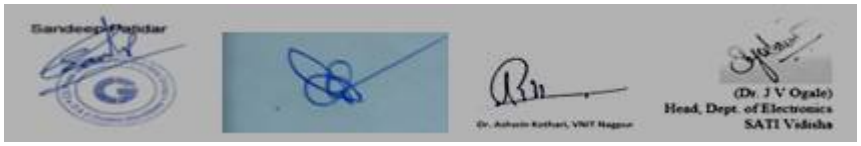
Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1871(A)	Embedded System	70	20	10	-	-	100

Course Description	This course is a study of advanced processor architecture and programming topics focused on embedded system, their physical architecture and design of embedded system and techniques for embedded software development and debugging. Emphasis is placed on the appropriate use and choice of processor technology.
Prerequisite Knowledge	Basic of Computer Languages like C & C++ , Digital System Design, Basic Processor Architecture
Course Objectives	Upon completion of this course, the student will be able to: 1. Learn different embedded software development methods, particularly Top-Down design 2. Develop Real world embedded solution. 3. learn Tradeoff between H/W and S/W design.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO-1** Gain Knowledge and Describe the embedded systems, architectures & programming. **CO-2**Identify complex issues in embedded systems. **CO-3**Apply knowledge in planning and implementing embedded solutions for real world problems. **CO-4** Elucidate the design tradeoffs of hardware and software.

Syllabus

Unit-I

Introduction to Embedded Systems-Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems. Memory: ROM, RAM, and Memory according to the type of Interface, Memory selection for Embedded Systems, Sensors and Actuators, Communication Interface: Onboard and External communication interfaces.



Unit-II

Embedded Processors: Review of MCS-51 family, Peripheral of MCS-51 family, Introduction to MCS-96 family, Peripherals of MCS-96 family, Introduction to PIC & Motorola MC68H11 Family Architecture: Registers, Addressing modes, Interrupts ,watchdog timer, Introduction to ARM Architecture: Registers, Program Status Register, Instruction Pipeline, Interrupts

Unit-III

Embedded Programming, Introduction to RIO Architecture, RT Programming –Introducing ARM with LabVIEW ,Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits, the need for pull-up resistors, creating 'hardware delays' using counters, Example: Generating a precise, Delay, Simple LabVIEW Programs using Function Calls, Funtional global variables . coding guidelines.

Unit-IV

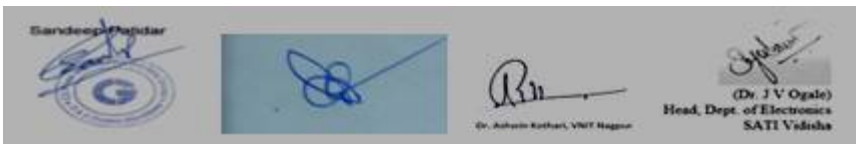
Embedded Software development and tools-Embedded software devolution trends, Requirement engineering, Design: design tradeoff, hardware software co-design, implementation, integration & testing, packaging. Assembler, cross compiler, simulators, emulator, debugger, Integrated Development Environment.GNU development tools, tools for device driver development

Unit-V

RTOS Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling.
Task Communication: Shared Memory, Message Passing, Remote Procedure Call and Sockets, Task Synchronization: Task Communication/Synchronization Issues, Task Synchronization Techniques, Device Drivers, How to Choose an RTOS, Introduction to FPGA , Advantages f FPGA over RTOs, FPGAs for High speed data acquisition and control.

Text Books:

1 .Embedded Systems -Raj Kamal, TMH.
2. Embedded/ Real time systems: concepts, design & Programming-K.V.K.K. Prasad, Dream tech press
3.The 8051 Microcontroller And Embedded Systems-M. Mazidi, J. Mazidi, R. Mckinlay
4.8051 Microcontroller: Architecture and Programming - Ayala



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)
ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 4			Theory Paper
			L	T	P	
DE-4	Advanced Digital Signal Processing	EI-1871(B)	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1871(B)	Advanced Digital Signal Processing	70	20	10	-	-	100

Course Objectives	At the completion of this course the student should have in-depth knowledge of processing digital signals through understanding and working knowledge of design implementation and analysis.
Prerequisite Knowledge	Digital Signal Processing, Multi rate signal processing.
Course Description	This course discusses advanced topics in digital signal processing such as implementation of systems, multi-rate digital signal processing, Filter bank and quantization.
Course Outcomes	Student will be able to **CO-1** Acquire knowledge of multi rate systems and filer banks. **CO-2**Able to design multi rate system **CO-3**Able to identify different issues related to ultirate and filter bank. **CO-4**Able to determine performance parameters by investigation. **CO-5**Able to resolve issues.

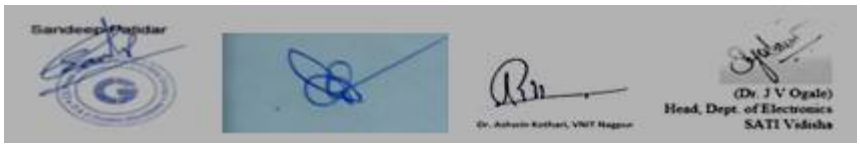
Syllabus

UNIT-I

Fundamentals of multirate systems, decimation, interpolation, aliasing, imaging, single stage and multistage implementation, polyphase representation, anti-alias and anti-image filters.

UNIT-II

Filterbanks: Introduction, analysis and synthesis filter banks, two-channel QMF, M-channel filterbanks, Tree structured filterbanks, polyphase representation.



UNIT-III

Cosine modulated filter banks, near perfect and perfect reconstruction, pseudo QMF bank, polyphase structure.

UNIT-IV

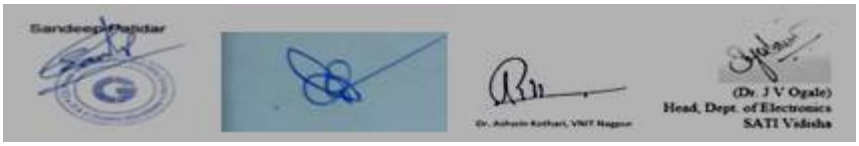
Design of cosine modulated filterbanks, paraunitary filterbanks.

UNIT-V

Quantization effects: Types of quantization effects, standard techniques, noise in filterbanks, coding gain, sub-band coding. Introduction to Wavelet transform , Continuous time and Discreate time wavelet Transform, Haar wvelet, Walsh hadamard transform.

Suggested Text Books:

1. Multirate systems and filterbanks, P.P. Vaidyanathan, Preason Edu.
2. Digital signal processing: A computer based approach, S.K. Mitra, TMH.
3. Multirate digital signal processing, N.J. Fliege., John Wiley.
4. Multirate Digital Signal Processing, Crochiere and Rabiner., PHI.
5. **Digital Signal Processing- A Practical Approach - Ifeachor and Jervis PHI**
6. Introduction to Wavelet Transorm-S.V Narsimham



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits – 4			Theory Paper
			L	T	P	
DE-4	**DSP Processors**	EI-1871-(C)	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1871-(C)	DSP Processors	70	20	10	-	-	100

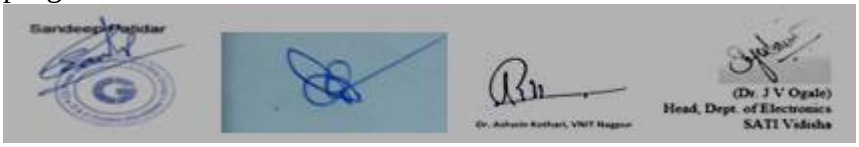
Course Description	Real time Digital Signal Processing (DSP) using general purpose Digital Signal Processors is a very hot subject and challenging work in today's engineering fields. Real Time DSP provides an effective way for designing and implementing a variety of DSP algorithms for real world applications with DSP penetrating into various applications, the demand for high performance digital signal processors has expanded rapidly in recent years. It has become increasingly important for today's students to master not only theory of DSP, but also the techniques involved in real-time DSP system design and implements.
Prerequisite Knowledge	Digital Signal Processing
Course Objectives	After completing this course student will be able to understand Architecture, Working, and Implementation of Digital Signal Processors for solving Real World Problems.
Course Outcomes	After completion of the course students should be able to 1. Identify and formalize architectural level characterization of Programmable -DSP hardware. 2. Design, program (assembly and C), and test code using Code Composer Studio environment. 3. Deploy DSP hardware for controlling Audio and Video Signal processing application. 4. Understand major areas and challenges in DSP based embedded systems. 5. Formulate engineering problems in terms of DSP tasks.

Syllabus

Unit I: Introduction to Programmable DSPs: Processing Architectures (von Neumann, Harvard) special Architectures Modules used in Digital Signal Processors (like MAC unit, Barrel Shifters) on chip peripherals, Software development tools, DSP Core algorithms (FIR, IIR, Convolution, Correlation, FFT).

Unit II Implementation Considerations: IEEE standard for fixed and floating Point computations, finite wordlength Effects, Programming issues - Addressing modes, pipelining instruction cache, interrupts, Real Time Implementations Considerations - Signal converters stream processing, block processing vector processing, DSP benchmarking, Hardware interfacing.

Unit III: Fixed point Digital Signal Processors TMS320C54x: Internal Architecture, Arithmetic & Logic unit, Auxillary Registers Addressing modes, Instruction set, Application programs in C54x.

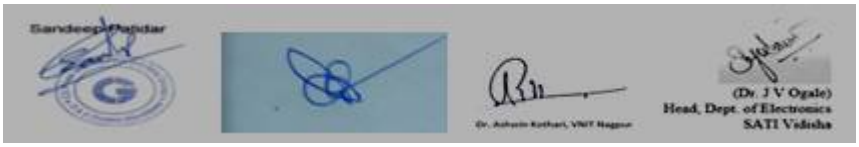


Unit IV: Floating Point Digital Signal Processors TMS320C67x: Architecture, Memory Organization, Addressing Mode, Instruction Set, Progrmamming Considerations, Real Time Implementations, Assembly Language programming, Code Composer Studio, Mixed C and Assembly language Programming.

Unit V: Limitaions of Programmable DSPs, FPGA base Digital System Design, Introduction to Multi Core Computing and Applicability for DSP Hardware.

Text Books:

1. Digital Signal Processors Architectures, Implementations and Applications, Sen M. Kuo and Woon-Seng Gan, Pearson Publication.
2. Digital Signal Processors, Architecture, Programming and Applications, B. Venkataramani, M. Bhaskar, Tata McGraw-Hill Education.
3. Real time digital signal Processing fundamentals, algorithms and Implementations using TMS Processors, V. Udayashankara, PHI.
4. Introduction to Parallel Processing by M. Sarikumar, D. Shikhare, Rani Prakash, PHI
5. Multi Core Embedded Systems - Georgios Kornaros, CRC Press.



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

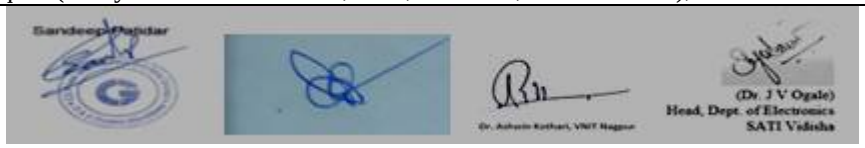
ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 6			Theory Paper
			L	T	P	
Departmental Elective-5	Digital Image Processing	EI 1872 A	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI1872 A	Digital Image Processing	70	20	10	-	-	100

Course Objectives	The Student will be able to understand fundamentals of digital image processing to compare different algorithms and implementations.
Prerequisite Knowledge	Basic Electrical Concepts, Analog and Digital Electronics, Signal Processing
Course Description	To learn and understand the fundamentals of digital image processing, and various image, Transforms, Image Enhancement Techniques, image compression methods and segmentation, and morphology used in digital image processing.
Course Outcomes	Upon completion of this course, student will be able to 1. Analyze basic concepts of two-dimensional signal acquisition, sampling, and quantization. 2. Employ image processing algorithms and techniques in image enhancement, restoration. 3. Identify and execute applications of image processing in various domains by applying image compression, image segmentation and morphological operations.

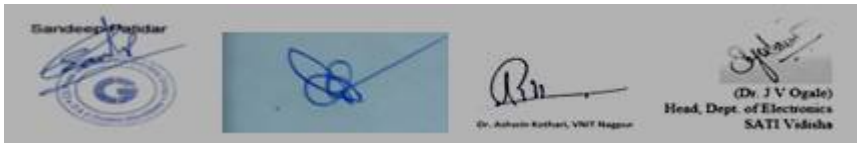
Syllabus	
	Topics covered
Unit-I	Elements of a Digital Image Processing system, Image formation, simple image model, Sampling and Quantization, Relationship between pixels, Distance measures, Image acquisition, Image processing applications.
Unit-II	Introduction to Fourier transform-DFT, Properties of two dimensional FT, Separability, Translation, Periodicity, Rotation, Average value, FFT algorithm, Walsh transform, Hadamard transform, Discrete Cosine transform.
Unit-III	Image Enhancement: Definition, Spatial domain methods, Frequency domain methods, Histogram modification technique, Neighborhood averaging, Median filtering, Lowpass filtering, Averaging of multiple images, Image sharpening by differentiation and high pass filtering.
Unit-IV	Image Restoration and Image Compression: Definition, Degradation model, Noise Models, Classification of image restoration techniques, Inverse Filtering, Wiener Filtering. Introduction to Image Compression and its need, Coding Redundancy, Classification of Compression Techniques (Lossy and Losless - JPEG, RLE, Huffman, Shannon fano), Scalar & Vector Quantization



Unit-V	Image Segmentation And Mathematical Morphology: Point, Edge, Line detection, Line detection using Hough Transform, Thresholding, Region based segmentation. Morphological operations: Dilation, Erosion, Opening and Closing, some basic gray scale morphological operations.

Text Books:

1. Rafael, C. Gonzalez., and Paul, Wintz, "Digital Image Processing", Addison-Wesley Publishing Company.
2. Jain Anil K., "Fundamentals of Digital Image Processing", Prentice Hall.
3. Rosenfeld, and Kak, A.C., "Digital Image Processing", Academic Press.
4. William K. Pratt., "Digital Image Processing", John Wiley and Sons



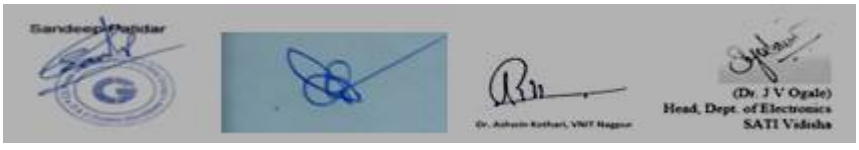
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits-4			Theory Paper (ES)
			L	**T**	**P**	
DE -5	Digital System Design Using VHDL	EI – 1872(B)	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1872 (B)	**Digital System Design Using VHDL**	**70**	**20**	**10**	**-**	**-**	**100**

Course Description	This course instructs the students in the use of VHDL (Very High Speed Integrated Circuit Hardware Description Language) for describing the behavior of digital systems. VHDL is a standardized design language used in computer/ semiconductor industry. This course will teach students the use of the VHDL language for representation of digital signals, use of IEEE standard logic package/library, design description, design of arithmetic, combinational, and synchronous sequential circuits.
Prerequisite Knowledge	Students must demonstrate a working knowledge of digital logic and design techniques
Course Objectives	1. Students must learn the basics, methodology & IEEE Standard of VHDL. 2. Students must be able to simulate and debug digital systems described in VHDL. 3. Students must be able to implement logic on an FPGA.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO 1-** Understand basics of VHDL Language. **CO 2-** Apply concepts of VHDL on FPGA for problem solving by using modern tools and technology. **CO 3-** Synthesize complex digital circuits at several level of abstractions.



Syllabus

Unit-1

Concepts of Digital System Design Process, Design automation, Hardware Description Language, Hardware Simulation, Oblivious Simulation, Event-driven simulation, Hardware synthesis, Level of abstraction.

VHDL Language, Design methodology based on VHDL, Elements of VHDL, Describing components, Packages, Top down design, verification, Top-down design with VHDL, Subprograms, VHDL operators, Conventions & Syntax.

Unit-2

Basic concept in VHDL: Characterizing Hardware Language, Timing, Concurrency, Hardware modeling, Objects & Classes, Signal assignment, Inertial delay mechanism, Transport delay mechanism, Comparing Inertial and Transport delay.

Concurrent and Sequential Assignment: concurrent assignment, Event and Transaction, Delta delay, Sequential placement of transaction.

Type declaration and usage, Enumeration type for multi value logic, Array declaration, VHDL Operators, subprogram parameters, Types and overloading, Predefined attributes.

Unit-3

Sequential processing: Process statement, Signal assignment versus Variable assignment, Sequential statements – IF, CASE, LOOP, ASSERT, WAIT etc., Concurrent assignment problem, Passive processes.

Structural Specification of Hardware: Inverter model, NAND gate model, Logic Design of Comparator, VHDL description of comparator, VHDL description of a simple test-bench, simulation, Logic design of Latch, Flip-flop, Counter and Registers.

Unit-4

Subprograms and Packages: Subprograms, Functions, Conversion functions, Resolution functions, Procedures. Packages, Package declaration, Deferred constants, Subprogram declarations, Package body.

Unit-5

Aliases, Qualified expressions, User-defined attributes, Generate statements, Text I/O.

Data flow Description in VHDL: Multiplexing and data selection, General Multiplexing, Guarded signal assignments, Block Declaration Parameters, Resolving between several driving values.

Suggested Text Books

1. A VHDL Primer - Jayram Bhaskar
2. Digital system design using VHDL(2^{nd} edition) - Jr. Charles, H. Roth,Lizy, K. john
3. Digital system design using VHDL- Chin Hwa Lee
4. VHDL Analysis and modeling of digital systems: Zainalabedin Navabi, Mc Graw Hill Edition
5. VHDL From Simulation to synthesis: Sudhakar Yalamanchili

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 4			Theory Paper
			L	T	P	
DE-5	VLSI Technology	EI-1872 (C)	3	1	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

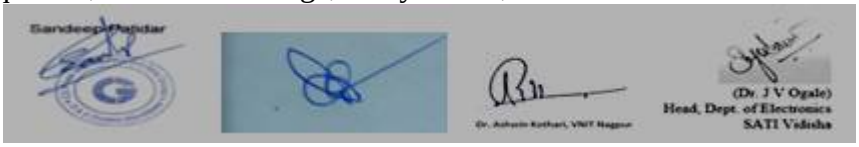
Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz/ Assignment	End Sem.	Lab Work/ Assignment	
EI-1872(C)	VLSI Technology	70	20	10	-		100

Course Objectives	This course covers basic theories and techniques of digital VLSI design in CMOS technology.
Prerequisite Knowledge	Fundamentals of Analog Electronics and Digital Electronics.
Course Description	To produce graduates who understand the CMOS circuit design concepts, basic CMOS fabrication technology, estimate prformance charactristics circuit characterization.
Course Outcomes	Upon completion of this course, student will be able to **CO1**:Introduce CMOS circuit design and operating principle of MOS transistors. **COL2**:Analyze CMOS inverter and its characteristics. **CO3**:Describe silicon semiconductor technology and CMOS fabrication process. **CO4**:Estimate performance characteristics of CMOS circuits e.g. estimation of delay, power dissipation. **CO5**:Apply Hardware Description Language (VHDL) concepts to model a digital system.

Syllabus

Unit - I

Introduction to CMOS Circuits, Circuit and System Representation,Behavioral, Structural and Physical Representation of systems, Gajski chart, Levels of Abstraction, VLSI Design flow, MOS Transistor Theory, PMOS and NMOS Enhancement Transistor, MOS Device Design equation, Basic DC Equation,Threshold voltage, Body Effect, Second Order Effects.



Unit - II

CMOS Inverter: D C Characteristics,Static load MOS Inverter—Pseudo NMOS Inverter, Saturated Load Inverter,Cascode Inverter, Differential Inverters,Bipolar Devices, diodes, transistors, BiCMOS Devices.

Unit – III

Review of Silicon Semiconductor Technology-Wafer Processing, Oxidation, Epitaxy, Deposition, Ion-Implantation The Silicon gate NMOS process, Basic CMOS Technology, n-well and p-well process,Twin Tub process, Interconnects and contacts, Layout Design Rules Latch-up, Latch - up Triggering, Latch up Prevention techniques.

Unit - IV

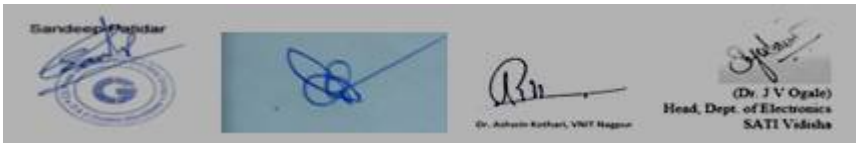
Introduction to circuit characterization and performance estimation, Resistance Estimation, Capacitance Estimation, CMOS gate transistor sizing, Power Dissipation, Basic Physical Design of simple logic gates.

Unit – V

Introduction to VHDL, Language elements: Identifiers - Data objects - Data types - Operators - Behavioral modeling - Dataflow modeling - Structural modeling - Examples - Sub programs and overloading - Package concepts.

Textbooks/ Reference Books:

1. VLSI Technology, S.M.Sze, 2nd Edition, TMH, 2003
2. Principles of CMOS VLSI Design, Weste & Eshraghian, 2nd edition, Addison Wesley, 1993
3. Basic VLSI Design, Pucknell and Eshraghian, 3rd Edition, Prentice Hall of India (PHI)
4. VHDL Primer, J. Bhaskar, 1st edition, BSP, 2002



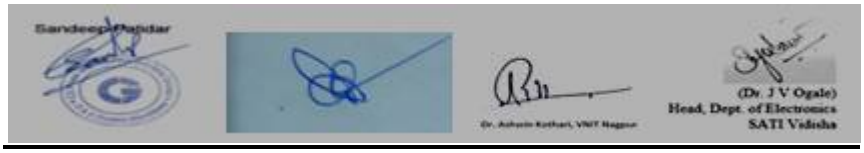
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	**Course Title**	**Course Code**	**Credits - 3**			**Theory Paper**
			L	**T**	**P**	Max.Marks-70
DE-6	Process Control -I	EI-1873(A)	3	-	-	Min.Marks-22 Duration-3 Hrs.

Sub. Code	**Subject Name & Title**	**Maximum Marks Allotted**					**Total Marks**
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1873 (A)	Process Control-I	70	20	10	-	-	100

Prerequisite Knowledge	Basic fundamentals of Control System
Course Objectives	Upon completion of this course, the student will be able to: 1. Understand the basic principles & importance of process control in industrial process plants; 2. Specify the required instrumentation and final elements to ensure that well-tuned control is achieved 3. Design and tune process (PID) controllers;. 4. Understand the importance and application of good instrumentation for the efficient design of process control loops for process engineering plants 5. Draw a PID (Process & Instrumentation Diagram) & devise simple but effective plant wide control strategies using appropriate heuristics
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO-1**. The basic knowledge of process control loop- different blocks in the loop, Process Equations **CO-2** To analyze on-off control, Time-proportional control, P, I, D control. **CO-3**.To analyze and design Split-Range control, Ratio control, Cascade control, Feed forward control **CO-4**. Able to use different final control elements.



Syllabus

UNIT-I

The basic process control loop- different blocks in the loop.

Process Equations - their limitations, scale modeling, typical processes and their transfer function deviations, processing modeling techniques.

Effect of disturbances and set-point variations in the loop transfer functions, Review of system response with standard inputs, offset, Process Reaction Curves, Controllability using deviation reduction factor, Gain bandwidth product and state variable formulation, Stability - review, Self-regulation.

UNIT-II

Schemes and analysis of on-off control, Time-proportional control, P,I,D controls, Control action comparison, Pneumatic adjustment, Pneumatic, Electrical/Electronic and Hydraulic controllers,

UNIT-III

Schemes and analysis of Split-Range control, Ratio control, Cascade control, Feedforward control, Selective/override control, Antireset control, Introduction to Multivariable control systems. Control of flow, level, temperature and pressure, PI diagrams: symbols, terminology, case studies.

UNIT-IV

Final control elements, The pneumatic actuator and control valves, Sizing and selection of control valves, Linearization, Positioners, Electrical actuators and their driver circuits, P-I and I-P converters, Safety valves and other associated components.

UNIT-V

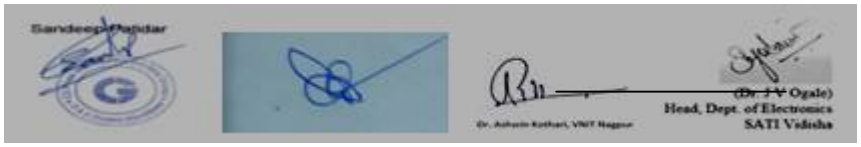
Introduction to Computer Control of Processes, Elements in a digital control loop, A simple case study, Introduction to digital control algorithm.

Introduction to programmable logic controllers & SCADA

Discussions on control of specific plants like boilers, distillation column, paper plant, steel plant, power plant etc. Control of Batch processes, Introduction to Distributed Control Systems.

Text Books:

1. Principles of Process Control, D. Patranabis, TMH
2. Process Control Instrumentation Technology,C.D.Johnson
3. Process Control, B.Wayne Banquette, PHI
4. Process Control (Principles and Applications), Surekha Bhanot,Oxford University press.
5. Process Dynamics and control, Dale. E. Seborg, Thomas Edgar, Duncan A. Millichamp



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 3			Theory Paper
			L	T	P	
DE-6	Neural Networks & Deep Learning	EI-1873(B)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1873 (B)	Neural Networks & Deep Learning	70	20	10	-	-	100

Course Description	This course is a study of Neural Networks
Prerequisite Knowledge	None
Course Objectives	Introduce major deep learning algorithms, the problem settings, and their applications to solve real world problems.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO1**. identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains. **CO2**. Implement deep learning algorithms and solve real-world problems

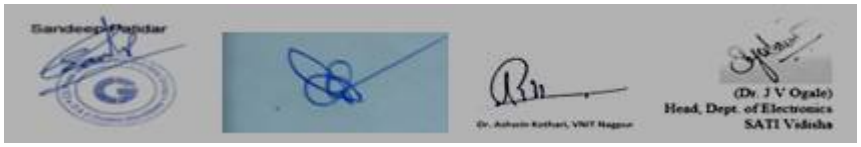
Syllabus

Unit I

Introduction: Various paradigms of earning problems, Perspectives and Issues in deep learning framework, review of fundamental learning techniques.

Unit II

Feedforward neural network: Artificial Neural Network, activation function, multi-layer neural network.



Unit III

Training Neural Network: Risk minimization, loss function, backpropagation, regularization, model selection, and optimization.

Unit IV

Conditional Random Fields: Linear chain, partition function, Markov network, Belief propagation, Training CRFs, Hidden Markov Model, Entropy.

Unit V

Deep Learning: Deep Feed Forward network, regularizations, training deep models, dropouts, Convolutional Neural Network, Recurrent Neural Network, Deep Belief Network.

Probabilistic Neural Network: Hopfield Net, Boltzman machine, RBMs, Sigmoid net, Autoencoders.

Text Books

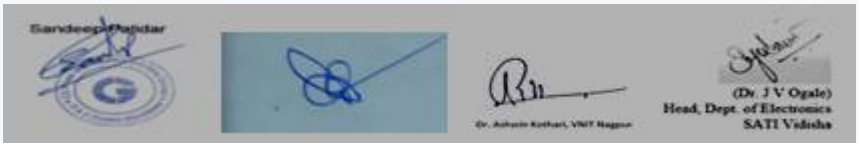
- T1. Goodfellow, I., Bengio,Y., and Courville, A., Deep Learning, MIT Press, 2016..
- T2. Bishop, C. ,M., Pattern Recognition and Machine Learning, Springer, 2006.

Reference Books

- R1. Yegnanarayana, B., Artificial Neural Networks PHI Learning Pvt. Ltd, 2009.
- R2. Golub, G.,H., and Van Loan,C.,F., Matrix Computations, JHU Press,2013.
- R3. Satish Kumar, Neural Networks: A Classroom Approach, Tata McGraw-Hill Education, 2004.

Books on Optimization Techniques

- A. Ravindran, K. M. Ragsdell , and G. V. Reklaitis , ENGINEERING OPTIMIZATION: Methods and Applications , John Wiley & Sons, Inc. , 2016..
- A. Antoniou, W. S. Lu, PRACTICAL OPTIMIZATION Algorithms and Engineering Applications, Springer , 2007.



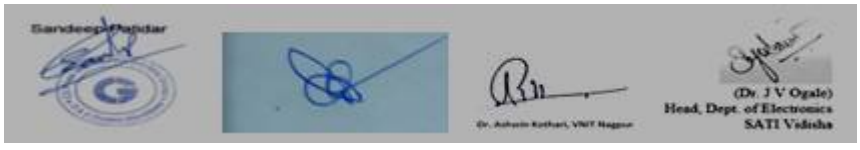
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits – 3			Theory Paper
			L	T	P	
DE-6	Instrumentation System Design	EI-1873(C)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1873(C)	Instrumentation System Design	70	20	10	-	-	100

Course Description	The purpose of this course is to introduce the key concepts in designing MEMS sensors
Prerequisite Knowledge	Fundamental knowledge on Measurements and Instrumentation, Microprocessor and Microcontroller
Course Objectives	1. To explain the concept of industrial instrumentation and impart knowledge on industrial automation 2. To develop an ability to measure and analyze thermal power station. 3. To develop an ability to evaluate the parameters in Petrochemical Plant. 4. To develop an ability to design energy conserved, intrinsically safe instrumentation. 5. To discuss special purpose instruments and control.
Course Outcomes	On the completion of this course, the students will: CO1 Demonstrate on the understanding of various instrumentation processes. CO2 Have an ability to identify and analyze various components of a processing plant. CO3 Have an ability to evaluate the performance of a real time system. CO4 Have an ability to evaluate a larger for industrial automation. CO5 Update on the recent trends in automation technologies.



Syllabus

UNIT-I

DESIGN OF SIGNAL CONDITIONING CIRCUITS: Design of V/I Converter and I/V Converter- Analog and Digital Filter design – Signal conditioning circuit for pH measurement –Compensation circuit - Signal conditioning circuit for Temperature measurement - Cold Junction Compensation – software and Hardware approaches -Thermocouple Linearization – Software and Hardware approaches

UNIT-II

DESIGN OF TRANSMITTERS: RTD based Temperature Transmitter – Thermocouple based Temperature Transmitter- Design of Capacitance based Level Transmitter – Air-purge Level Measurement – Design of Smart Flow Transmitters

UNIT-III

DESIGN OF DATA LOGGER AND PID CONTROLLER: Design of ON / OFF Controller using Linear Integrated Circuits, Electronic PID Controller, Microcontroller Based Digital PID Controller, Microcontroller based Data Logger design, Design of PC based Data Acquisition Cards

UNIT-IV

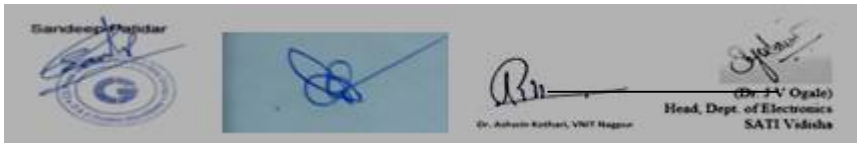
DESIGN OF ALARM AND ANNUNCIATION CIRCUIT: Alarm and Annunciation circuits using Analog and Digital Circuits, Thyristor Power Controller

UNIT-V

PROGRAMMING OF PLC: Addressing modes of PLC, Languages used in PLC Programming, Instructions used in Ladder programming, Programming examples of different processes. Module - 7: Communication topolgies used in PLC, Configuring of PLC, Documentation and selection of PLC.

Text Books:

1. Lucas M.P, “Distributed Control System”, Van Nostrand Reinhold Co. NY 1986
2. Pertrezeulla, “Programmable Controllers”, McGraw-Hill, 1989
3. Chidambarm. M, “ Computer control of processes”, Narosa Publications, 2002.
4. C. D. Johnson, “Process Control Instrumentation Technology”, 8th Edition, Prentice Hall, 2006.
5. Chidambarm. M, “ Computer control of processes”, Narosa Publications, 2002.



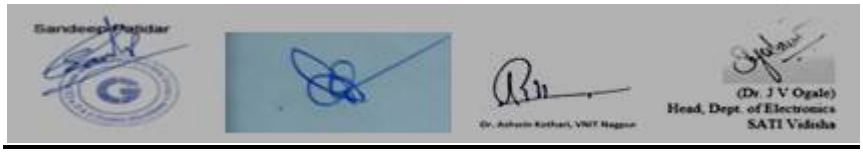
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 3			Theory Paper
			L	T	P	
OC-3	Data Communication	**EI – 1874 (A)**	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1874(A)	Data Communication	70	20	10	-	-	100

Course Objectives	The objectives of this course are to: 1. Introduce students to the evolution of computer networks and the concepts data communication. 2. Introduce students the general principles of network design and compare the different network topologies. 3. Introduce students to the general principles of circuit and packet switching. 4. Provide students with in-depth knowledge of data link layer fundamental such as error detection, correction and flow control techniques; multiple access control techniques.
Prerequisite Knowledge	Analog and digital communication, Digital circuits and system
Course Outcomes	**CO-1**Describe the components of Data Communication System and identify key considerations in selecting various transmission media in networks. **CO-2** Describe and apply various error detection and correction schemes. **CO-3** Identify the different types of network topologies and protocols and describe the features of modulation and multiplexing techniques . **CO-4** Identify the different types of network devices and their functions within a network and building the skills of subnetting and routing mechanisms.



Syllabus

Unit I

Basic data communication concepts: Host computers and terminal modems, parallel and serial transmission Asynchronous and Synchronous transmission. Simplex, half duplex and duplex. Front end processor, Port-sharing device, Line splitters and remote intelligent controllers. Multiplexer: TDM, FDM, WDM. Data compression devices, Inverse multiplexer.

Unit II

Data Interfaces and transmission : Digital interface standards ; RS-232C standard, hand shaking, connecting a DTE in RS-232 C, RS-449, RS-422A and RS-423A standards. High speed desktop serial interfaces. Remote digital transmission : T carrier ISDN, Packet data networks, Digital access. Data Communication Efficiency : Modems, AM, FM, Phase modulation, multi speed modems, high speed modems, Error Correcting modems Data compression in modems. Short-wave modems, Facsimile and Fax modems.

Unit III

Data Integrity and, Security: Data Integrity, Sources of error control approaches. Implementation of error Control Echo checking parity, checking and cyclical parity, Hammering code, Checksums, Cyclical Redundancy check. Security and security measuring.

Unit IV

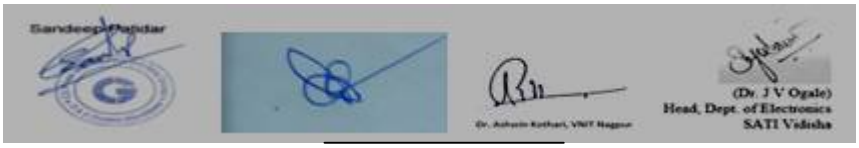
Architectures and Protocols: OSI model, Traditional communications architectures: Systems network architecture and other communication architecture Protocols: Polling and selecting, automatic repeat request common link level protocols. Binary synchronous communications characters in a BSC frame, Synchronous data link control.Protocols Converters and Code Converters TCP/IP protocols.

Unit V

Data transport Network: Packet switching, LAN and Internet working, Carrier Sense Multiple Access (CSMA), Time-Division Multiple Access (TDMA), Code-Division Multiple Access (CDMA).

Reference Books:

1. Computer network " Tanenbaum" 5th edition, Pearson Education.
2. Data Communications and networking " Behrouz A Forouzan, Tata Mcgraw Hill
3. Data & Computer Communication "William Stalling" 8th edition, Pearson Education.



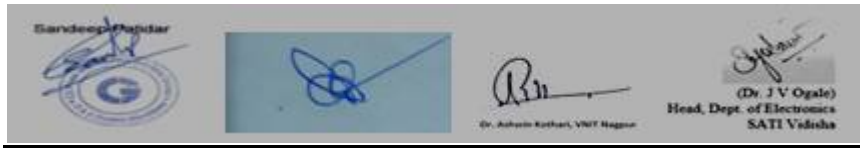
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 3			Theory Paper
			L	T	P	
OC-3	Robotics	**EI – 1874 (B)**	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1874(B)	Robotics	70	20	10	-	-	100

Course Objectives	The objectives of this course are to: 1. To acquire the knowledge on advanced algebraic tools for the description of motion. 2. To develop the ability to analyze and design the motion for articulated systems. 3. To develop an ability to use software tools for analysis and design of robotic systems
Prerequisite Knowledge	Digital Circuit Systems., Basic Electronics., Microprocessor, Embedded Systems Design
Course Outcomes	Students will be able to: CO1: Be able to use matrix algebra and Lie algebra for computing the kinematics of robots. CO2: Be able to calculate the forward kinematics and inverse kinematics of serial and parallel robots. CO3: Be able to calculate the Jacobian for serial and parallel robot. CO4: Be able to do the path planning for a robotic system. CO5: Be proficient in the use of Maple or Matlab for the simulation of robots.



Syllabus

Unit I

Robots: Introduction, anatomy, Robot specifications, Robot characteristics, Areas of application, classification of robots.

Unit II

Robotic arm, Sensors, Encoders, Tachometers, Robotic drive systems and actuators. Specification, principle of operation and areas of application of: DC motor, Stepper motor, Servo motor and brushless DC motor,

Unit III

Microprocessor control of electric motors, speed control using PWM and direction control using H-Bridge

Unit IV

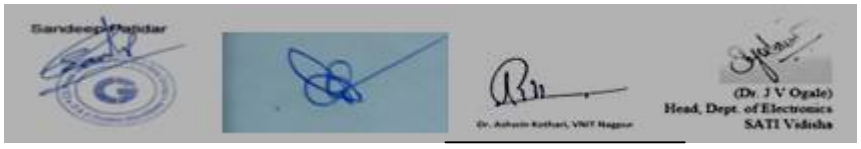
Robotic vision systems, Image processing techniques, kinematics, inverse kinematics, Velocity kinematics, Application of velocity kinematics for all serial manipulators

Unit V

Digital and Programmable Logic (PLC) controllers. Robot Programming, Industrial applications of Robots, Mobile robots, Micro robots, Recent developments in Robotic

TEXT BOOKS & REFERENCES:

1. Mikell and Groover, Industrial Robotics – Technology, Programming and Applications, McGraw Hill, 2/e, 2012
2. Saeed B. Niku Introduction to Robotics. Analysis and control, applications- Wiley student edition, 2010 3. Spong and Vidyasagar, Robot Dynamics and Control, John Wiley & Sons, 1990.
References:
1. Ashitava Ghosal, Robotics, Fundamental concepts and analysis, OXFORD University Press, 2006
2. Fu, K.S,Gonzalez,R.C,Lee, C.S.G.,Robotics, Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987.
3. John. J.Craig, Introduction to Robotics: Mechanics and Control, PHI, 2005.
4. Klafter, R.D., Chmielewski, T.A, Negin, M, Robotic Engineering An Integrated Approach, PHI, 2007
5. Robert J. Schilling, Fundamentals of Robotics: Analysis & Control, Pearson Education, 2000
6. S. R. Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill, New Delhi, 1994.



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 3			Theory Paper
			L	T	P	
OC-3	Automation	EI-1874(C)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

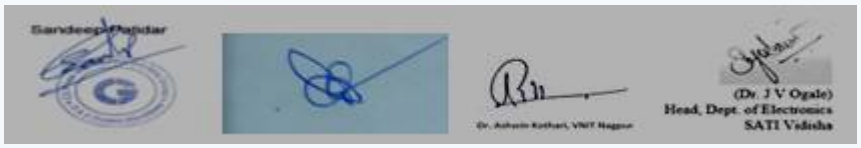
Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1874 (C)	Automation	70	20	10	-	-	100

Course Description	Automatism/Industrial Data Processing is the creation and implementation of technology that automatically processes data. This technology includes computers and other communications electronics that can gather, store, manipulate, prepare and distribute data to serve or control specific operations such as motor control, electric generator, production lines etc.
Prerequisite Knowledge	None
Course Objectives	1. To introduce the basic principles of networking 2. To learn industrial protocols and the way of data processed and transferred in industrial network 3. To equip the students with the relevant knowledge to understand and solve technical problems in industrial automation systems.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* CO1. Identify the need for network protocols during data exchange CO2. Demonstrate the use of serial standards as required in an industrial plant environment. CO3. Analyze and identify the methods of communications

Syllabus

Unit I

Fundamental of Industrial Data Communication Systems Review of Data Acquisition, Automation System Architecture - Hierarchical Levels, Functional Layered Models - OSI reference model, System engineering approach, Input / Output Structures, Control Unit Structure, Protocols, Communication principles and modes: network topology, transmission media, noise, cable characteristic and selection; bridges, routers and gateways, Instrumentation and control devices.



Unit II

Industrial Communication Standards and Protocols: (18 T) Serial communication standards: Standards organizations, Serial data communication interface standards, Balanced and unbalanced transmission lines, Synchronous and asynchronous communication, RS 232,422,485 standards. Industrial protocols: XON/OFF Signaling, Binary Synchronous Protocol (BSC),

Unit III

UHART Communication Protocol Architecture - physical, data link, application layer, communication technique, normal and burst mode of communication, benefits of HART

Unit IV

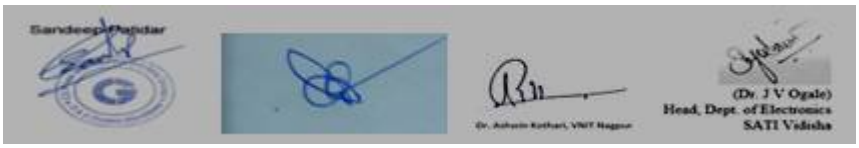
Open industrial Fieldbus and DeviceNet systems Industrial Ethernet: 10Mbps, 100Mbps Ethernet, Gigabit Ethernet, Industrial Ethernet. Foundation fieldbus: Fieldbus requirement, features, advantages, fieldbus components, types, architecture–physical, data link, application layer, system and network management, wiring, segment functionality checking, function block application process.

Unit V

PROFIBUS: Architecture, OSI-model, PROFIBUS types – PA, DP & FMS and their comparison, Designing PROFIBUS, Network design, Advantages and Applications of PROFIBUS in industries.

Text Books/ References

1. John Park, Steve Mackay, Edwin Wright, Practical Data Communications for Instrumentations and Control, 1 st Edition ELSEVIER, 2003.
2. Deon Reynders, Steve Mackay, Edwin Wright, Practical Industrial Data Communications, 1 st Edition ELSEVIER, 2005.
3. William C. Dunn, Fundamental of industrial instrumentation and process control, Mc Graw-Hill, 2005.
4. Behrouz A. Forouzan, Data Communications and Networking, 2nd Edition, Mc Grow – Hill, 2001.



SAMRAT ASHOK TECHNOLOGICAL INSTITUTE

(Engineering College), Vidisha, MP

(An autonomous Institute Affiliated to RGPV, Bhopal)

ELECTRONICS & INSTRUMENTATION

Course Evaluation Scheme & Syllabus												
VII SEM B.Tech.	Subject Code	Subject Name / Title	Maximum Marks Allotted						Contract Hrs.			Total Credits
			Theory			Practical						
			End Sem	Mid Sem Exam	Quiz/ Assign Ment	End Sem	Lab Work & Sessional	Total Marks	L	T	P	
	EI-1875(A) OC-4	Programming, Data Structure & Algorithm using Python	70	20	10	-	-	100	3	-	-	3

Pre-requisite: Programming in python and Basic Mathematical knowledge

Objectives of the course:

A) To impart the basic concepts of data structures and algorithms.
B) To understand concepts about stacks, queues, lists , trees , searching and sorting techniques
C) To understand basic concepts about Python programming language.
D) To Implement data structures & algorithms in python.

Course Outcomes: The students would be able to

CO1: Define and understand the use of Data Structures to make efficient program. Demonstrate the static and dynamic storage representation of data in memory.

CO2: Articulate Linked List data structures and legal operations permitted on them.

CO3: Develop and analyze the use of stack and queue to solve suitable problems.

CO4: Understand and articulate the concept of Tree and Graph Operations and Their Applications.

CO5: Applying suitable method to solve a problem of searching and sorting.

COURSE CONTENTS

UNIT I:

Introduction: Introduction to programming, algorithms and data structures, Data, Data types, types of Data Structures. Array: Definition and Types of Array, Common operation on Array, Row/Column major representation of Arrays, String. Abstract data types, Basic algorithmic analysis: input size, asymptotic, time-space complexity, Big O() notation.

UNIT II

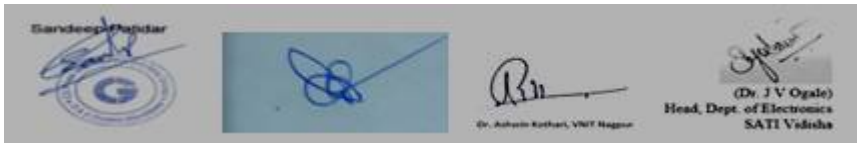
Python Review: Basics of python**:** variables, operations, control flow - assignments, conditionals, loops, functions, data types, expressions, strings, tuples , List & Dictionaries, mutable and immutable values, Python list operations- slice etc. Classes and objects in Python.

UNIT III:

Linked Lists: Singly linked lists: operations: Traversing, Searching, Insertion into, Deletion from linked list, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.

UNIT IV:

Stacks and Queues: Stack, Implementations using arrays, using a python list and using linked list. Queue: Types of Queue: Simple Queue, Circular Queue, Priority Queue; Implementation using a python list, using a circular array, using a linked list.

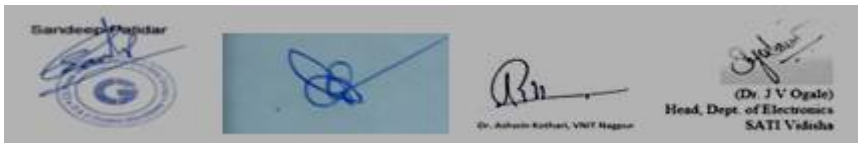


UNIT V:

Searching and Sorting: Linear Search, Binary Search, comparison of Linear and Binary search, bubble sort, selection sort, Insertion Sort, quick Sort, merge sort, Comparison of Sorting Techniques

Text Book:

1. Necaise, Rance D, "Data structures and algorithms using Python'", John wiley & son Press, ISBN 978-0-470-61829-5



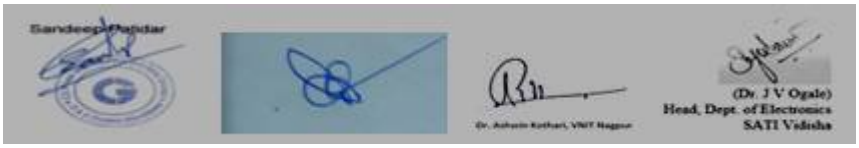
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	**Course Title**	**Course Code**	**Credits - 3**			**Theory Paper**
			L	**T**	**P**	
OC-4	Artificial Intelligence & Machine Learning	EI-1875(B)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	**Subject Name & Title**	**Maximum Marks Allotted**					**Total Marks**
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1875(B)	Artificial Intelligence & Machine Learning	70	20	10	-	-	100

Course Description	This course is a study of the basic problem solving methods, state space search, and different search methods. Knowledge representation, resolution and Question – Answering, conceptual dependency, frames and scripts. AI languages like PROLOG and LISP. Expert systems Design and ANN's.
Prerequisite Knowledge	Basic of Computers
Course Objectives	Upon completion of this course, the student will be able to: 1.general understanding of structure of basic search methods. 2. purpose, structure and functions of AI. 3. illustration of key AI aspects by example. 4.Understanding of resolution, CD, Scripts, AI languages, Expert system design and ANN's.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO1**. Describe the general problem solving. **CO2**. Describe, contrast and compare different search strategies. **CO3**. Understand and analyze different Question Answering strategies, CD, Frames and Scripts. **CO4**. Understanding of AI Languages, Expert system Design and ANN's



Syllabus

Unit I

Basic Problem solving methods: Production systems-state space search, control strategies, Heuristic search, forward and backward reasoning, Hill climbing techniques, Breadth first search, Depth first search, Best search, staged search.

Unit II

Knowledge Representation: Predicate logic, Resolution question Answering, Nonmonotonic Reasoning, statistical and probabilistic reasoning, Semantic Nets, Conceptual Dependency, frames and scripts.

Unit III

Introduction to Expert Systems: Structure of an Expert system interaction with an expert, Design of an Expert system.

Unit IV

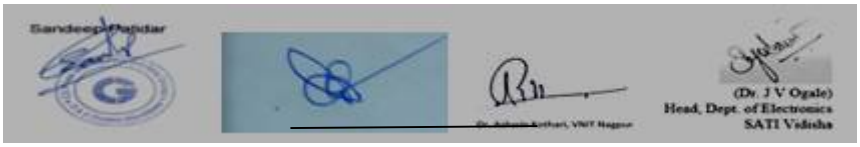
Introduction to ML; Problems, data, and tools; Visualization; Overfitting and complexity; training, validation, test data, Classification problems; decision boundaries; nearest neighbor methods, Probability and classification, Bayes optimal decisions, Naive Bayes and Bayes' Rule and Naive Bayes Model, Logistic regression.

Unit V

Linear classifiers, (SVM) Support vector machines and large-margin classifiers , Ensemble methods: Bagging, random forests, Unsupervised learning: clustering, k-means, support vector regression ,Time series; Markov models; autoregressive models

Text Books:

- Rich E and Knight K, Artificial Intelligence, TMH New Delhi.
- Nelsson N.J., Principles of Artificial Intelligence, Springer Verlag, Berlin.
- Barr A, Fergenbaub E.A. and Cohen PR. Artificial Intelligence, Addison Wesley, Reading
- Waterman D.A., A guide to Expertsystem, Adision - Wesley, Reading
- Artificial Intelligence Hand book, Vol. 1-2, ISA, Research Triangle Park.
- Kos Ko B, Neural Networks and Fuzzy system –PHI.
- Haykin S, Artificial Neural Networks-Comprehensive Foundation, Asea, Pearson.
- Tom M. Mitchell, Machine Learning ,Publisher: McGraw-Hill Science/Engineering/Math; (March 1, 1997)



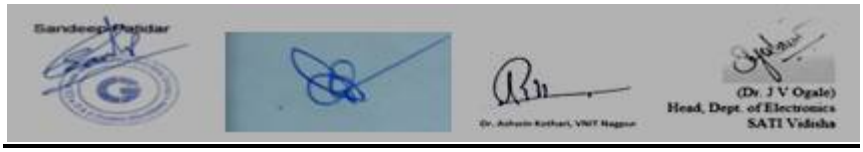
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	**Course Title**	**Course Code**	**Credits - 3**			**Theory Paper**
			L	**T**	**P**	
OC-4	Internet of things	EI - 1875(C)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

Sub. Code	**Subject Name & Title**	**Maximum Marks Allotted**					**Total Marks**
		Theory Paper			Practical Slot		
		End Sem.	Mid Sem. MST	Quiz/ Assignment	End Sem.	Lab Work/ Assignment	
EI - 1875(C	Internet of things	70	20	10	-	-	100

Course Objectives	•Assess the genesis and impact of IoT applications, architectures in real world. •Illustrate diverse methods of deploying smart objects and connect them to network. • Compare different Application protocols for IoT. •Infer the role of Data Analytics and Security in IoT. •Identify sensor technologies for sensing real world entities and understand the role of IoT in various domains of Industry.
Prerequisite Knowledge	•Digital Circuit Systems. •Basic Electronics. •Microprocessor •Embedded Systems Design
Course outcome	On successful completion of this course student should be able to: **CO-1** Interpret the impact and challenges posed by IoT networks leading to new architectural models. **CO-2** Compare and contrast the deployment of smart objects and the technologies to connect them to network. **CO-3** Appraise the role of IoT protocols for efficient network communication. **CO-4** Elaborate the need for Data Analytics and Security in IoT. **CO-5** Illustrate different sensor technologies for sensing real world entities and identify the applications of IoT in Industry.



Syllabus

Unit -1

What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.

Unit -2

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.

Unit- 3

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.

Unit -4

Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and FAIR, The Phased Application of Security in an Operational Environment

Unit -5

IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. Temperature Monitoring System Smart and Connected Cities, An IoT Strategy for Smarter Cities, Smart City IoT Architecture, Smart City Security Architecture, Smart City Use-Case Examples.

Text Books:

1.Dr. Rajkamal "INTERNET OF THINGS Architecture and design principles" by Mc Graw Hill Education Private Limited.
2.David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1 stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978- 9386873743)
3.Srinivasa K G, "Internet of Things",CENGAGE Leaning India, 2017

Reference Books:

1. Adrian Mcewen, Hakin Cassimally, "Designing The Internet of Things" Wiley.
2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", Elsevier Publications.
3. Charalampos Doukas, Building The Internet of Things with the Arduino: V.10, 2012.
4. Hakima Chaouchi (Ed.), The Internet Of Things: Connecting Objects, Wiley,2010.
5. A Bahaga, V.Madisetti," Internet of Things-Hands on approach", VPT publisher