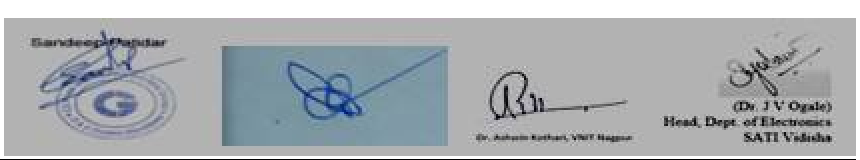
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 4			Theory Paper
			L	T	P	
DC	Control System Engineering	EI -1861	3	-	2	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 -1861	Control System Engineering	70	20	10	30	20	150

Course Objectives	Study the principles of system modeling, system analysis and feedback control, and use them to design and evaluate feedback control systems with desired performance; specifically, to acquire the related knowledge and techniques of control system.
Prerequisite Knowledge	Basic Electricals, Mathematics (Matrix, Laplace Transform, Differential Equations and Complex Variables), Signals and Systems, Network analysis.
Course Description	This course is to explore the modeling of linear dynamic systems via differential equations and transfer functions utilizing state-space and input-output representations; analysis of control systems in the time and frequency domains and using transfer function and state-space methods; study of the classical stability tests, such as the Routh-Hurwitz and Nyquist criterions, and design methods using root-locus plots and Bode plots; and the development of control techniques based on PID, lead and lag networks, using linear state or output feedback
Course Outcomes	After completion of the course students will be able to **CO 1-** Apply knowledge of mathematics in modeling of electric, mechanical and electromechanical systems using differential equations, transfer functions, block diagrams, Signal flow graph and state variables. **CO 2-** Analyze the time domain behavior of second and higher order systems. **CO 3-** Analyze the system stability in time domain and frequency domain. **CO 4-** Design compensation network and feedback controllers. **CO 5-** Do state space modeling of the system and its analysis.



<u>**Syllabus**</u>

Unit-I

Basic idea of control systems and their classification - differential equations of systems - linear approximation - Laplace transform and transfer function of linear system - Model of physical system (Electrical, mechanical and electromechanical)- block diagram - signal flow graph - Mason's gain formula. Control system components: - Error detectors, servomotor, tachogenerator, servo amplifier, magnetic amplifier, rotating amplifier.

Unit-II

Time domain analysis - Representation of deterministic signals - First order system response - S-plane root location and transient response - impulse and step response of second order systems - performance - characteristics in the time domain - effects of derivative and integral control - steady state response - error constant - generalized definition of error coefficients - concepts of stability - Routh - Hurtwitz criterion.

Unit-III

Frequency domain analysis - frequency response - Bode plot, Polar plot, Nicol's chart - closed loop frequency response and frequency domain performance characteristics. Stability in the frequency domain. Nyquist criterion.

Unit-IV

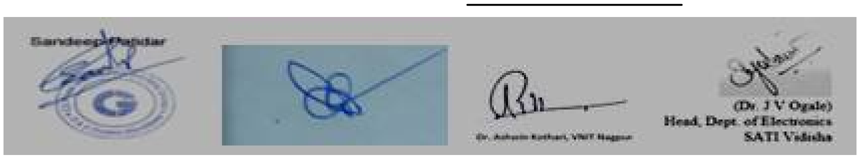
Root locus method - Basic theory and properties of root loci - procedure for the construction of root loci - complete root locus diagram. Design and compensation of feedback control system: - approaches to compensation - cascade compensation networks and their design in the frequency domain - simple design in S-plane, different types of controllers.

Unit-V

State variable methods:- introduction to state variable concepts - state variable description of linear dynamic systems - representation in matrix forms - block diagram and signal flow graph representation of state equations - Transfer matrix from state equations - transition matrix - general solution for linear time invariant state equations.

Text Books:

1) Ogata K, " Modern Control Engineering", Prentice Hall
2) Kuo B. C , "Automatic Control System", Prentice Hall
3) Nagarath and Gopal, " Control System Engineering", Wiley Eastern
4) U A Bakshi, “Control Engineering”, Technical Publication.
5) Norman S. Nise “Control System Engineering” Wiley Eastern



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-1	Medical Instrumentation	EI-1862(A)	3	-	2	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-1862(A)	Medical Instrumentation	70	20	10	30	20	150

Course Objectives	1. Gain a strong background in medical physiology which will allow them to apply knowledge of life sciences (biology, physiology and medicine) to biomedical engineering problems and understand current developments in biomedical engineering. 2. Be able to apply engineering principles to solve physiological and medical challenges and apply knowledge of mathematics to biomedical engineering problems. 3. Be able to use their physiological knowledge and mathematical methods to design laboratory experiments and equipment, and obtain and analyze data.
Prerequisite Knowledge	Basic Electrical Concepts, Analog and Digital Electronics.
Course Description	This course covers the basic and advanced principles, concepts, and operations of medical sensors and devices. The origin and nature of measurable physiological signals are studied, including chemical, electrochemical, optical, and electromagnetic signals. The principles and devices to make the measurements including a variety of electrodes and sensors. Fundamentals of medical instrumentation systems, physiological systems, sensors, and biomedical equipments,e.g. instruments for cardiovascular and respiratory assessment. Clinical laboratory measurements, Therapeutic Instruments, medical imaging Systems and electrical safety requirements.
Course Outcomes	Upon completion of this course, student will be able to 1. List, classify and explain different sources of biomedical signals, medical electrodes and transducers. 2. Demonstrate a basic understanding of various physiological systems. 3. Design and analyze the working principles of various systems and devices that can measure, test and/or acquire biological information from the human body viz. EEG, ECG, EMG, Respiratory Controllers etc. 4. Demonstrate and apply various clinical laboratory equipments and medical imaging equipments by understanding their working principles. 5. Conceptualize principles of biotelemetry and electrical shock and hazards and prevention.

Syllabus

Unit I

Introduction to biomedical instrumentation, Transducers and electrodes: Different types of transducers selection for Biomedical applications, Electrode theory, different types of electrodes Hydrogen Calomel, Ag-AgCl, pH, PO_2, PCO_2 electrodes, selection criteria of electrodes.
Sources of bioelectric potential, resting and action potential, propagation of action potential. Introduction to physiology of heart, muscle, nerve, neuro-muscular joint, neural conduction.

Unit II

Physiology of cardiovascular system, heart and other cardio vascular systems, Cardiovascular measurement, Measurement of Blood Pressure, Blood flow, Cardiac output and Cardiac rate, Electrocardiography, Phonocardiography, Plethysmography, Cardiac pace-maker, Defibrillator, Computer applications.

Unit III

Measurement of Electrical Activities in Muscles and Brain: Electromyography, Electroencephalograph and their interpretation, Respiratory System Measurement, Respiratory mechanism, Measurement of gas volume, flow rate carbon dioxide and oxygen concentration in inhaled air, respiratory controller.

Unit IV

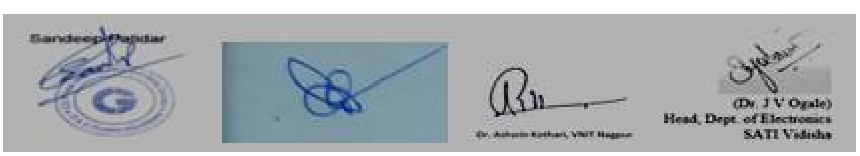
Instrumentation for Clinical Laboratory: Measurement of pH value of blood, ESR measurements, Hemoglobin measurement, oxygen and carbon dioxide concentration in blood, GSR measurement, polar graphic measurements, Laser in medicine.

Unit-V

Medical Imaging: Ultrasound imaging, Radiography, MRI, Electrical Tomography and applications, Biotelemetry, Transmission and Reception aspects of Biological signal via long distances, Aspect of Patient Care Monitoring, Electrical shock hazards and prevention.

Text Books:

1. Biomedical Instrumentation – Pfieffer, Cromwell – PHI
2. Medical Instrumentation – Webster – Wiley
3. Medical Instruments & Measurement – Carr – Asia Pearson
4. Handbook & Biomedical Instrumentation – Khandpur - TMH



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

ELECTRONICS & INSTRUMENTATION DEPARTMENT

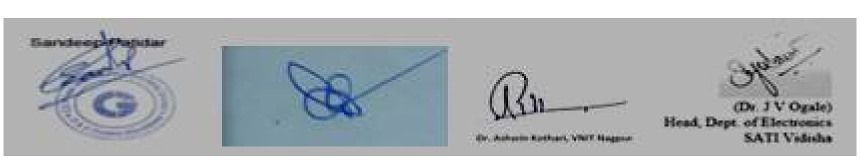
Category of Course	Course Title	Course Code	Credits - 4			Theory Paper
			L	T	P	
DE-1	Electromagnetic Theory	EI-1862(B)	3	-	2	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

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-1862(B)	Electromagnetic Theory	70	20	10	30	20	150

Course Objectives	The objective of this course is to enable the students to make use of maxwell's equation for analyzing wave- formation and wave propagation in various media.
Prerequisite Knowledge	Mathematics I & II, Fundamentals of Electrical Engineering
Course Outcomes	On successful completion of this course student should: CO1: Ability to understand vector analysis and static electric field behavior. CO2: Ability to understand static magnetic field behavior. CO3: Ability to understand the behavior of time varying electric and magnetic field. CO4: Ability to understand polarization and interference of waves. CO5: Ability to understand Reflection and refraction of plane waves and radiation principle.

Syllabus

Unit I: Orthogonal coordinate systems, gradient, divergence and curl. Stokes's theorem, gauss's theorem and divergence theorem. Static electric fields: Electric flux density, permittivity, Columb's law, and electric field intensity, field of distributed charges in free space and line charge, potential function, Laplace's and Poisson's equations, electric dipole, dipole moment, field due to electric dipole, stored electric energy density. Boundary conditions at abrupt discontinuities between two media including conducting boundaries, surface charge distribution, capacitance between two isolated conductors.



Unit-II: Solution of Laplace’s equations in systems of dielectric and conducting boundaries, uniqueness theorem, Static current and magnetic fields- current density, mobility, Ohm’s law employing mobility. Biot-Savart’s law, magnetic field, magnetic field intensity, magnetic flux, and permeability, closed loop currents, Ampere’s circuital law in integral and differential vector form, magnetic vector potential. Problems related to straight wire, toroid and cylindrical solenoids. Boundary conditions on magnetic field.

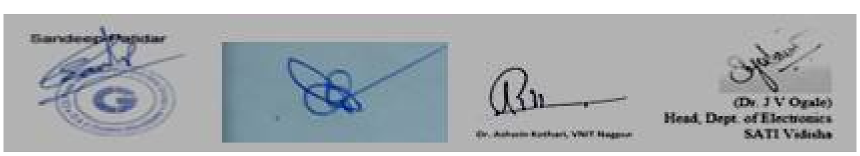
Unit-III: Time varying fields – Faraday’s law in integral and differential forms, displacement current concept, Maxwell’s equations in differential and integral forms, wave equations in source free region, continuity equation, Poynting vector theorem, complex Poynting vector. Time harmonic fields, Maxwell’s equations for TH field, average energy density, duality concept. Helmholtz wave equation, general solution in free space in various coordinates, plane polarized wave in free space, properties of plane waves, wave front, power flow, stored energy density

Unit-IV: Circular and elliptic polarization, resolution in terms of linear polarized waves and vice-versa. Plane waves in lossy medium, low loss dielectric, good conducting and ionized media, loss tangent, skin depth, transmission line analogy, Interference of two plane waves traveling at oblique directions.

Unit-V: Reflection and refraction of plane waves at dielectric media and conducting Surfaces, Brewster’s angle, total internal reflection, resultant fields and power flow in both media. Frequency dispersive propagation, phase velocity and group velocity. Magnetic vector potential for sources in free space, retarded potential, radiation principles.

TEXT BOOKS& REFERENCES:

- Mathew N.O Sadiku: Elements of Electromagnetic, Oxford University Press
- William H. Hayt: Engineering Electromagnetic, TMH.
- John D. Kraus: Electromagnetics, Mc. Graw Hill.



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-1	High Frequency Engineering	EI-1862(C)	3	-	2	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

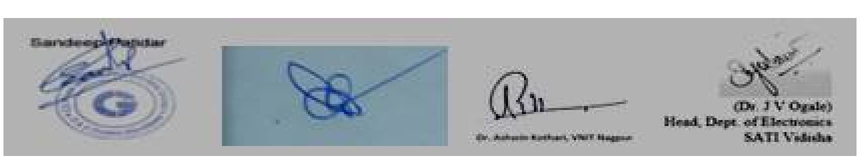
Sub. Code	Subject Name & Title	Maximum Marks Allotted					Total Marks
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1862 (C)	High Frequency Engineering	70	20	10	30	20	150

Course Objectives	The objective of this course is to enable the students to learn about the design, uses and applications of HF Engineering
Prerequisite Knowledge	Knowledge of Electronics devices and circuits, Basic electronics
Course Outcomes	On successful completion of this course student should: CO 1: To describe Maxwell's equation & wave equation & their interpretation. CO 2: To discuss concepts of waves. CO 3: Gain knowledge of transmission lines & waveguides. CO 4: To discuss working and operation of high frequency components like magnetron, klystron, TWT.

Syllabus

UNIT-1 Review of Wave Propagation: Maxwell's equations and its importance at high frequency, Wave, Propagation through various media, behavior of passive components at high frequency, equivalent circuit of R, L, C, Skin effect, Skin depth.

UNI-II Introduction to Transmission lines-I: Two wire transmission line, its equivalent circuit, equation for voltage and current of transmission line, characteristics impedance, reflection coefficient, input impedance of transmission line, lossy and loss-less transmission lines, primary and secondary constants of transmission line Standing waves and VSWR.



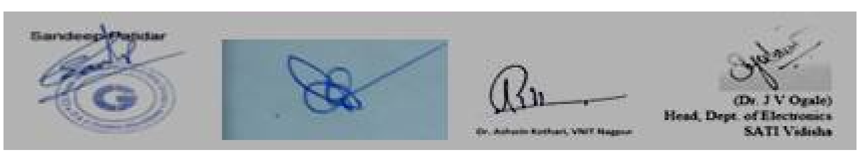
UNI-III Transmission lines-II: Open and Short circuited transmission lines, their voltage and current equations, input impedance of short and open circuited transmission line, Concept of impedance matching, perfectly matched transmission line, Stub matching, Single and double stub technique, causes of attenuation in transmission. Smith chart and its applications, calculations using Smith chart, importance of Smith chart at high frequency.

UNI-IV Wave Guides: Waves between parallel planes of perfect conductors, types: Parallel plate, rectangular, circular wave guides, Field equations, modes in wave guides, excitation of modes, field patterns, cut-off wavelength and phase velocity, dominant mode, transverse Electric and Transverse Magnetic (TE and TM) waves, Wave impedances, attenuation in wave guides.

UNIT-V High frequency devices: High frequency Transistors and their equivalent circuit analysis, microwave semiconductor devices. Klystron, Magnetron and TWT. Microwave instrumentation in air traffic control. IOT (Inductive Output Tube) IOT (Inductive Output Tube) Construction & operating principle. Comparison of IOT with Klystron

Text Books:
1. Jordan E.C.,EM Fields and wave propagation systems, Pearson Education
2. IMPACT Teaching Modules on High Frequency Engineering
3. N. N. Rao, Elements of Electromagnetism, Pearson Education

References Books: 1. K. D. Prasad, Antenna and Wave Propagation, Satya Prakashan, New Delhi



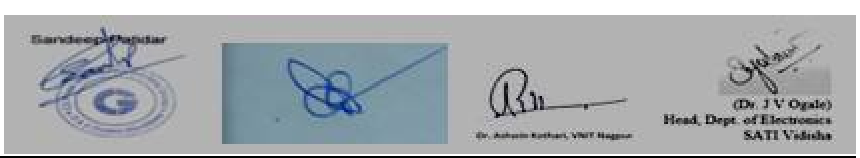
SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE)
VIDISHA (M.P)

ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits -4			Theory Paper
			L	**T**	**P**	
DE-2	Microcontrollers	EI-1863(A)	3	-	2	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-1863(A)	Microcontrollers	70	20	10	30	20	150

Course Objectives	This course explores the internal architecture of the Microcontroller and its operation. It includes the 8051 assembly language programming, high level programming and interfacing of 8051 microcontrollers with various peripheral devices, architecture and programming of PIC18 microcontrollers, and study of various buses and their configuration.
Prerequisite Knowledge	Fundamentals of Analog Electronics and Digital Electronics.
Course Description	To produce graduates who understand the internal architecture and operation of a 8051 microcontroller system, fundamental programming skills in assembly language and high level language and interfacing concepts, PIC18 microcontroller, and Bus Configurations.
Course Outcomes	Upon completion of this course, student will be able to **CO-1** Identify the architectural features of 8051 microcontroller which includes port structure, memory organization, interrupt structure and analyze the timers and counters. **CO-2** Develop skills in Assembly Language Programming of 8051 for simple problem solving using instruction set of 8051. **CO-3** Conceptualize the architectural features of 16 bit 8096 microcontroller and PIC18 Microcontrollers. **CO-4** Analyze and apply different bus configurations used in industry.



<u>**Syllabus**</u>

Unit - I

Intel family of 8 bit microcontrollers, Architecture of 8051, Pin description, I/O configuration, interrupts; Interrupt structure and interrupt priorities, Port structure and operation, Accessing internal & external memories and different mode of operations, Memory organization, Addressing modes, instruction set of 8051 and programming.

Unit - II

8051 interfacing to LED, LCD, ADC and DAC, Stepper motor interfacing, Timer/ Counter functions, 8051 based data acquisition system, 8051 connections to RS-232, 8051 Serial communication, Serial communication modes, Serial communication programming, Serial port programming in C.

Unit – III

Overview of 16 bit 8096 microcontroller architecture, Types of Microcontrollers their Selection and Applications of Microcontrollers, RISC/CISC and Harvard/Princeton Architectures.

Unit - IV

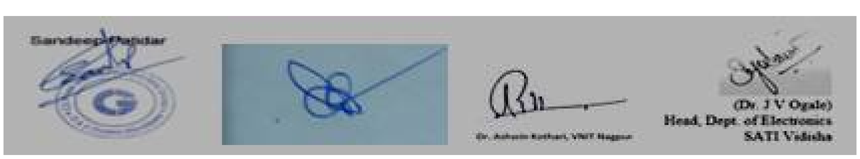
Introduction to PIC18 Microcontroller, PIC18 architecture, CPU registers, memory oganization and types, instruction format and addressing modes, instruction set of PIC 18 microcontroller and assembly language programming, port structure, interrupt structure & timers of PIC18, Input/Output ports and interfacing of switches, LED and LCD with PIC Microcontroller.

Unit – V

Different Bus Configuration used for industrial automation- RS232, UART, SPI, RS485, GPIB, CAN, USB, I2C.

Textbooks/ Reference Books:

1. 8051 microcontroller – Kenneth J. Ayala, Penram International, 3rd edition
2. 8051 Microcontroller and embedded systems – M. Mazidi, Pearson Higher Education
3. Programming and Customizing the 8051 microcontroller – Myke Predko, TATA McGraw Hill.
4. Microcontrollers — Rajkamal, Pearson Education.
5. PIC Microcontroller & Embedded system -- Mazidi, 3rd Edition, Pearson Education
6. Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC Microcontroller Family) Ramesh Gaonkar, Penram International Publishing Pvt. Ltd.



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-2	Peripherals & Interfacing	EI-1863(B)	3	-	2	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-1863(B)	Peripherals & Interfacing	70	20	10	30	20	150

Course Objectives	This course explores the architecture of the computer systems, their memory allocations and processing
Prerequisite Knowledge	Fundamentals of Microprocessors
Course Description	To course ids about to learn and study the architecture of the computer systems, their memory allocations and processing
Course Outcomes	Upon completion of this course, student will be able to CO1: To discuss architecture of computer systems for Uni-processing and parallel processing. CO2: Gain knowledge of memory systems like cache & virtual memory. CO3: Gain knowledge of floppy disk controller & CRT controller. CO4: Develop ability to identify specific peripherals related to computer system.

Syllabus

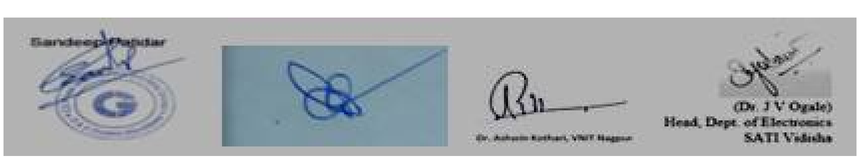
UNIT-I Computer Systems And Architecture, Storage Structure & Hierarchy, Hardware Protection, Network Structures, Parallel Processing, Uniprocessor Systems, Parallel Systems Classification.

UNIT-II Common Instrument Interface: Current Loop, RS232, RS 485, GPIB, System Buses, Interface Buses, I2c, USB, Networking Buses For Office & Industrial Applications (ISA,EISA, LOCAL, VLB, AGP, PCI), Bus Architecture, System Ports & Classification.

UNIT-III Architecture of different CPU like Intel 8088/8086/80286/80386, interfacing with 8086: semiconductor memory interfacing, interfacing I/O ports, interfacing with ADC & DAC, stepper motor.

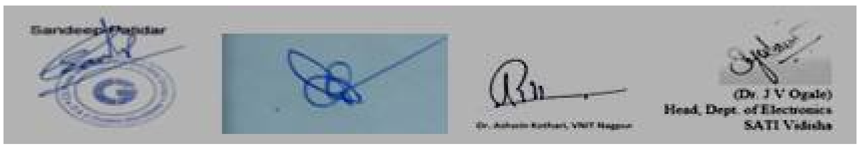
UNIT-I V Intel 8272, hard disk, hard disk controller 82064. CD, pen drive, zip drive. Concept of ADC -Successive Approximation & Interfacing, Concept of DAC R-2R (ladder) & Interfacing, Introduction to Sensors & Transducers, Keyboard Display &Centronics Printer Parallel Interfacing using 8255.

UNIT-V Memory System: Hierarchy, virtual and cache memory, Paging & Segmentation, Allocation Policies and management scheme. Micro architecture: Horizontal Micro architecture and Vertical Micro architecture.



Text Books:
1. Tanenbaum A.S., Structured Computer Organization.
2. Hwang and Briggs, computer Architecture and Parallel Processing.
3. Intel Data Book.

Reference Books:
1. IBM PC/XT/AT Technical Reference Manual.
2. William Stallings, Computer Organization and Architecture.



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	Max.Marks-70
DE-2	Telemetry	EI -1863(C)	3	-	2	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 - 1863(C)	Telemetry	70	20	10	30	20	150

Course Objectives	This course is a study of to understand the principles of telemetry, multiplexing, modem protocols, fiber optic for practical
Prerequisite Knowledge	Basic fundamentals of communication
Course Description	Upon completion of this course, the student will be able to: 1. Describe the functions, strengths, and limitations of various communication method. 2. Describe the modems. 3. Operate numerous types of frequency modulation technique. 4.Explain the function and importance of Optical Fiber.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* 1. Discuss electrical Non-electrical telemetry. 2 Describe FDM and TDM. 3. Describe Modems and Transmission Line 4. Classify Fiber optical telemetry 5. Discuss Internet based telemetry

UNIT-I

Introduction to Telemetry Principles

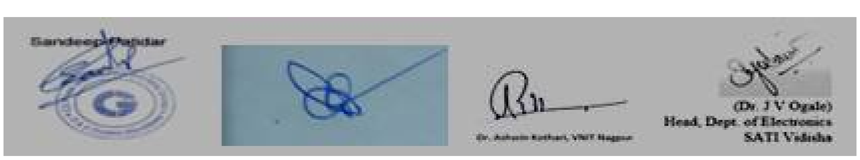
Introduction, The basic system, Classification, Non-electrical Telemetry systems, Voltage and Current Telemetry systems, Local transmitters and converters, Frequency Telemetering, Power line carrier communication (PLCC).

Bits and Symbols, Time-function pulses, Line and channel codings, Modulation codes, Intersymbol interference, Error rate and probability of Error.

UNIT-II

Frequency Division Multiplexed Systems

FDM: An Introduction, IRIG Standards, FM circuits, Phase Modulation Circuits, The Receiving End, Phase Locked Loop, Mixers.



UNIT-III

Time Division Multiplexed System

Introduction, TDM-PAM System, PAM/PM System, TDM-PCM System, Digital Multiplexer, PCM Reception, Coding for varying levels, Differential PCM (DPCM), Conclusion and Standards. Introduction to Modems, Quardrature Amplitude Modulation, Modem Protocol.

UNIT-IV

Basics and Satellite Telemetry

Introduction, General Considerations, TT&C Services, Digital Transmission System in Satellite Telemetry, TDM, The Antenna, Some Aspects of TT&C- subsystems, Satellite Telemetry and Communications: MA Techniques

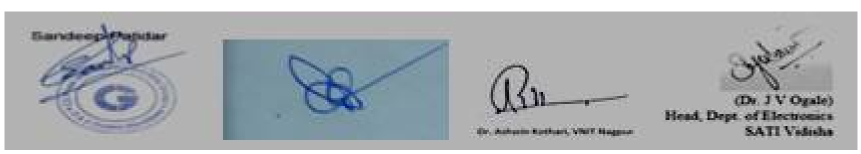
UNIT-V

Fibre Optical Telemetry

Introduction, The Optical Fibre Cable, Dispersion, Losses, Connectors and Splices, Sources and Detectors, Transmitter and Receiver Circuits, Coherent Optical Fibre Communication System, Wavelength Division Multiplexing, Internet based Telemetry, Remote control.

Suggested Text Books:

1. D. Patranabis :Telemetry Principles", Tata McGraw–Hill Publications
2. R.P.Singh & S.D. Sapre "Communication Systems"
3. Simon Haykins "Communication Systems" Wiley Publications
4. Taub & Schilling, "Principles of Communication Systems", Tata McGraw–Hill Publications
5. Umesh Sinha, "Transmission Lines & Network", Satya Prakashna
6. J.M.Senior "Optical Fiber Communications", Person Publications



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-3	**Data Structure**	EI-1864(A)	3	-	-	Max.Marks-70 Min.Marks-22 Duration-3 Hrs.

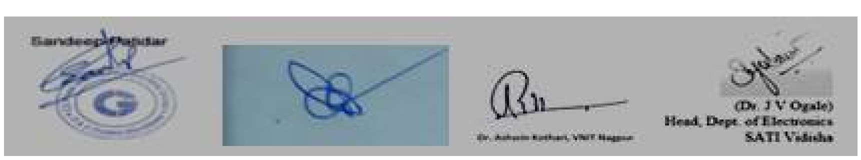
Sub. Code	**Subject Name & Title**	**Maximum Marks Allotted**					**Total Marks**
		Theory Paper			Practical		
		End Sem.	Mid Sem. MST	Quiz, Assignment	End Sem.	Lab Work/ Assignment	
EI-1864(A)	**Data Structure**	70	20	10	-	-	100

Course Description	The purpose of this course is to introduce the key concepts in automatic control and instrumentation of process plants. Commonly used sensing, transmission and final control elements are described and depicted in piping and Instrumentation Diagrams (P&IDs). The course is delivered through a combination of lectures, tutorials and exposure to simulation programs currently used in industry
Prerequisite Knowledge	Programming and Basic Mathematical knowledge
Course Objectives	1. To impart the basic concepts of data structures and algorithms. 2. To understand concepts about searching and sorting techniques 3. To understand basic concepts about stacks, queues, lists, trees and graphs. 4. Toenablethemtowritealgorithmsforsolvingproblemswiththehelpoffundamentaldatastructures
Course Outcomes	**CO1** For a given algorithm student will able to analyse the algorithms to determine the time and computation complexity and justify the correctness. **CO2** For a given Search problem (Linear Search, Binary Search and Hash Search) student will able to implement it. **CO3** Student will able to write an algorithm Selection Sort, Bubble Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort and compare their performance in term of Space and Time complexity. **CO4** For a given problem of Stacks, Queues and linked list student will able to implement it and analyse the same to determine the time and computation complexity. **CO5** Student will able to implement Graph search and traversal algorithms and determine the time and computation complexity.

Syllabus

Unit I Introduction: Data, Datatypes, Data structure and abstract data types (ADT). Algorithm: Characteristics of an algorithm. Analysis in programs. Frequency count. Time and space complexity Asymptoticnotations, Best. Average and worst cases complexities. Danglingpointers, Garbage memory and Dynamic Memory Allocation.

Unit II: Array- Searching and Sorting: Array: Definition of Arrays, Types of Array, Common operation on Array, Row/Columnm representation of Arrays, String. Searching: linear and binary search algorithm. Hashing: hashing functions, chaining, overflow handling with and without chaining, open addressing: linear. Quadraticprobing. Sorting Methods: Various Sorting algorithm such as Bubble sort, Selection Sort, Insertion Sort, Merge Sort, Quick Sort, Radix sort and Shell sort with their complexity



Unit III Stacks and Queues: Stack and queue as ADT. Operations on stack and queue. Implementations using arrays and dynamic memory allocation. Application of stack for expression evaluation, expression conversion. Recursion and stacks. Queue: Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues.

UNIT IV Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list, Header nodes, Doubly linked list: operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis. Representation & manipulations of polynomials/sets using linked lists.

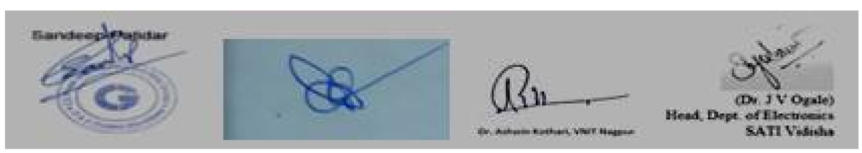
Unit V: Trees and Graphs: Tree: Definition, Terminology Binary tree **-** definitions and properties, Representation, Binary Tree Traversal In-order, Pre-order, Post order, Insertion and deletion of nodes in binary search tree. Introduction to Binary Search Tree. AVL Tree; Tree operations on each of the trees and their algorithm and analysis. B Tree, B+ Tree: definitions, algorithms and analysis. Graph: Representation of graphs using adjacency matrix, adjacency list. Graph search and traversal algorithms and complexity analysis

Text Books:

- E. Horowitz, S. Sahni, S. Anderson-freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, ISBN 978-81-7371-605-8
- B. Kernighan, D. Ritchie, “The C Programming Language”, Prentice Hall of India, Second Edition, ISBN 81-203-0596-5
- Y. Langsam, M. Augenstin and A. Tannenbaum, “Data Structures using C”, Pearson Education Asia, First Edition, 2002, ISBN 978-81-317-0229-1

Reference Books:

- Ellis Horowitz, S. Sahni, D. Mehta “Fundamentals of Data Structures in C++”, Galgotia Book Source, New Delhi 1995 ISBN 16782928



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-3	Filter Design & Simulation	EI-1864(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-1864 (B)	Filter Design & Simulation	70	20	10	-	-	100

Course Description	This course is a study of Designing Filter using OP-AMP and DSP techniques
Prerequisite Knowledge	Knowledge of Op-amp, DSP
Course Outcomes	*The student will be able to* CO1: To discuss various active network elements, control sources and properties of GIC, Nic, gyrators using Op-amp. CO2: Evaluation of elliptical filters and fundamentals of approximation theory. CO3: To implement realization of Butterworth filters of first order and second order using Op-amp CO4: Analyzing active networks using IAM approach and its implementation. CO5: To discuss LC ladder simulation, cascade realization, Kerwins circuit and other filter circuits and its simulation.

Syllabus

UNIT-I Active Network elements, various control sources, ideal and non-ideal conditions, properties of GIC, NIC, gyrators, FDNR etc. using Op-Amp. Impedance, inversion factor, inductance simulation using linear active circuits.

UNIT-II. Fundamentals of approximation theory, Butterworth's and Chebyshev approximation and elliptic filters, Introduction to elliptical filters.

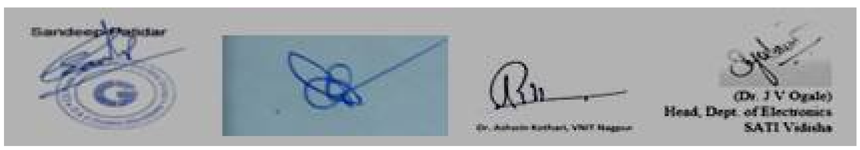
UNIT-III Realization of Butterworth's filters of first order& second order using Op-Amps. Low pass, High pass, All pass, Band pass and Band reject type of filters. Active resonant band pass filters, Gain boost circuit.

UNIT-IV Analysis of Active networks using IAM approach, reduction of multipole and its implementation parallel connections of multipoles, analysis of networks containing active elements and operational amplifiers.

UNIT-V. LC ladder simulation, cascade realization, Sallen's and Key's filters and their realization, Kerwin's circuit, constant KLC filters and their analysis, M-derived filters, composite filters attenuators, switched capacitor filter, introduction to digital filters, Simulation of filter circuit.

Text Books:

1. Temes G.C. and Lapatra J.W., Circuit Synthesis and Design.
2. Mitra S.K., Analysis and Synthesis of linear Active Networks.
3. Van Valkenburg and R.Schuman: Active Filter Design



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

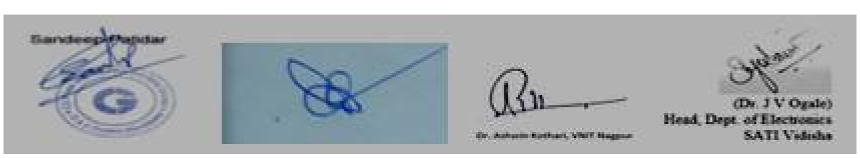
ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	Course Title	Course Code	Credits - 3			Theory Paper
			L	T	P	
DE-3	PLC & SCADA	EI-1864(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-1864 (C)	PLC & SCADA	70	20	10	-	-	100

Course Description	This course is a study of various industrial process automation techniques used in Industry.
Prerequisite Knowledge	Basic of Process Control and Control Systems, basic programming
Course Objectives	Upon completion of this course, the student will be able to: 1. Explain the General function of Industrial Automation 2. Identify Practical Programmable Logic Controller Applications 3. Understand the Distributed Control System and its applications. 4. SCADA systems. 5. CNC machines.
Course Outcomes	*The student will be able to* 1. List basic Devices in Automated Systems and Distinguish Different Controllers Employed In Automated Systems. 2) Demonstrate Basic PLC Skills. 3) Practically Apply Distributed Control System. 4) Categorize Input/Output Modules And Wiring. 5) Apply CNC machine in industries.

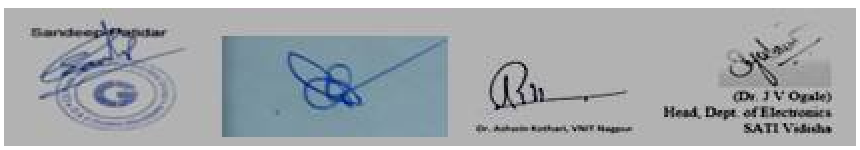
	Syllabus Contents
Unit-I	Industrial automation: introduction, evolution and challenges of automation, device connectivity, automation system controllers. Introduction to process variables: Pressure, Temperature, Flow, Level, Humidity, Ph, Displacement & Speed. Introduction to process control: Proportional Controllers, Integral Controllers, Derivative Controllers, Controller Tuning.
Unit-II	The programmable logic controller: Introduction to the programmable logic controller, hardware, internal architecture, I/O devices, I/O processing, Ladder and function block programming, function blocks, IL, SFC, and ST programming methods.
Unit-III	Distributed Control System: Introduction, Evolution of traditional control systems; Distributed control systems, Functional components of DCS, Diagnostics in IOs.



Unit-IV	SCADA Systems:Overview of SCADA systems; minicomputers and microprocessors, remote terminal units, communication technologies, program development tools.
Unit-V	CNC Machines: Introduction to Computer Numerically Controlled (CNC) Machines. CNC Machines: Interpolation, Control and Drive.

Some Suggested Textbooks/ Reference books:

1. Industrial Instrumentation, Control and Automation- S. Mukhopadhyay, S.Sen and A.K. Deb, Jaico Publishing House, 2013
2. Programmable Logic Controllers - Morriss, S.B., Prentice hall.
3. Process Control Systems: Application, Design and Tuning - Shinskey, F.G., McGraw-Hill Professional, 1996
4. Industrial Process Automation Systems - Mehta B. R. and Reddy Y. J., Elsevier publication, 2015



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-2	Optical Instruments & Sensors	EI-1865(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-1865(A)	Optical Instruments & Sensors	70	20	10	-	-	100

Course Description	This course is a study of fiber optics basics & Instruments based on fiber optics.. How different Instruments techniques are employed to achieve fiber communication and its related parameters measurement.
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* **CO-1**Analyze & measure the optical domain parameters. **CO-2**learn the principles of different sensors, geometric and wave optics. **CO-3**Able to use optical instruments such OTDR, Optical Spectrum Analyzer, fiber optics sensors. **CO-4**Analyze optical sources and detectors.

Syllabus

Unit-I

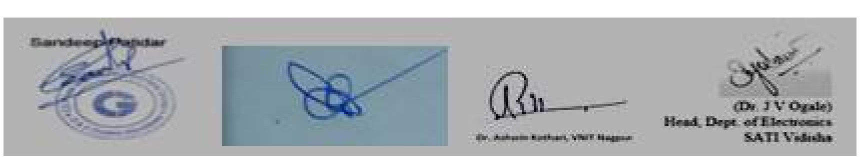
Introduction to vector nature of light, Propagation of light, Propagation of light in a cylindrical dielectric rod, ray model, wave model. Theory of image formation, Review of aberration, Comma, acclamation, distortion, Chromative aberration, Osages.

Unit-II

Different types of optical fibers, model analysis of a step index fiber. Signal degradation on optical fiber due to dispersion and attenuation.

Unit-III

Optical fiber in instrumentation use of optical fibers as sensors, modulation techniques for sensors fiber optic power measurement. Stabilized calibrated light sources end-to-end measurement of fiber losses, optical signal processing.



Unit-IV
Optical power meters, optical attenuators, optical spectrum analyzer, optical switching & logic gate and measurement techniques like optical time domain reflectometry, (OTDR), attenuation measurements.

Unit-V
Optical Sources & detectors: LED and LASERS, photo detectors, pin detectors detector responsitivity – noise, optical receivers. Integrated optical devices

Text Books:

1. An Introduction to Fiber Optics, Cherin
2. Optics by A.K. Ghatak, TMH 3. Optical fiber – System Technology, design and applications by C.K. Rao
4. Optical Fiber Sensors, Vol.12 by Culshaw B. and Dakin J. (Ed.), Arctech House
5. Fundamentals of Fiber Optics in Telecommunications and sensor, by B.P. Pal, Wiley Eastern
6. Optical Fiber Communication by G. Keiser, McGraw Hill 7. Optical Fiber Sensor technology, K.T.V. Grattan, B.T. Meggitt

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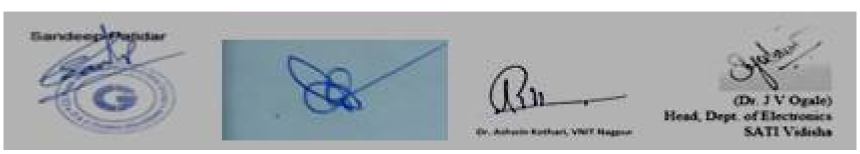


SAMRAT ASHOK TECHNOLOGICAL INSTITUTE (DEGREE) VIDISHA (M.P)

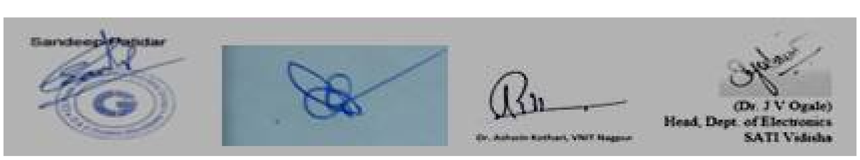
ELECTRONICS & INSTRUMENTATION DEPARTMENT

Category of Course	**Course Title**	**Course Code**	**Credits - 3**			**Theory Paper**
			L	**T**	**P**	
OC-2	Probability and Stochastic Process	EI-1865(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-1865(B)	Probability and Stochastic Process	70	20	10	-	-	100

Course Description	
Pre-Requisites Knowledge	Signal & Systems
Course Outcomes	On successful completion of this course student should be able to: CO1: Understand the axiomatic formulation of modern Probability Theory and think of random variables as an intrinsic need for the analysis of random phenomena. CO2: Characterize probability models and function of random variables based on single & multiples random variables. CO3: Evaluate and apply moments & characteristic functions and understand the concept of inequalities and probabilistic limits. CO4: Understand the concept of random processes and determine covariance and spectral density of stationary random processes. CO5: Understand the working of LTI Systems with Random Inputs.

Unit I: Definitions, scope and history; limitation of classical and relative-frequency-based definitions. Sets, fields, sample space and events; axiomatic definition of probability. Combinatorics: Probability on finite sample spaces. Joint and conditional probabilities, independence, total probability; Bayes' rule and applications. Definition of random variables, continuous and discrete random variables, cumulative distribution function (cdf) for discrete and continuous random variables; probability mass function (pmf); probability density functions (pdf) and properties



Unit II: Jointly distributed random variables, conditional and joint density and distribution functions, independence; Bayes' rule for continuous and mixed random variables. Function of random variable, pdf of the function of a random variable; Function of two random variables; Sum of two independent random variables. Expectation: mean, variance and moments of a random variable. Joint moments, conditional expectation; covariance and correlation; independent, uncorrelated and orthogonal random variables. Random vector: mean vector, covariance matrix and properties.

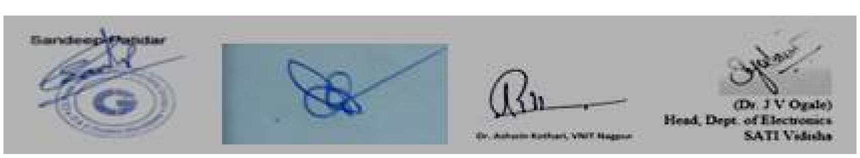
Unit III: Some special distributions: Uniform, Gaussian and Rayleigh distributions; Binomial, and Poisson distributions; Multivariate Gaussian distribution. Vector-space representation of random variables, linear independence, inner product, Schwarz Inequality. Elements of estimation theory: linear minimum mean-square error and orthogonality principle in estimation. Central Limit Theorem.

Unit IV: Random process: realizations, sample paths, discrete and continuous time processes, examples. Probabilistic structure of a random process; mean, autocorrelation and autocovariance functions. Stationarity: strict-sense stationary (SSS) and wide-sense stationary (WSS) processes. Autocorrelation function of a real WSS process and its properties, cross-correlation function. Ergodicity and its importance.

Unit V: Spectral representation of a real WSS process: power spectral density, properties of power spectral density; cross-power spectral density and properties; auto-correlation function and power spectral density of a WSS random sequence. Linear time-invariant system with a WSS process as an input: stationary of the output, auto-correlation and power-spectral density of the output; examples with white-noise as input; linear shift-invariant discrete-time system with a WSS sequence as input.

TEXT BOOKS & REFERENCES:

- Papoulis, A., 'Probability, Random Variables and Stochastic Processes', McGraw Hill (3PrdP edition), 1991.
- Cooper, G.R., McGillem, C.D., Probabilistic Methods of Signal and System Analysis, Oxford university Press.
- Peebles, P.Z., Probability, Random Variables and Random Signal Principles, 4e, McGraw Hill.
- H. Stark & J.W. Woods: Probability, Random Processes and Estimations Theory for Engineers, (2/e), Prentice Hall.



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-2	Statistical Signal Processing	EI-1865(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-1865(C)	Statistical Signal Processing	70	20	10	-	-	100

Course Objective	The objective of this course is to make the students conversant with those aspects of statistical decision and estimation which is indispensable tools required for the optimal design of digital communication systems.
Pre-Requisite Knowledge	Signal & Systems, Digital Signal Processing
Course Outcomes	*This course primarily contributes to EI program outcomes that develop students abilities to:* CO1: Understand the concepts of random signal processes. CO2: Model the random processes. CO3: Apply the concepts of random signals to Signal Processing and Digital Communications CO4: Develop simulation model for the random signals and processes..

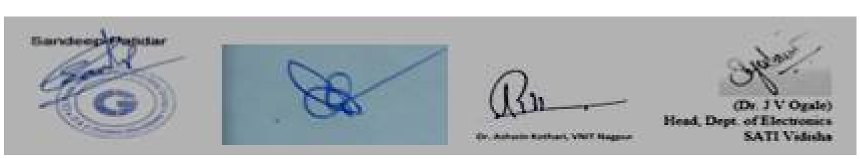
Syllabus

UNIT-I-

Representation of random signal processes, Random variables and expectations, Random processes

UNIT-II

Concept of Stationarity, Correlation and Covariances, Frequency domain representation of random signals, Weiner-Khinchin theorem, Ergodicity, Finite Dimensional representation of random processes.



UNIT-III Signal space Representation: Vector space concepts, Eigenvectors, Inner product spaces, Signal space representation

UNIT-IV Discrete signal representation, Complete orthonormal sets. Simulation methods for random processes, Monte-Carlo Simulations.

UNIT-V Estimators and their properties. Maximum likelihood, Fisher Information and the Cramer Rao bound. Bayes theorem, MAP estimation and minimum mean squared estimation. Reading assignment: supplemental materials

TEXT BOOKS & REFERENCES:

1. L. E. Franks , “Signal Theory”, Prentice Hall.
2. Haykin, “Adaptive Filter Theory”, Pearson Education
3. Papoulis, ‘”Probability Theory and Random Variables”, Mc Graw Hill
4. Oppenheim, “Signals Systems, and Inference”, Pearson
5. Gallager, “Stochastic Processes”, Cambridge