



**Shri Vaishnav Vidyapeeth Vishwavidyalaya, Indore**  
**Shri Vaishnav Institute of Technology and Science**  
**Choice Based Credit System (CBCS) in the Light of NEP-2020**  
**B.Tech. (EC/ECIOT/RA)**  
**(2021-2025)**

COURSE CODE	CATE- GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT501	DCC	Communication Systems	60	20	20	30	20	3	1	2	5

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

\***Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

**Course Educational Objectives (CEOs):**

To provide the fundamentals, principles, concepts of communication systems and various modulation techniques of analog and digital communication systems.

**Course Outcomes (COs):**

After completion of this course the students will be able to:

1. Analyze various analog modulation and demodulation techniques and apply suitable modulation techniques for various applications.
2. Analyze various digital modulation and demodulation techniques and apply suitable modulation techniques for various applications.
3. Understand different types of source and channel coding techniques.

**Syllabus:**

**UNIT I**

**9 Hrs.**

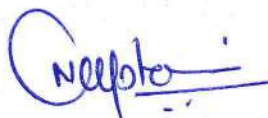
**Amplitude modulation Techniques:** Need of modulation, Amplitude modulation: mathematical representation of AM, modulation index, frequency spectrum, single tone and multi tone AM, generation of AM (square law modulator, switching modulator), Detection of AM (Square law detector, envelope detector),

Power distribution, DSB-SC: generation and detection techniques, SSB: generation and detection techniques, VSB.

**UNIT II**

**8 Hrs.**

**Angle modulation Techniques:** Frequency and phase modulation, spectrum and bandwidth, Narrowband FM, Wideband FM, FM Modulators: Direct and Indirect method of frequency modulation, FM Detectors: Slope Detector, Foster Seeley Discriminators, Ratio-Detectors and PLL detectors, AFC, Pre-Emphasis and De-Emphasis filters.



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**UNIT III**

**9 Hrs.**

**Digital conversion of Analog Signals:** Sampling theorem, types of sampling, signal reconstruction and reconstruction filters, Pulse Amplitude Modulation, Pulse Width Modulation, Pulse Position modulation, Quantization, quantization error, Pulse Code Modulation, Companding, TDM-PCM, Differential PCM, Delta modulation, Adaptive Delta modulation.

**UNIT IV**

**9 Hrs.**

**Digital Modulation Techniques:** Phase shift Keying (PSK)- Binary PSK, differential PSK, differentially encoded PSK, Quadrature PSK, M-ary PSK and associated Prob. of Error. Frequency Shift Keying (FSK)- Binary FSK (orthogonal and nonorthogonal), M-ary FSK and associated Probability of Error. Comparison of BPSK and BFSK, Quadrature Amplitude Shift Keying (QASK), Minimum Shift Keying (MSK).

**UNIT V**

**8 Hrs.**

**Information Theory & Coding:** Introduction to Information Theory, Channel Capacity, Source Coding, Entropy Codes: Huffman Coding & Shannon-Fano Coding, Linear Block Codes, Hamming Weight and Distance Properties, Syndrome Decoding, Cyclic Codes, Convolutional Codes.

**Text Books:**

1. B.P. Lathi and Zhi Ding, "Modern Digital and Analog Communication System"; 4<sup>th</sup> Edition, Oxford University Press, 2011.
2. Herbert Taub, Donald L Schilling, Gautam Saha, "Principles of Communication Systems, McGraw Hill Education; 4<sup>th</sup> Edition, 2013.

**References:**

1. Simon Haykin, Michael Moher, "Communication System", John Wiley, 5<sup>th</sup> Edition, 2010.
2. R.P. Singh and S.D. Sapre, "Communication Systems: Analog and Digital", McGraw Hill Education; 3rd Edition, 2012.



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3. H P. Hsu: "Schaum's Outline Analog and Digital Communications", McGraw Hill Education, 4<sup>th</sup> Edition, 2019.
4. John G. Proakis, Masoud Salehi, "Fundamental of Communication Systems", Pearson Edition, 2<sup>nd</sup> Edition, 2014.

**List of Experiments:**

1. To synthesize the Fourier series for periodic Signals.
2. To generate the Frequency Spectrum of various signals using Spectrum Analyzer.
3. To analyze characteristics of AM modulator & Demodulators and calculate the modulation Index.
4. To analyze characteristics of FM modulators & Demodulators.
5. To study signal reconstruction and aliasing and calculate sampling frequency for various signals.
6. To observe the waveforms of PAM, PPM and PWM.
7. To analyze the waveform of PCM signal and reconstruct the baseband signal by synchronizing the transmitter and receiver clock.
8. To analyze the Delta modulation waveform and observe the distortion.
9. To analyze Adaptive delta modulation waveform and compare the waveform with DM waveform.
10. To generate the ASK, PSK and FSK modulated signals and their reconstructed signals.



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**(Common to EE\EX)**  
**(2021-2025)**

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BTEE503	DCC	Control System Engineering	60	20	20	30	20	2	1	2	4

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**Course Educational Objectives (CEOs):**

The course will provide understanding of control system and mathematical modeling of the system

**Course Outcomes (COs):**

After the successful completion of this course students will be able to

1. Demonstrate the understanding of basic element and modeling of the control system.
2. Analyze the stability in time domain and frequency domain
3. Design the controller and compensators for the system

**Syllabus**

**UNIT I**

**8 Hrs**

**Introduction:** Basic Elements of Control System, Open loop and \*Closed loop systems, Differential equation, Transfer function, Modeling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph, Constructional and working concept of ac servomotor.

**UNIT II**

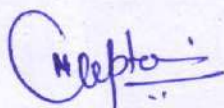
**9 Hrs**

**Time Domain Analysis:** Standard test signals, Time response of first order systems, Characteristic Equation of Feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants, P, PI, PD and PID Compensation

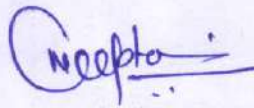
**UNIT III**

**8 Hrs**

**Stability Analysis and Root locus:** The concept of stability – Routh's stability criterion – qualitative stability and conditional stability – limitations of Routh's stability. The root locus concept - construction of root loci-effects of adding poles and zeros to  $G(s)$   $H(s)$  on the root loci.




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BTEE503		Control System Engineering	60	20	20	30	20	2	1	2	4

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**UNIT IV**

**8 Hrs**

**Frequency domain Analysis:** Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and Phase margin and Gain margin-Stability Analysis from Bode Plots. Polar Plots, Nyquist Plots, Stability analysis. Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain

**UNIT V**

**8 Hrs**

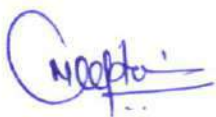
**State Space Analysis of Continuous Systems:** Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization- Solving the Time invariant state Equations- State Transition Matrix and it's Properties – Concepts of Controllability and Observability.

**Textbooks:**

1. I.J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 7th Edition, 2021.
2. Richard C Dorf; Robert H Bishop, "Modern control system", Pearson Education, 13th Edition, 2017.

**References:**

1. M F Golnaraghi and Benjamin C Kuo, "Automatic control systems", New York McGraw-Hill Education, 9th Edition, 2017.
2. M.Gopal, Digital Control and State Variable Methods, Tata McGraw- Hill 4th Edition, 2014.
3. Joseph J DiStefano, Allen R Stubberud and Ivan J Williams, Schaum's Outline Series, "Feedback and Control Systems", Tata McGraw- Hill, 2nd Edition 2014.
4. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGraw-Hill., 8th Edition.

  
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BTEE503	DCC	Control System Engineering	60	20	20	30	20	2	1	2	4

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**List of Experiments:**

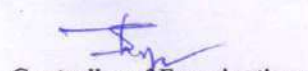
1. Perform step response of a transfer function
2. Perform impulse response of a transfer function
3. Perform ramp response of a transfer function
4. Analyze torque speed characteristics and determine the transfer function of a DC servomotor.
5. Analyze characteristics of a small AC servomotor and determine its transfer function.
6. Perform the transient and frequency response of a second order network.
7. Perform the performance of various types of controllers used to control the temperature of an oven.
8. Draw nyquist plot from a transfer function
9. Draw root locus from a transfer function
10. Draw bode plot from a transfer function

  
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BTEE404	DCC	Electromagnetic Field Theory	60	20	20	0	0	3	1	0	4

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**Course Educational Objectives (CEOs):**

The objective of this course is to-

1. Obtain an understanding of physical laws governing electromagnetic effects in the form of Maxwell's equations
2. Understand the concepts of static and time varying fields with an emphasis on wave propagation

**Course Outcomes (COs):**

After completion of this course students should be able to

1. Apply vector calculus to determine the electric and magnetic fields and energy stored due to specified charge and current distribution.
2. Apply Maxwell's equation in Differential and integral forms for the solution of appropriate problems involving static as well as time varying fields.
3. Discuss and analyze propagation of electromagnetic waves in free space, dielectric and conducting media

**Syllabus**

**UNIT I**

**10 Hrs.**

**Electrostatics I:** Introduction to various Co-ordinate systems and Co-ordinate transformations, Vector calculus, Divergence and Stokes theorem, Laplacian of a scalar and vector, Coulomb's law, Electric field intensity, Electric fields due to: point, line, surface and volume charge distributions, Electric flux density, Gauss's law and its application, Electric potential, Potential gradient, Electric dipole: dipole moment, potential & electric field intensity due to dipole, Energy stored in electrostatic fields, Method of images.

**UNIT II**

**8 Hrs.**

**Electrostatics II:** Poisson's and Laplace's equations, Solution of Laplace's equation, Uniqueness theorem, Capacitor and capacitance, Electric boundary conditions, Different electric currents and current densities, Behavior of different electrical materials in electric field, Equation of continuity and relaxation time, Ohms law in point form.

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BTEE404	DCC	Electromagnetic Field Theory	60	20	20	0	0	3	1	0	4

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### UNIT III

**8 Hrs.**

**Magnetostatics I:** Magnetic field intensity, Magnetic flux, Magnetic flux density, Biot-Savart Law, Magnetic field due to: straight conductors, circular loop, infinite sheet of current, Ampere's circuital law and its application, Magnetic scalar and vector potential, Force on a moving charge and current elements, Force and torque on closed circuit, Magnetic dipole, Magnetic polarization, Self and mutual inductance, Energy stored in magnetic fields, Magnetic boundary conditions.

### UNIT IV

**9 Hrs.**

**Magnetostatics II:** Faraday's Law, Induced EMF for time varying fields, Displacement current, Maxwell's equation in point form, Maxwell's equation in integral form, Concept of retarded potential, Poynting vector theorem, Complex poynting vector.

### UNIT V

**9 Hrs.**

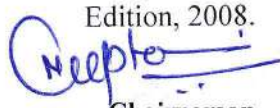
**Electromagnetic Waves:** Solution of wave equation, Propagation of plane EM wave in: perfect dielectric, lossy medium and good conductor, Media-attenuation, Phase velocity, Group velocity, Skin depth. Reflection and refraction of plane electromagnetic waves at boundaries for normal & oblique incidence, Snell's law of refraction, Brewster angle, Polarization of electromagnetic wave: linear, circular and elliptical polarization. Transmission Line parameters and equations,

#### Text Books:

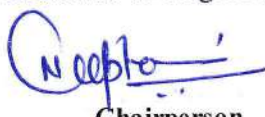
1. Matthew. N.O. Sadiku, "Elements of Electromagnetics", Oxford University Press, First Indian Edition, 2010.
2. Shankar Prasad Ghosh, Lipika Datta, "Electromagnetic Field Theory", McGraw Hill, 1<sup>st</sup> Edition, 2012
3. Gangadhar. K.A, "Field theory", Khanna Publishers, New Delhi, 15<sup>th</sup> Edition, 2004.
4. Umesh Sinha, "Transmission Lines and Networks", Satya Prakashan, 2003.

#### References:

1. William Hayt, "Engineering Electromagnetics", McGraw Hill, 7<sup>th</sup> Edition, 2011.
2. David K Cheng, "Field and Wave Electromagnetics", Pearson Education, 2<sup>nd</sup> Edition, 2013.
3. John D. Kraus, "Electromagnetics" McGraw Hill, 5<sup>th</sup> Edition, 1999.
4. Narayana Rao N, "Elements of Engineering Electro Magnetics", Prentice Hall of India, 6<sup>th</sup> Edition, 2008.



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BTECIOT401	DCC	Sensors and Signal Conditioning	60	20	20	30	20	3	0	2	4

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**Course Educational Objectives (CEOs):**

This course deals with various types of sensors and different signal conditioning methods.

**Course Outcomes (COs):**

The students will be able to

1. Identify the different sensors available for specific engineering applications.
2. Understand the construction and working of different types of sensors.
3. Apply the various signal conditioning techniques on different sensors and analyze the effects.

**Syllabus**

**UNIT I**

**10 Hrs.**

**Introduction to Sensor-Based Measurement Systems:** Concepts and Terminology: Measurement systems, Transducers, sensors and actuators, Signal conditioning and display, Interfaces, data domains, and conversion, Sensor Classification, Interfering and modifying inputs, Compensation techniques.

**UNIT II**

**9 Hrs.**


**Primary Sensors:** Temperature sensors, Bimetals, Pressure sensors, Flow velocity and Flow-rate sensors, Level sensors, Force and torque sensors, Acceleration and inclination sensors, Velocity sensors.

Materials for Sensor: Conductors, semiconductors, and dielectrics, Magnetic materials, Thick-Film technology, Thin-Film technology, Micromachining technologies.

**UNIT III**

**10 Hrs.**

**Resistive Sensors:** Potentiometers, Strain Gauges Fundamentals: Piezoresistive effect, types and applications. Resistive Temperature Detectors (RTDs), Thermistors: Models, Thermistor Types and Application, Magneto-resistors, Light-Dependent Resistors, Resistive Hygrometers, Resistive Gas Sensors, Liquid Conductivity Sensors.



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BTECIOT401	DCC	Sensors and Signal Conditioning	60	20	20	30	20	3	0	2	4

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**Signal Conditioning:** Measurement of Resistance, Voltage Dividers, Wheatstone Bridge: Balance and Deflection Measurements, Sensitivity and linearity, linearization of resistive sensor bridges, Sensor bridge calibration and balance, Power supply of Wheatstone bridges, Detection methods of Wheatstone bridge, Differential and Instrumentation Amplifiers, Interference types and reduction.

#### UNIT IV

9 Hrs.

**Reactance Variation Sensors:** Capacitive Sensors: variable and differential capacitor. Inductive Sensors: Variable Inductance, eddy current sensor, LVDT, Electromagnetic Sensor.

**Signal Conditioning:** Problems and alternatives, AC Bridges: Sensitivity and linearity, Capacitive bridge analog linearization, ac amplifiers and power supply decoupling, Electrostatic shields and driven shields.

#### UNIT V

8 Hrs.

**Self-Generating Sensors and its Signal Conditioning:** Thermoelectric Sensors: Thermocouples, Piezoelectric Sensors, Pyroelectric Sensors, Photovoltaic Sensor, Electrochemical Sensors.

**Signal Conditioning:** Chopper and Low-Drift Amplifiers, Electrometer and Trans-impedance amplifiers, Charge Amplifiers.

#### Text Books:

1. Ramón Pallás-Areny, John G. Webster, "Sensors and Signal Conditioning", 2nd Edition, John Wiley & Sons, 2012.
2. Walt Kester, "Practical Design Techniques for Sensor Signal Conditioning", Analog Devices, 1999.

#### References:

1. E.O. Doebelin, D.N. Manik, "Measurement systems", 6<sup>th</sup> Edition, Tata McGraw Hill, 2012.
2. R. Pallas-Areny and J. G. Webster, "Analog Signal Processing", John Wiley & Sons, 1999.

#### List of Experiments:

1. To study various Primary sensor.
2. To study RTD for Temperature measurement.
3. To study Strain Gauge for pressure measurement.

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**(2021-2025)**

COURSE CODE	CATE- GORY	COURSE NAME	TEACHING & EVALUATION SCHEME								
			THEORY			PRACTICAL		L	T	P	CREDITS
			END SEM University Exam	Two Term Exam	Teachers Assessment*	END SEM University Exam	Teachers Assessment*				
BTECIOT401	DCC	Sensors and Signal Conditioning	60	20	20	30	20	3	0	2	4

**Legends:** L - Lecture; T - Tutorial/Teacher Guided Student Activity; P – Practical; C - Credit;

**\*Teacher Assessment** shall be based following components: Quiz/Assignment/ Project/Participation in Class, given that no component shall exceed more than 10 marks.

4. To study LDR and Photodiode for sensing light intensity.
5. To study Thermocouple for Temperature measurement.
6. To study Photovoltaic for sensing light parameter.
7. Measuring the temperature using temperature sensor.
8. Measuring the light intensity using sensor.
9. Measuring the humidity using humidity sensor.
10. Measuring the distance using sensor.

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BTEC405	AEC	Programming with Arduino	0	0	0	30	20	0	0	4	2

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**Course Educational Objectives (CEOs):**

The objective of this course is to-

1. Being one of the fundamental courses of Electronics stream its prime objective is to make the students capable of analyzing given electrical network composed by passive element and some active element.
2. To make the students learn how to synthesize an electrical network from a given impedance/admittance function

**Course Outcomes (COs):**

After completion of this course the students are expected to be able to demonstrate following knowledge, skills and attitudes:

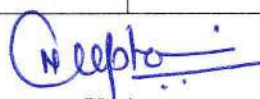
1. Apply the fundamental concepts in solving and analyzing different Electrical networks.
2. Select appropriate and relevant technique for solving the Electrical network in different conditions.
3. Apply mathematics in analyzing and synthesizing the networks in time and frequency domain.
4. Estimate the performance of a particular network from its analysis.

**Syllabus**

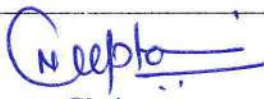
Study of Arduino and various programs based on Arduino.

**Experiment List**

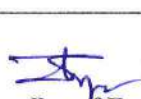
E.N.	Aim
1.	Understanding Arduino IDE and Arduino board family.
2.	Understanding I/O access on ATmega328p
3.	Interfacing LED and Seven Segment.
4.	Interfacing Switch and Keypad.



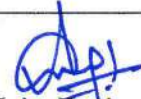
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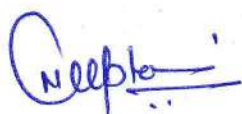
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5.	Program based on Timers.
6.	Experimenting data transfer using SPI Communication.
7.	Establishing i2c interface with ATmega328p
8.	Program based on Interrupts.
9.	Program based on Serial Communication.
10.	Interfacing GSM, RFID, Wi-Fi.



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