SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
(Engineering College), VIDISHA M.P.
(An Autonomous Institute Affiliated to RGPV Bhopal)

Department of Electronics Engineering
Syllabus applicable to July 2024 admitted and later batches

Name of the course:	B. Tech in Electronics & Instrumentation Engineering
Semester and Year of study	B. Tech 2nd Year 3rd Semester
Subject Category	Departmental Core (DC)
Subject Code: EI-301	Subject Name: Process Instrumentation-I

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	-	-	-	100	3	0	0	3

Prerequisites:

- Fundamental of Instrumentation

Course Objective:

1. To impart students with the fundamental concepts, working principles and applications of various transducers for sensing physical parameters such as RPM, Acceleration, vibration, shock, Force, torque, weight etc.
2. To enable the students to analyze and solve various problems on the sensors and develop suitable designs for practical applications.

Course Outcomes:

- CO1: Acquire knowledge of different Primary sensing elements of physical variables measurements & apply them in instrumentation systems.
- CO2: Understand the theory and working of various Strain Gauge sensors by acquiring the knowledge and apply them in industrial weight and Torque measuring Transducers
- CO3: Analyze, design and evaluate different transducers for RPM & Torque measurement
- CO4: Understand the working of Proximity sensors and analyze the overview of Sensor-Actuator Networks

CO-PO Mapping

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2										
CO2	3	2										
CO3	3	2	2									
CO4	3	2										

UNITs	Descriptions	Hrs.	CO's
I	**Primary Sensing Elements**- Transducer: classification of transducers, resistive transducers, POT and Inductive transducers, LVDT, Capacitive Transducers, piezoelectric, Magnetic type (eddy current, magnetostrictive, magnetoresistive), Hall Effect transducers. Photo transducers and Optoelectronic Transducers	10	CO1
II	**Strain Guages-** Theory of Strain Gauges, Piezoresistive effect, guage factor, Bridge configuration (Wheatstone bridge) Various types-their construction and applications, Weight Measurement using load cells-column type and bending beam type, application consideration of load cells, weigh-feeders.	8	CO2
III	**RPM & Acceleration Measurement-** Tacho-generators, tachometers, stroboscopes, strobotron, encoders, non contact rpm measurement techniques, seismic accelerometers- piezoelectric, piezoresistive and capacitive types.	8	CO3

IV	**Torque Measurement-** feedback torque sensors, torsion bar dynamometer, Torque measurement using strain gauge, Shaft power: Dynamometer (servo control and absorption power measurement) Prony Brake and rope brake methods Introduction to vibration measurement and monitoring - Eddy current type, piezoelectric	8	CO3
V	**Proximity Sensors:** Inductive, optical, magnetic, capacitive and ultrasonic. Pneumatic systems: Flapper-nozzle assembly Introduction to smart sensors, smart transmitter and receivers sensor-actuator networks	8	CO4
Guest Lectures (if any)		Nil	
Total Hours		42	

Suggestive list of experiments:

1. Displacement measurement by inductive pick up.
2. Measurement of angular displacement using capacitive type transducer.
3. To measure the speed of motor using photoelectric pick-up.
4. To measure the air velocity by using hot wire anemometer.
5. To measure the intensity of light on different distance by using photo transducer.
6. Demonstration of ultrasonic transmitter and receiver in remote control mode and intruder alarms.
7. To measure the flux density by gauss meter.
8. To measure the torque by torque transducer.
9. Measurement of weight using Strain Gauge
10. Study of Tachometer
11. Study of Sound sensor

Text Books -

1. H.N. Norton-Handbook of Transducers, Prentice Hall; Facsimile Edition
2. D. Patranabis-Principle of industrial Instrumentation, McGraw Hill Education; 3 Edition
3. E.O. Doebelin - Measurement Systems Applications and Design, Tata McGraw Hill Education; 5th Edition

Reference Books

1. Nakra and Chaudhary-Instrumentation Measurement and Analysis, McGraw Hill Education India Private Limited; Fourth edition.
2. A. K. Sawhney -Electronic Instruments & Measurement, Dhanpat Rai Publications

List and Links of e-learning resources:
www.nptel.ac.in - Dr.AlokBarua IIT Kharagpur/Industrial Instrumentation Lecture Series

Modes of Evaluation and Rubric

The evaluation modes consist of performance in two mid-semester tests, quiz/ assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	19/12/24
Approval by Academic council on	
Compiled and designed by	Prof. K G Kirar

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Department of Electronics Engineering

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Name of the course:	B. Tech in Electronics & Instrumentation Engineering
Semester and Year of study	B. Tech 2nd Year 3rd Semester
Subject Category	Departmental Course (DC)
Subject Code:EI-302	Subject Name: Electronic Devices and Circuits

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

Basic knowledge of electrical and electronic components and laws such as KCL, KVL, etc.

Course Objective:

1. The course intends to provide an overview of the principles, operation and application of the, JFET and MOSFETs for performing various functions.
2. This course relies on elementary treatment and qualitative analysis and makes use of simple models and equation to illustrate the concepts involved.
3. To provide an overview of MOS amplifiers.
4. Sufficient knowledge is provided so that students will be able to use this course as the basis for other advanced courses like Analog Circuits, Power Electronics.

Course Outcomes:

After completion of this course students will be able to

CO1: Acquire knowledge of JFETs and MOSFETs.

CO2: Analyze various JFETs and MOSFETs based electronic circuit configurations.

CO3: Analyze the circuit characteristics and compute its parameters.

CO4: Design various electronic circuits.

CO-PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	1								2
CO2	2	3	3	2	2							
CO3	2	3	3	2	2							
CO4	2	3	3	3	2						2	

UNITs	Descriptions	Hrs.	CO's
I	Field Effect Transistors (FETs): Introduction, Advantages and Disadvantages of FET, Basic Construction; Characteristic curves; Principles of operations of the JFET, Effect of V_{DS} on channel conductivity, Channel Ohmic Region and Pinch-Off Region, Characteristic Parameters and Effect of temperature on FET parameters, FET Biasing. MOSFET: Introduction, Structure and Physical Operation of the nMOS, pMOS, Enhancement –Type MOSFET, Current-Voltage Characteristics of the Enhancement –Type MOSFET, The Depletion –Type MOSFET, Difference between JFETs and MOSFETs.	10	CO1,CO2, CO3, CO4
II	Common Source AC Amplifier, Fixed Bias with Self Bias, The Common Drain or Source Follower, The Common Gate FET Amplifier, Frequency Response of the FET Amplifier, Other Amplifier Configurations. MOSFET as an Amplifier, Biasing in MOS Amplifier Circuits, Basic Configurations of Single Stage IC MOS Amplifiers.	08	CO1,CO2, CO3, CO4

III	FET Small Signal Analysis: FET Small Signal Model, Voltage Gain, Source Follower Circuit, Common Gate Circuit, Design of FET Amplifier Circuits, Low frequency analysis, High Frequency Analysis of FET.	10	CO1,CO2, CO3, CO4
IV	IC Technology: Overview of IC fabrication process: crystal growth, wafer preparation, oxidation, epitaxial layer growth, lithography, diffusion, ion implantation, metallization, fabrication process of BJT and CMOS Transistors	9	CO1,CO2, CO3, CO4
V	The complementary MOS (CMOS) inverter-DC characteristics, Static load MOS inverters, Pseudo NMOS Transistors, Tristate inverter, Static CMOS gate circuits (NAND, NOR, XOR, XNOR etc.) Static and Dynamic Memory Cell.	8	CO1,CO2, CO3, CO4
Guest Lectures (if any)		May be arranged as required	
Total Hours		45	

Suggestive list of experiments:

1. To plot transfer and output characteristics of an n-channel Junction Field Effect Transistor (JFET).
2. To plot transfer and output characteristics of a p-channel Junction Field Effect Transistor (JFET).
3. To plot transfer and output characteristics of an n-channel Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in Common-source configuration.
4. To plot transfer and output characteristics of a p-channel Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in Common-source configuration.
5. To design a common source JFET amplifier and plot its frequency response.
6. To design a common source MOSFET amplifier and plot its frequency response.
7. Study and investigate various fabrication techniques of BJT and MOS ICs.

Text Book-

1. Integrated Electronics. – MillmanHalkias
2. Electronic Devices & Circuits – Boyelstad&Nashelsky – PHI
3. Electronic Devices & Circuits – David A. Bell – PHI
4. Principles of Electronic Devices – Malvino
5. Digital Integrated Circuits - D. A. Hodges, H. G .Jackson, R. A. Saleh, McGraw Hill

Reference Books-

1. Microelectronic Circuits- Sedra, Smith.
2. Electronics Circuits And Systems- Owen Bishop
3. Intuitive Analog Circuit Design- Marc T. Thompson
4. Starting Electronics (Fourth Edition)-Keith Brindley

List and Links of e-learning resources:

1. https://nptel.ac.in/courses/117103063/
2. https://www.electronics-tutorials.ws/

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	19/12/24
Approval by Academic council on	
Compiled and designed by	

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Name of the course:	B. Tech in Electronics & Instrumentation Engineering
Semester and Year of study	B. Tech 2nd Year 3rd Semester
Subject Category	Departmental Course (DC)
SubjectCode:EI-303	Subject Name: Network Analysis

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			**Total Marks**				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:

- Mathematics I & II
- Fundamentals of Electrical Engineering

Course Objective:

To make the students capable of analyzing any given electrical network.
To make the students learn how to synthesize an electrical network.

Course Outcomes:

CO1.Acquire and demonstrate the knowledge of circuit elements, different laws and theorems.-(BL1, BL2)
CO2. Analyze and solve different Electrical networks in time and frequency domain by utilizing fundamental concepts and mathematics.-(BL3, BL4)
CO3. Design/synthesize the electrical networks in time and frequency domain.(BL3, BL6)
CO4. Evaluate / Estimate the performance of a particular network.(BL3, BL5)

CO-PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	3		2	2							
CO3	3	2	3	2	2							
CO4	3	2		2	2							

UNITs	Descriptions	Hrs.	CO's
I	**DC circuits-** Current, voltage, power, energy, circuit elements, ideal & practical voltage & current sources, dependent & independent sources, Ohm's Law, Kirchhoff's law, Voltage and current division, Nodal & mesh analysis, Source transformation, Supermesh&supernode, Star-Delta transformation. **Steady state AC circuits-** RMS & Average value, Concept of phasor & vector, Impedance & admittance, Node and Mesh analysis of RL, RC and RLC networks with sinusoidal and other driving sources.	12	1, 2, 3, 4
II	**Network Theorems for AC & DC circuits-** Superposition, Thevenin's& Norton's, Reciprocity, Maximum power transfer, Millman's, Tellegen's, and Substitution theorem, Problems with dependent & independent sources.	8	1, 2, 3, 4

III	**Transient analysis-** Transients in RL, RC & RLC Circuits, initial conditions and time constants, Network driven by constant driving sources & their solutions.	7	1, 2, 3, 4
IV	**Frequency domain analysis –** Review of Laplace transform and its properties, Initial and final value theorem, Application of Laplace transform: circuit element models, circuit analysis. **Resonance-** Series & parallel resonance, Quality factor. **Analysis of magnetically coupled circuits-** Mutual and self inductance, Energy in coupled circuit, Dot convention.	10	1, 2, 3, 4
V	**Two port networks-** Impedance parameter, admittance parameter, hybrid and inverse hybrid parameter, transmission line and inverse transmission line parameter, reciprocity and symmetry in two port network, relationship between parameters, Interconnection of two ports networks.	8	1, 2, 3, 4
Guest Lectures (if any)		Nil	
Total Hours		45	

Suggestive list of experiments:

1. To observe and plot the V-I characteristic of Constant Current Source. CO1
2. To observe and plot the V-I characteristic of Constant Voltage Source.CO1
3. To verify Superposition Theorem for a given electrical circuit. CO2
4. To verify Thevenin's Theorem for a given electrical circuit. CO2
5. To verify Norton's Theorem for a given electrical circuit. CO2
6. To verify Maximum Power Transfer Theorem for a given electrical circuit. CO2
7. To verify Millman's Theorem for a given electrical circuit. CO2
8. To observe the Response of RC Integrating Circuit using various input signals and measure the Time Constant of the circuit. CO2
9. To observe the Response of RC Differentiating Circuit using various input signals and measure the Time Constant of the circuit. CO2
10. To determine the Open Circuit and Short Circuit parameters of a Two Port Network. CO4
11. To determine the h- parameters of a Two Port Network. CO4
12. To determine the ABCD Circuit parameters of a Two Port Network. CO4
13. To determine the Inverse ABCD Circuit parameters of a Two Port Network. CO4

Text Book-

- Hayt, Kemmerley and Durbin, "Engineering Circuit Analysis", TMH.
- M.E. Van Valkenburg, "Network analysis", PHI.
- Charles K. Alexander and Matthew N. O. Sadiku "Fundamentals of Electric Circuits", 4th edition, McGraw Hill.

Reference Books-

- Artice M Davis "Linear Circuit Analysis", PWS Pub. Co.
- Van Valkenberg M.E., B.K. Kinarawala "Linear circuits", PHI.
- David K. Cheng "Analysis of Linear Systems", Narosa Publishing House.
- Bruce Carlson, "Circuits", Thomson Learning.

List and Links of e-learning resources:

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/ Assignments, term work, end-semester examinations, and end-semester practical examinations.

Recommendation by Board of studies on	19/12/24
Approval by Academic council on	
Compiled and designed by	Dr. shilpa Datar

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Department of Electronics Engineering

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Name of the course:	B. Tech in Electronics and Instrumentation Engineering
Semester and Year of study	B. Tech 2nd Year 3rd Semester
Subject Category	Departmental Course (DC)
Subject Code: EI-304	Subject Name: Signals & Systems

Maximum Marks Allotted							Contact Hours			Total Credits
Theory				Practical		**Total Marks**				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	Lab-Work		L	T	P	
60	20	10	10	-	-	100	3	1	0	4

Prerequisites:

Basic algebra, ***Differential equations,*** Trigonometry, Complex Arithmetic

Course Objective:

When a student completes this course, s/he should be able to:

- ***Understand the fundamentals of the Signals and Systems.***
- ***Understand LTI systems and able to obtain mathematical equation of the system.***
- ***Apply the concepts of frequency domain representations to analyze continuous and discrete time signals and systems.***
- ***To get understanding of sampling and its role in discrete-time signals and system.***
- To examine the discrete time signals and system in the Fourier and Z transform domain.
- To correlate the signals and systems in real time applications.

Course Outcomes:

Upon completion of this course, the student will be able to:

CO1: Discriminate the nature of the given signals and systems.
CO2: AnalyzeLinear Time Invariant Systems and its representation.
CO3: Analyze the discrete and continuous time signals in frequency domain.
CO4: Understand the process of sampling and the effects of under sampling.
CO5: Compute the output of an LTI system in the time and frequency domains.

CO-PO Mapping

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1		2		1			1			1
CO2	3	2	2		1							
CO3	3	3	2	3	1							
CO4	3	2	2	3								
CO5	3	2	1	3	1	1			1			1

UNITs		Hrs.	CO's
I	Signals and systems in everyday life, Definition of signal and system, Classification of signals: Continuous time and Discrete-time signal, Elementary signals: The unit step, impulse, ramp exponential, sine, triangular etc., Operations on signals: Amplitude scaling, addition, multiplication, time scaling, time shifting, time folding, differentiation, and integration. Classification of systems, System representation and properties of systems.	8	1
II	Linear Time-Invariant Systems: Introduction, Convolution: impulse response representation for LTI systems, properties of the impulse response representation for LTI systems, differential and difference equation for LTI Systems, block diagram representations (direct form-I, direct form-II, cascade and parallel).	8	2
III	Fourier series and their properties; Application of Fourier series to LTI	10	3, 4

	systems; Dirichlet's conditions; Fourier Transform & its properties; Applications of Fourier Transform to LTI systems; Magnitude and phase response; Parseval's theorem; Sampling theorem; Reconstruction of a signal from its samples; Aliasing and its effect in frequency domain, Basic concept of DTFT and DFT.		
IV	Introduction of Laplace transform; Region-of-convergence; Properties of Laplace transform; Inverse Laplace Transform, Applications of Laplace Transform in analysis of LTI systems, Unilateral Laplace transform & its applications to solve differential equations.	6	3,5
V	Z-transform: Basic principle of z-transform, definition, region of convergence, transfer functions, poles and zeros of systems and sequences, properties of z-transform, Inverse z-transform relationship between z-transform and Fourier transform, Unilateral z-transform & its applications to solve difference equations.	8	3,5
Guest Lectures (if any)		Nil	
Total Hours		40	

Suggestive list of experiments:

Nil

Text Book-

- Signals and Systems, ANagoorKani, 2e, TMH, 2010.
- Signals and Systems, A. Anand Kumar, 2e, PHI, 2012.
- Signals and Systems, Tarun Kumar Rawat, Oxford University Press, 2010.
- Signals and Systems, B. Kumar, New Age International Publishers, 2011.

Reference Books-

- Signals and Systems, H P Hsu, Schaum's Outline Series, 2e, McGraw Hill, 2008.
- B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, 1998.
- Signals and Systems, Simon Haykin, Barry van Veen, John Wiley and Sons (Asia) Private Limited, 1998.

List and Links of e-learning resources:

- NPTEL Course.
- MOOC, IIT Bombay, EE210x, Signals and Systems.

Modes of Evaluation and Rubric

The evaluation modes consist of performance in Two mid-semester Tests, Quiz/Assignments, end-semester examinations.

Recommendation by Board of studies on	19.12.2024
Approval by Academic council on	
Compiled and designed by	Dr.D.K.Shakya

SAMRAT ASHOK TECHNOLOGICAL INSTITUTE
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Electronics Engineering Department

Semester/Year	III/II	Program	B.Tech- Electronics & Instrumentation
Subject Category: **DC**	Subject Code: **EI305**	Subject Name:	**Analog Communication**

Maximum Marks Allotted								Contact Hours			Total Credits
Theory				Practical			Total Marks				
End Sem	Mid-Sem	Assignment	Quiz	End Sem	LW	Quiz		L	T	P	
60	20	10	10	30	10	10	150	3	0	2	4

Prerequisites:(Only for open electives)

Course Objective:

To introduce the concepts of analog communication systems, and to equip students with various issues related to analog communication such as modulation, demodulation, transmitters and receivers and noise performance.

Course Outcomes:

After completion of the course, students would be able to -
CO 1: Acquire knowledge of signal and its properties, understand and demonstrate about different modulation, demodulation techniques of analog signals. (BL1,BL2)
CO 2: Conduct analysis of baseband signals in time domain and frequency domain. Analyse error performance of a communication system in presence of noise and other interference. (BL3,BL4)
CO 3: Design communication systems to meet desired needs.(BL3,BL6)
CO4: Evaluate the performance of modulation and demodulation techniques in various transmission environments. And evaluate fundamental communication system parameters such as bandwidth, power and signal to noise ratio.(BL3,BL5)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	2	2	-	-	-	-	-	-	-
CO3	3	2	3	2	2	-	-	-	-	-	-	-
CO4	3	2	-	2	2	-	-	-	-	-	-	-

Contents:

UNITs	Descriptions	Hrs.	CO's
I	An introduction to signal & its properties, Operations on signals: Amplitude scaling, addition, multiplication, differentiation, integration, time scaling, time shifting, and time folding, Frequency domain representation of signal: Fourier transform & its properties, Applications of Fourier Transform for the analysis of different signals.	06	1,2
II	Basic block diagram of wireless communication, Need of Modulation, Types of Modulation, Amplitude modulation (AM): Analysis of single tone and multi-tone AM, Bandwidth, Power, modulation efficiency, under, critical and over modulation, Generation of AM, Demodulation of AM.	09	1,2,3,4
III	DSB-SC: Basic concepts, generation and demodulation, SSB-SC: Basic concepts, generation and demodulation, VSB, Frequency division multiplexing (FDM).	07	1,2,3,4
IV	Frequency modulation (FM), NBFM, Power, Bandwidth and Modulation efficiency calculation, Generation of FM, Phase Modulation, Generation of FM from PM and vice-versa, Maximum phase and frequency deviation of	09	1,2,3,4

	FM & PM, Demodulation of FM.		
V	Mixer, Tuned Radio Frequency AM Receiver, Super Heterodyne AM Receiver, Image frequency, Image rejection ratio, Fidelity, Pre-emphasis and de-emphasis, FM Receiver, Introduction to pulse modulation: Pulse Amplitude Modulation (PAM), Pulse Position Modulation (PPM), Pulse Width Modulation (PWM), Noise in analog modulation.	09	1,2,3,4
Guest Lectures (if any)		Nil	
Total Hours		40	

Suggestive list of experiments:

Text Books-

1. Singh and Sapre: Communication System, TMH
2. B.P. Lathi: Modern Analog and Digital Communication System, Oxford University Press

Reference Books-

1. Taub and Schilling: Principles of Communication System, TMH
2. Simon Haykins: Communication Systems, 4th Edition, John Wiley.

Modes of Evaluation and Rubric

There will be continuous evaluation for during the semester for 40 sessional marks and 60 semester End term Marks. Out of 40 sessional marks, 20 shall be awarded for Mid semester, 20 marks to be awarded for day to day performance and Quiz/Assignments. For the 60 Marks, there will be a semester – End examination as per the norms of AICTE.

Recommendation by Board of studies on	Date:
Approval by Academic council on	Date:
Compiled and designed by	Dr. Ankita Srivastava
Checked and approved by