IN201N: ANALOG ELECTRONICS

Teaching Scheme	**:** 03L + 00T; Total: 03 hours/week	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

This course covers the fundamental principles, theories, and applications of electronic circuits that work with continuously variable signals.

DESIRABLE AWARENESS/SKILLS

Knowledge of semiconductor theory, basic electronic devices

COURSE OUTCOMES

On the successful completion of this course; student shall be able to -

1. demonstrate the understanding and working of BJT circuits and their analysis
2. develop a circuit for inverting and non-inverting amplifiers
3. design, implement and analyze various analog filter circuits.
4. design, implement differentiator, integrator and comparator circuits.

RELEVANCE OF COURSE OUTCOMES (COS) WITH POS AND PSOS (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1											3		1
2	2			3					2				3	2	
3			3						2		1	1	3		
4	3								2	1	1		3		1

1-Weakly correlated **2 – Moderately correlated** **3 – Strongly correlated**

COURSE CONTENT

Fundamentals of Diodes and Transistors [12 Hrs.]

Diode junction characteristics, rectifiers, half wave and full wave, efficiency, ripple factor, diode wave shaping circuits, Zener diode, Bipolar Junction Transistor, biasing, Transistor as an amplifier; various configurations viz. CE, CB and CC; load line analysis; thermal stabilization, large signal dc and small signal CE values of current gain.

Large signals and feedback amplifiers [12 Hrs.]

Class A, Class B and Class C operation. Push pull amplifier, Complementary symmetry configuration. Basic concept of feedback, transfer gain with feedback, general characteristics of negative feedback amplifier, effect of negative feedback on input and output resistance, voltage series, voltage shunt, current series, current shunt feedback amplifier

Operational Amplifiers [10 Hrs.]

Introduction, block diagram, Characteristics of ideal and practical operational amplifiers, Op-Amp parameters, frequency response, effect of temperature on Op-Amp parameters, ideal voltage transfer curve, open loop and closed loop op-amp configurations

General Linear Applications [8 Hrs.]

Instrumentation amplifier, adder, subtractor, differentiator, integrator, Comparators, V to I and I to V Converters, precision rectifier, Voltage controlled oscillators, PLL and its applications

Active filters [8 Hrs.]

Introduction, First order low-pass Butterworth Filter, Second order low-pass Butterworth Filter First order high-pass Butterworth Filter, Second order high-pass Butterworth Filter, Band-Pass filters, Band Reject Filters, All-Pass Filter

Text Books

1. "Ramakant Gayakwad, “Op-Amp and Linear Integrated Circuits”, PHI, Forth ed.,2011
2. “Dr. R.S. Sedha, “A Text book of Applied Electronics”, S. Chand Pub. 2013

Reference Books

1. "V.K. Mehata", “Principles of Electronics”, S. Chand Pub. 2020
2. George Clayton and Steve Winder, “Operational Amplifiers”, Newnes Publishers, Fifth ed., 2003.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN202N: NETWORK THEORY

Teaching Scheme	**:** 02 L + 00 T; Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency of various electrical circuits. This course introduces the student to analyze, design and apply concepts of networks in electrical circuits using mesh and node analysis and its applications

DESIRABLE AWARENESS / SKILLS

EE101N: Basic Electrical Engineering, Math-I and Math-II

COURSE OUTCOMES

On the successful completion of this course, students will be able to:
1. understand fundamental concepts of node and mesh analysis for linear circuits.
2. study network theorems and network functions.
3. investigate initial conditions and obtain circuit response using Laplace Transform.
4. understand Sinusoidal Steady State Circuit Analysis.
5. study Two-port network parameters and their inter-relationships

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	3	-	-	-	-	-	-	-	-	-	-	2	-	-
2	3	3	3	3	-	-	-	-	-	-	-	-	3	-	2
3	2	3	3	3	1	-	-	-	-	-	-	-	3	1	2
4	3	3	3	2	-	-	-	-	-	-	-	-	3	1	2
5	3	2	2	1	-	-	-	-	-	-	-	-	2	1	2

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Single Phase AC Circuits: [6 Hrs.]

Review of AC circuits, Phasor representation of alternating quantities- Mathematical representation of Phasors– Behavior of pure resistor, Inductor and capacitor in ac circuits. First order and second order differential equation for Series RL circuit, RC circuit and RLC circuit – Parallel AC circuits - , instantaneous power, average power, calculation of average power for periodic non-sinusoidal wave forms.

Network Theorems in AC Circuits [8 Hrs.]

Mesh Analysis, Source Conversions, Nodal Analysis, Independent and Dependent Sources, Thevenin's and Norton's Theorem, Superposition, Millman's, Reciprocity Theorem, Maximum Power Transfer Theorem, Solution of Network Equation: Steady state and transient solution, Time constant for RL and RC circuits.

Two Port Network [8 Hrs.]

Port in Network, Network Configuration Z-Parameters, Y-Parameters, Hybrid Parameters, ABCD Parameters, Condition of Reciprocity and Symmetry in Two Port Network, Inter-Relationships between Parameters. Interconnection of Two-Port Networks. Driving Point functions, Impedance and Admittance, Transfer Impedance and Admittance, Concept of Poles and Zeros, Restriction on Location of Poles and Zeros in Driving Point Functions,

Laplace Transformation for Electric Circuit [6 Hrs.]

Laplace Transformation Technique in Electric Circuit, Solution of network equations using Laplace transform method inverse Laplace transform analysis of electrical network with and without initial conditions by Laplace transform for step, impulse and ramp functions, Laplace transform of various periodic and non-periodic waveforms.

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Text Books

1. Circuit Analysis, Ashutosh Chakraborty, 1st edition, Tata McGraw, 2011
2. Network Analysis, M. E. Van Valkenburg, 3rd edition, Prentice Hall, 2001
3. Circuits and Networks, A. Sudhakar, 4th edition, Tata McGraw Hill, 2011
4. Networks and Systems, Ashfaq Husain, 2nd edition, Khanna publishing company

Reference Books

1. Engineering Circuit Analysis, William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, Tata McGraw:Hill, 6 the dition.
2. Introduction to Circuit Analysis, Boylestad Robert L. Charles E., Merril Publishing Company.
3. Circuit Analysis, John R. OMalley, Prentice Hall.
4. Network & Systems, D. Roy Choudhary, 2nd edition, New Age publications, 2010.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) Quiz

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN203N: TRANSDUCERS

Teaching Scheme	**:** 03 L + 00 T; Total: 03 hours/week	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency to install, calibrate and test various transducers and sensors for measuring displacement, force, temperature flow, level, pressure and other parameters.

DESIRABLE AWARENESS / SKILLS

Basic knowledge of measurement fundamentals.

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. To define the basic principle of displacement, force, flow, level, temp .and pressure transducers.
2. Classify and compare the transducers.
3. Apply the principles of transducers for applications.
4. Analyze the transducers according to applications.
5. To understand about the smart transducer.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	1	2	2	2	0	0	0	0	2	3	2	0
2	3	2	1	1	2	2	2	0	0	0	0	2	3	2	0
3	2	3	2	2	2	2	1	0	0	0	0	2	2	2	0
4	3	3	2	2	2	2	2	0	0	0	0	2	2	2	0
5	1	1	1	1	1	1	1	0	0	0	0	1	2	1	0

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Transducers: **[4 Hrs.]**

Review of transducers, classification of transducers, characteristics of transducers, specifications of transducers, selection criteria. Introduction to smart transducer.

Displacement measurement: **[6 Hrs.]**

Resistive: Potentiometer, linear and rotary, loading effect types, strain gauges and its types. Inductive: LVDT and eddy current type transducers. Capacitive: Capacitance pickups, differential capacitive cells.

Force measurement: **[4Hrs.]**

Basic methods of force measurement, elastic force traducers, strain gauge, load cells, piezoelectric force transducers

Pressure measurement: **[6 Hrs.]**

Working principle, types, materials, design criterion: Manometers, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, force balance type, motion balance type, capacitive (delta cell), ring balance, vibrating cylinder type, high-pressure gauges, dead weight tester.

Temperature measurement: **[6 Hrs.]**

Classification of temperature sensors ,bimetallic thermometer, filled system thermometers, resistance temperature detectors (RTD), thermistors, thermocouples, study of thermocouple tables ,thermo well, thermopiles, pyrometers, temperature IC sensors (AD590 and LM35).

Flow Measurement: **[8 Hrs.]**

Bernoulli's equation for incompressible flow, density, beta ratio, Reynolds number correction, square root relation, head type flow meters, variable area type, open channel flow measurement, turbine, electromagnetic, ultrasonic, positive displacement and anemometers.

Level Measurement: **[6 Hrs]**

Float, displacer (Torque tube unit), bubbler, diaphragm box, DP cell, ultrasonic, capacitive, radioactive type, laser type transducers, level gages, resistance, thermal, radar, solid level detectors, fiber optic level detectors, level switch.

Text Books

1. D.V.S. Murthi, "Instrumentation and Measurement Principles", PHI, New Delhi, Second ed. 2003.
2. D. Patranabis, "Principle of Industrial Instrumentation", Tata McGraw Hill, Second ed., 1999.
3. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, Second ed., 2004**.**

Reference Books

1. B.G. Liptak, “Process Measurement & Analysis”, Chilton Book Company, Fourth ed., 2003.
2. E.O. Doebelin, “Measurement Systems”, McGraw Hill, Fifth ed., 2003.
3. SabrieSoloman, “Sensors Handbook” ,McGraw Hill Publication, First ed., 1998.
4. A. K. Sawhney, “Electrical & Electronic Instruments & Measurement”, DhanpatRai and Sons, Eleventh ed., 2000.
5. R.K.Jain, “Engineering Metrology”, Khanna Publisher, Delhi, Eighteenth ed.,2002.

Middlehook S. and Audet S. A., “Silicon Sensors”, Academic Press

ASSESSMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN204NX: TRANSDUCERS

Teaching Scheme	**:** 03 L + 01 T; Total: 03 hours/week	**Credits**	**:** 04
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency to install, calibrate and test various transducers and sensors for measuring displacement, force, temperature flow, level, pressure and other parameters.

DESIRABLE AWARENESS / SKILLS

Basic knowledge of measurement fundamentals.

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. To define the basic principle of displacement, force, flow,level,temp.and pressure transducers.
2. Classify and compare the transducers.
3. Apply the principles of transducers for applications.
4. Analyze the transducers according to applications.
5. To understand about the smart transducer.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1	1	1	2	2	2	0	0	0	0	2	3	2	0
2	3	2	1	1	2	2	2	0	0	0	0	2	3	2	0
3	2	3	2	2	2	2	1	0	0	0	0	2	2	2	0
4	3	3	2	2	2	2	2	0	0	0	0	2	2	2	0
5	1	1	1	1	1	1	1	0	0	0	0	1	2	1	0

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Transducers: **[4 Hrs.]**

Review of transducers, classification of transducers, characteristics of transducers, specifications of transducers, selection criteria. Introduction to smart transducer.

Displacement measurement: **[6 Hrs.]**

Resistive: Potentiometer, linear and rotary, loading effect types, strain gauges and its types. Inductive: LVDT and eddy current type transducers. Capacitive: Capacitance pickups, differential capacitive cells.

Force measurement: **[4Hrs.]**

Basic methods of force measurement, elastic force traducers, strain gauge, load cells, piezoelectric force transducers

Pressure measurement: **[6 Hrs.]**

Working principle, types, materials, design criterion: Manometers, elastic pressure sensors, secondary pressure sensors, differential pressure sensors, force balance type, motion balance type, capacitive (delta cell), ring balance, vibrating cylinder type, high-pressure gauges, dead weight tester.

Temperature measurement: **[6 Hrs.]**

Classification of temperature sensors ,bimetallic thermometer, filled system thermometers, resistance temperature detectors (RTD), thermistors, thermocouples, study of thermocouple tables ,thermo well, thermopiles, pyrometers, temperature IC sensors (AD590 and LM35).

Flow Measurement: **[8 Hrs.]**

Bernoulli's equation for incompressible flow, density, beta ratio, Reynolds number correction, square root relation, head type flow meters, variable area type, open channel flow measurement, turbine, electromagnetic, ultrasonic, positive displacement and anemometers.

Level Measurement: **[6 Hrs]**

Float, displacer (Torque tube unit), bubbler, diaphragm box, DP cell, ultrasonic, capacitive, radioactive type, laser type transducers, level gages, resistance, thermal, radar, solid level detectors, fiber optic level detectors, level switch.

Text Books

1. D.V.S. Murthi, "Instrumentation and Measurement Principles", PHI, New Delhi, Second ed. 2003.
2. D. Patranabis, "Principle of Industrial Instrumentation", Tata McGraw Hill, Second ed., 1999.
3. B. C. Nakra and K. K. Choudhari, "Instrumentation Measurements and Analysis" by, Tata McGraw Hill Education, Second ed., 2004**.**

Reference Books

1. B.G. Liptak, “Process Measurement & Analysis”, Chilton Book Company, Fourth ed., 2003.
2. E.O. Doebelin, “Measurement Systems”, McGraw Hill, Fifth ed., 2003.
3. SabrieSoloman, “Sensors Handbook” ,McGraw Hill Publication, First ed., 1998.
4. A. K. Sawhney, “Electrical & Electronic Instruments & Measurement”, DhanpatRai and Sons, Eleventh ed., 2000.
5. R.K.Jain, “Engineering Metrology”, Khanna Publisher, Delhi, Eighteenth ed.,2002.

Middlehook S. and Audet S. A., “Silicon Sensors”, Academic Press

ASSESSMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN204NY: INDUSTRIAL INSTRUMENTATION

Teaching Scheme	**:** 03 L + 01 T; Total: 04 hours/week	**Credits**	**:** 04
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

This course provides knowledge about measuring instruments and standards. It also gives introduction to recorders, oscilloscopes, errors in measurements. It also covers the active and passive electronic components measuring circuits.

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. demonstrate an understanding of measuring electrical quantities
2. understand the construction and operating principles of measuring instruments
3. extend range of ammeters and voltmeters
4. apply analog measuring devices
5. identify, formulate and solve a problem of electrical measurement

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3											2	2	2	1
2	3	2										2	2	2	1
3	3	2	3										3	3	1
4	3	3			3	2							3	3	1
5	3	3	2	1	1	2						2	1	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Introduction to Measurement System **[8 Hrs.]**

Definition of measurement, working of measurement system/Instrument, classification of instruments, static and dynamic characteristics of instruments, dead zone, hysteresis, threshold, resolution, input and output impedance, loading effects, calibration of instruments, traceability, types of errors and their remedies, statistical treatment of experimental data, system accuracy calculation, comparison of analog and digital instruments, instrument specifications, terminology as per ISA standards, standards for time, current, voltage, frequency etc.

Measuring Instruments

DC instruments: galvanometer, PMMC instruments and its characteristics, design and operation of multi-range ammeter, voltmeter, ohm meters, megger. AC instruments: moving iron type, electrodynamometer type, phase and line frequency meter, wattmeter, energy meter, current transformer, potential transformer

Bridge Circuits **[8 Hrs.]**

DC bridges: Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges **AC bridges**: Maxwell bridge, Hey bridge, Schering bridge, Wein bridge, storage and dissipation factor, applications of AC bridges

Potentiometers and Recorders **[8 Hrs.]**

Potentiometers: principle, calibration, sensitivity of potentiometer. self balancing potentiometer, multi-range potentiometer, applications of potentiometer. Recorders: Rectilinear recorder, inject, ink pen, thermal galvanometric recording, magnetic, paperless, oscilographic, hybrid recording, Y-T, X-T single, multichannel recorders, driving systems for pen and chart, chart speed and their applications.

Oscilloscopes **[8 Hrs.]**

General purpose cathode ray oscilloscope (CRO), cathode ray tube block diagram, front panel controls, measurement of amplitude, phase, frequency, time, duration, rise and fall time. z-modulation, dual beam and dual trace oscilloscope, X-Y mode, sampling oscilloscope, analog storage oscilloscope, digital storage oscilloscope and its applications, CRO probes.

Text Books

1. A course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, 9th edition, Dhanpat Rai & co, 2011
2. Modern Electronic Instrumentation and Measurement Techniques by Helfrick and Cooper, Publisher- PHI, 1990.
3. Electronic Instrumentation by Kalsi H. S. 3rd Edition, Tata McGraw Hill, 2010.

Reference Books

1. Electronics Instruments and Measurements by Jones and Chin, Tata McGraw Hill. 1987
2. Electronic Instrumentation and Measurements by David Bell, 2nd Edition, Prentice hall India, 2003.
3. Introduction to Measurements and Instrumentation, Arun K. Ghosh, 4th edition, Prentice Hall India Learning Private Limited, 2012.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN206N: ANALOG ELECTRONICS LAB

Teaching Scheme : 02 P; Total: 02 hours/week **Credits** : 01
Evaluation Scheme : 30 ICA + 20 ESE **Total Marks** : 50
ESE : Held in regular laboratory session.

COURSE DESCRIPTION

This course provides hands-on experience with designing, building, and testing analog electronic circuits. This lab serves as a complement to theoretical knowledge gained in related courses, allowing students to deepen their understanding of fundamental concepts in electronics. Through a series of guided experiments, students will gain proficiency in circuit analysis.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course IN203NAnalog Electronics

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1 Identify and measure transistor and operational amplifier parameters
2 Design and implement various circuits using op-amp for various applications.
3 Design and implement active filters for various applications.

RELEVANCE OF COURSE OUTCOMES (COS) WITH POS AND PSOS (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	1							1				3	1	
2	3	2	3						2	1			3		
3	3	3	2	2					2				3		1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum ten experiments shall be performed to cover entire curriculum of course IN203NAnalog Electronics. The list of experiments provided below is just a guideline.

List of Experiments

- Design and Implementation of transistor biasing circuits.
- Measurement of op-amp parameters.
- Design and implementation of integrator and differentiator
- Design and implementation of comparators
- Design and implementation of Instrumentation amplifier.
- Design and implementation of voltage multiplier.
- Design of low pass and high pass filters.
- Design of band pass and band reject filters.
- Design and implementation of inverting and non-inverting operational amplifiers
- Design and implementation of Zener diode shunt regulator
- Design and implementation of power amplifiers

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.

- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

IN207N: TRANSDUCERS LAB

Teaching Scheme : Practical 02; Total: 02 hours/week **Credits** : 01
Evaluation Scheme : 30 ICA + 20 ESE **Total Marks** : 50
ESE : Held in regular laboratory session.

COURSE DESCRIPTION

This course consists of minimum 8 experiments based on theory syllabus of IN204N. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

DESIRABLE AWARENESS / SKILLS

IN203N: Transducers.

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. To measure the displacement by using LVDT.
2. To measure and calibrate the flow transducer like Rotameter etc.
3. To measure and calibrate the temperature transducers.
4. To measure and calibrate the level transducers
5. To measure and calibrate the pressure transducers.

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2	2	1	1	1			1	1			3	1	1	
2	2	2			1			1	1	1		2	1		
3	2	1			1			1	1	1		2	1	1	
4	2	1	1	1	1			1	1	1		2	1		
5	2	2	3		2			1		1		2		1	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course IN204N.

List of Experiments:

1. Characterization of displacement measurement system using LVDT.
2. Calibration of capacitive transducer for angular displacement measurement
3. Measurement of force using strain gauge
4. Calibration of load cell for weight or force measurement.
5. Characterization of pressure measurement by using transducer.
6. Characterization of flow measurement system using orifice and venturimeter.
7. Rotameter calibration.
8. Characterization of temperature measurement system using thermocouple and RTD etc.
9. Characterization of level measurement system using capacitive, resistive, and air purge.
10. Study of smart sensor.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student.

SH202N: ENTREPRENEUR DEVELOPMENT

Teaching Scheme: 02 L hours/week **Credit:** 02
Evaluation Scheme: 10 ISA +30 MSE + 60 ESE **Total marks:** 100
MSE Duration: 1.5 Hrs **ESE Duration:** 3.0 Hrs

COURSE DESCRIPTION

Entrepreneurship Development is a dynamic course designed to equip students with the knowledge, skills, and mindset essential for success in entrepreneurial endeavors. The course focuses on awareness of entrepreneurs and its different aspects. This course will cover details about design thinking, Entrepreneurial Behavior and Innovation Function, small-scale enterprises, family business and rural entrepreneurship as well as recent trends. It gives an overview of entrepreneurship.

COURSE OBJECTIVES

The course "Entrepreneurship Development" aims to achieve comprehensive learning outcomes across various critical areas of entrepreneurial studies. Firstly, it explores the concept of entrepreneurship and the role of entrepreneurs in driving innovation and economic development. Secondly, it delves into entrepreneurial behavior, emphasizing traits such as creativity, risk-taking, and opportunity recognition essential for entrepreneurial success. The course also introduces design thinking methodologies and Entrepreneurship Development Programs (EDP), focusing on practical project implementation and management skills. Furthermore, it addresses the dynamics of small business enterprises, including the causes and management of business sickness, to prepare entrepreneurs for operational challenges. Lastly, it examines the unique aspects of family businesses and rural entrepreneurship, providing insights into their challenges and opportunities. By covering these diverse topics, the course aims to equip participants with the knowledge, skills, and mindset necessary to initiate, sustain, and grow successful entrepreneurial ventures in various contexts.

COURSE OUTCOMES

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

1. apply the concept and knowledge of entrepreneurship
2. utilize the concept of entrepreneurial behavior as well as innovation
3. prepare project report to start own enterprise
4. develop the ability to start small scale business
5. run and enhance their own family business, develop rural entrepreneurship and utilize recent trends in entrepreneurship

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO- RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	3	2	2	2	2	2	3			3
2	-	-	-	-	-	3	2	2	2	2	2	3			3
3	-	-	-	-	-	3	2	2	2	2	2	3			3
4	-	-	-	-	-	3	2	2	2	2	2	3			3
5	-	-	-	-	-	3	2	2	2	2	2	3			3

1-Weakly correlated 2-Moderately correlated 3 –Strongly correlated

COURSE CONTENT

Entrepreneur and Entrepreneurship:

Entrepreneur, entrepreneur and enterprise, entrepreneurs and managers, traits of a true entrepreneur, characteristics of a successful entrepreneur, classification and functions of an entrepreneur, problems faced by entrepreneurs, Concepts of entrepreneurship, importance, myths, barriers, stages in the entrepreneurial process, socio-economic origins of entrepreneurship, environmental factors affecting entrepreneurship, entrepreneurship in economic growth:-definition, relationship between entrepreneur and entrepreneurship, Nature and characteristics of entrepreneurship, role of entrepreneurship in economic growth, Concepts- Sociopreneur, Edupreneur, Ecopreneur, Netpreneur, Intrapreneur (Only concept and Characteristics)

Entrepreneurial Behavior and Innovation Function: Innovation and Entrepreneur, Schumpeter's and Ducker's theories, Entrepreneurial Behavior and Psychological Theories: Maslow's need hierarchy theory, McClelland's Need Achievement Theory, Knight's Risk Taking theory, Social Responsibility, **Innovation Function**: Concept, Characteristics, Sources, Types, Levels, and Evolution of innovation management, Effective innovation management, Performance evaluation.

Design Thinking, EDP and Projects:

Design Thinking – Basics, Principles, Process, Personality Profile of Design Thinker, Design Thinking Cultures, Ten Tools for Design Thinking, Creating Ideal conditions for design thinking.

EDP - Concept, Phases, Importance, Objectives, Success of EDP, Shortcomings of EDP, Project - Identification, Classification, internal and external constraints, project objectives

Small Business Enterprise and sickness in small business enterprises:

Business idea- Sources, selection, concepts and Business opportunities in various sectors, Identifying the business opportunity ,Steps for starting of business, Definitions of SSI, Formalities for setting up of a small business enterprise, Environment pollution related clearances, Project report guidelines, Procedures and formalities for registration, Problems for small-scale industries. Definition of sickness and status of sickness of SSI in India, Criteria to identify sickness/incipient sickness Causes for sickness/incipient sickness in SSI, Symptoms of sickness, Cures for SSI sickness, Institutions supporting small business enterprises: introduction, Central level institutions, State level institutions, Other agencies, Industry associations.

Family Business and Rural Entrepreneurship:

Family business - Importance, Types, Succession, Management development plan and precautions Meaning and Needs of Rural Entrepreneurs, Rural Industrialization in Retrospect, Problems of Rural Entrepreneurship and Step to Develop Rural Entrepreneurship, Advantages and Major Challenges to Develop Rural Entrepreneurship, Recommendations to Boost up Rural Entrepreneurship, Recent Trends- Start up, Stand up, Skill India, Make in India, Incubation Centre-Concept and Importance.

Text Books:

1. Entrepreneurship Development Small Business Enterprises, Poornima M Charantimath, Pearson, 1st edition Reprint, 2005.
2. Entrepreneurial Development, C.B.Gupta, Srinivasan N.P., Sultan Chand and Sons Publications, 5th edition, 2008.
3. Dynamics of Entrepreneurship Development and Management, Vasant Desai, Himalaya, 1st edition, 2009.
4. Entrepreneurship Development, Dr .S. Senthil, Suchitra publications.
5. Entrepreneurship Development–Lall & Sahai: Excel Books
6. Entrepreneurial Development by Dr. S.S Khanka, S Chand & Company, 2011edition

Reference Books:

1. Entrepreneurship, Robert D. Hisrich, Michal P. Peters, Tata McGraw-Hill,7th Edition, Jan 1, 2007.
2. Patterns of Entrepreneurship, Jack M. Kaplan, Willey Publications, 4th edition, 2013.
3. Entrepreneurship Development and Project Management, Neeta Baporikar, Himalaya, 2nd edition, 2011.
4. Entrepreneurship Development, Cynthia L. Greene, Cengage Learning, 4th edition, 2008.

Evaluation Methodology:

MSE: The Mid-Semester Examination will cover 50% of the syllabus.
ESE: The End-Semester Examination will cover 75% of the remaining syllabus (excluding the MSE syllabus) and 25% of the MSE syllabus.

ISA: The Internal Sessional Assessment (ISA) will be based on any one or a combination of the following components:

1. Declared Test
2. Surprise Test
3. MCQ Test
4. Performance in Tutorials
5. Assignments/Tutorials/Punctuality/Attendance

Additionally, the Course Coordinator may select other components and will announce the method of evaluation at the beginning of the course.

SH204N: UNIVERSAL HUMAN VALUES- II

Teaching Scheme: 02 hours/week **Credits:** 02
Evaluation Scheme: 30 MSE + 70 ISA **Total Marks:** 100
MSE Duration: 1.5 Hours **ESE Duration:** 3:00 Hrs.

COURSE DESCRIPTION:

The course is intended to provide universally adaptable, systematic and rational study of the human being vis-à-vis the rest of existence. It is free from any dogma or value prescriptions. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with and within the student himself/herself finally.

DESIRABLE AWARENESS/SKILLS:

Fundamental knowledge of universal human values and ethics.

COURSE OUTCOMES:

On the successful completion of this course students shall be able to

1. Create awareness on Engineering Ethics and Human Values.
2. Understand social responsibility of an engineer.
3. Appreciate ethical dilemma while discharging duties in professional life.
4. Develop Faculty-student or mentor-mentee programs throughout their time with the Institution.

RELEVANCE OF COURSE OUTCOMES [COS] WITH POS AND PSOS [WITH STRENGTH OF CO-RELATION]:

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1						3	2					
2						3	2					
3						3	2					
4						3	2					

1-Weakly correlated 2 –Moderately correlated 3–Strongly correlated

COURSE CONTENT

Exploring aspirations and concerns (basic human aspirations): (05 Hrs.)
Value Education, Definition, Concept and Need for Value Education, The Content and Process of Value Education, Basic Guidelines for Value Education, Self exploration as a means of Value Education, Happiness and Prosperity as parts of Value Education.

Harmony in the Human Being (05 Hrs.)
Human Being is more than just the Body, Harmony of the Self ('I') with the Body, Understanding Myself as Co-existence of the Self and the Body
Understanding Needs of the Self and the needs of the Body, Understanding the activities in the Self and the activities in the Body.

Harmony in the Family and Society and Harmony in the Nature (05 Hrs.)
Family as a basic unit of Human Interaction and Values in Relationships, The Basics for Respect and today's Crisis: Affection, Guidance, Reverence, Glory, Gratitude and Love, Comprehensive Human Goal: The Five Dimensions of Human Endeavour, Harmony in Nature: The Four Orders in Nature, The Holistic Perception of Harmony in Existence**.**

Social Ethics (05 Hrs.)
The Basics for Ethical Human Conduct, Defects in Ethical Human Conduct, Holistic Alternative and Universal Order, Universal Human Order and Ethical Conduct, Human Rights violation and Social Disparities

Professional Ethics (5 Hrs.)
Value based Life and Profession, Professional Ethics and Right Understanding, Competence in Professional Ethics, Issues in Professional Ethics -The Current Scenario, Vision for Holistic Technologies, Production System and Management Models

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010A.N Tripathy, New Age International Publishers, 2003.
2. A.N Tripathy, New Age International Publishers, 2003.
3. Bajpai. B. L.New Royal Book Co, Lucknow, Reprinted, 2004
4. Bertrand Russell Human Society in Ethics & Politics

Reference Books:

1. Corliss Lamont, Philosophy of Humanism
2. Gaur. R.R., Sangal. R, Bagaria. G.PA Foundation Course in Value Education,
3. I.C. Sharma Ethical Philosophy of India Nagin & co Julundhar
4. Mortimer. J. Adler, – Whatman has made of man
5. William Lilly Introduction to Ethic Allied Publisher

Evaluation Methodology:

MSE: The Mid-Semester Examination will cover 50% of the syllabus.
ISA: The Internal Sessional Assessment (ISA) will be based on any one or a combination of the following components:

1. Declared Test
2. Surprise Test
3. MCQ Test
4. Performance in Tutorials
5. Assignments/Tutorials/Punctuality/Attendance

Additionally, the Course Coordinator may select other components and will announce the method of evaluation at the beginning of the course.

IN250N: COMMUNITY ENGINEERING PROJECT

Teaching Scheme	**:** 00 L + 02 P; Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks**	**:** 50
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

This course is designed to provide students a hands-on, real-world experience in applying engineering principles to address the needs of local communities. This course emphasizes collaborative, interdisciplinary approaches to problem-solving, addressing both technical skills and community engagement. This course exposes students to the socio-economic issues in society so that the theoretical learning can be supplemented by actual life experiences to generate solutions to real-life problems.

COURSE OUTCOMES

On the successful completion of this course, students shall able to -

1. identify and define a problem statement from the requirements raised from literature survey /need analysis .
2. build and test electronic/electric circuits/prototype for developing real life control applications.
3. demonstrate ability of team-work.
4. write comprehensive report of the project work and present it effectively.

MAPPING OF COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1		3				2									
2			3		2		2	2							
3								2	3						
4								2		3					

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Guidelines: This course is a team activity having 2-3 students in a team. This is electronic circuit building and testing for developing real life control applications. This work is design based on a complete hardware or hardware with programming software based system development. It should encompass electronics components, devices, analog or digital ICs, micro controller, arduino etc. It should cater to a small system required in laboratory or real-life application. Based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of community engineering project (CEP).

By designing a project that has direct community involvement; students learn valuable engineering skills and gain a sense of pride for contributing something beneficial to community in general.

At the end of the course, students should submit their project work along with report and presentation.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of task based on knowledge/skill acquired in design and understanding of the project. The performance shall be assessed task wise using the prescribed internal continuous assessment format.

- **ESE –** It shall be based on model made by student with the report submitted in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student.

IN251N: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Teaching Scheme	**:** 03 L + 00 T; Total: 03 hours/week	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is structured to explore the basics of electrical/ electronic measurement system. It encompasses the fundamentals and AC/DC measurements with various analog and digital instruments such as ammeters, voltmeters and oscilloscopes. This course also provides knowledge of signal generators and analyzers.

DESIRABLE AWARENESS / SKILLS

ET151N: BASIC ELECTRONICS ENGINEERING

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. demonstrate an understanding of measuring electrical quantities
2. understand the construction and operating principles of electrical/electronic instruments
3. extend range of ammeters and voltmeters
4. analyze the signals using signal analyzers
5. select suitable instrument for given application

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3											2	2	2	1
2	3	2										2	2	2	1
3	3	2	3										3	3	1
4	3	3			3	2							3	3	1
5	3	3	2	1	1	2						2	1	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals of Measurements **[8 Hrs.]**

Block diagram of measurement system, types of errors and its remedies, static and dynamic characteristics of measuring instruments, calibration of instruments, calibration report and certification, traceability and traceability chart. Classification of measuring instruments, d'Arsonval type galvanometer, principle of operation and construction of PMMC type instruments, range extension of ammeters and voltmeters, ohmmeter, electrodynamometer type of instruments

Bridge Circuits **[8 Hrs.]**

DC bridges: Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges **AC bridges**: Maxwell bridge, Hey bridge, Schering bridge, Wein bridge, storage and dissipation factor, applications of AC bridges

Potentiometers and Recorders **[8 Hrs.]**

Potentiometers: principle, calibration, sensitivity of potentiometer. self balancing potentiometer, multi-range potentiometer, applications of potentiometer. Recorders: Rectilinear recorder, inject, ink pen, thermal galvanometric recording, magnetic, paperless, oscilographic, hybrid recording, Y-T, X-T single, multichannel recorders, driving systems for pen and chart, chart speed and their applications.

Electronic Instruments **[8 Hrs.]**

Oscilloscopes: General purpose oscilloscope, construction, front panel controls, deflection sensitivity, dual trace CRO, measurement of electrical parameters like voltage, current, frequency, phase, Z-modulation, digital storage oscilloscope ,Q-meter, digital voltmeters, digital multi-meters, automation in digital instruments, digital frequency meter, universal counter,

Signal Generators and Analyzers **[8 Hrs.]**

Fixed and variable AF oscillators, square and pulse generator, sweep generator, function generator, arbitrary waveform generator, frequency synthesizer, frequency selective wave analyzer, heterodyne wave analyzer, harmonic distortion analyzer, spectrum analyzer

Text Books

1. A course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, 9th edition, Dhanpat Rai & co, 2011
2. Modern Electronic Instrumentation and Measurement Techniques by Helfrick and Cooper, Publisher- PHI, 1990.
3. Electronic Instrumentation by Kalsi H. S. 3rd Edition, Tata McGraw Hill, 2010.

Reference Books

1. Electronics Instruments and Measurements by Jones and Chin, Tata McGraw Hill. 1987
2. Electronic Instrumentation and Measurements by David Bell, 2nd Edition, Prentice hall India, 2003.
3. Introduction to Measurements and Instrumentation, Arun K. Ghosh, 4th edition, Prentice Hall India Learning Private Limited, 2012.

4. Electronic Measurements and Instrumentation by Oliver. B.H and Cag. J. M. McGrawHill, 1992.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN252N: AUTOMATIC CONTROL SYSTEMS

Teaching Scheme	**:** 03 L + 00 T; Total: 03 hours/week	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency for modeling, characteristics, and performance of feedback control systems and analyze the stability using root locus, frequency response methods.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic Laplace transform and basics of differential equations

COURSE OUTCOMES

On the successful completion of this course, students will be able to:
1. Demonstrate the understanding and working of open and closed loop control systems
2. Demonstrate and Analysis of time domain specifications
3. Demonstrate and Analysis of frequency domain specifications
4. Analysis from root locus, Bode plots and Nyquist/Polar plots

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1										2	3	
2	3	3	3										2	2	
3	3	3	3										1	2	
4	3												3	3	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Review of Laplace and inverse Laplace transform, Introduction to control systems, Introduction to design process, classification of control system, Concept of transfer function, modeling of mechanical, electrical, electromechanical systems. **[6 Hrs.]**

Block diagram reduction techniques, signal flow graph, Mason's gain formula, signal flow graph from block diagram. **[6 Hrs.]**

Standard test signals, Time response analysis, 1st, 2nd and higher order systems, effect of addition of poles and zeros, steady state errors (SSE) for feedback systems, static error constants and system types, steady state errors for external disturbances. Design of system parameters from SSE **[6 Hrs.]**

Stability of open loop and closed loop systems, Concept of Stability in s domain, classification of Stability (BIBO stability and asymptotic stability), Routh-Hurwitz criterion, Stability and Performance analysis. **[6 Hrs.]**

Root locus techniques, root locus construction rules, sketching of root locus, relative stability study from root locus. **[8 Hrs.]**

Frequency response analysis, Bode plot, asymptotic approximations and refining of plot, Gain Margin, Phase Margin via Bode plot, Polar plot, Nyquist plot, stability, gain margin, phase margin via Nyquist plot. **[8 Hrs.]**

Text Books:

1 . Control System Engineering, Norman Nise, Wiley International, sixth Edition, 2011
2 Control System Engineering, Nagrath and Gopal, New Age International Publication, Fifth Edition, 2003.

Reference Books:

1. Control System Design , G. Goodwin, S. Graebe, Mario Salgado, Pearson Education, 2000.
2. Feedback Control of Dynamic Systems,G. Franklin, J. Powell, A. Naeini, Pearson Education, Sixth Edition, 2010.
3. Control Engineering- K. Ogata, Modern Prentice Hall Publications, Fifth Edition, 2010

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one and/or two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Any other teaching-learning approach declared at start of semester or at least two weeks before commencement of activity

However, apart from above components, the course teacher/coordinator can choose small community projects in the groups. This can be communicated to students at the beginning of semester

ESE: End Semester Exam will be based on 100% of the syllabus

IN253N: DIGITAL CIRCUIT DESIGN

Teaching Scheme	**:** 03 L + 00 T; Total: 03 hours/week	**Credits**	**:** 03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

There is a notable increase in the use of the word 'digital' for products and services that are becoming part of our everyday life. Examples are digital camera, digital watch, digital weighing machine, digital signature, digital payment, digital art and so on. The digital prefix associates a term with digital technology and is considered a step up in the delivered performance at a given cost. The world of digital provides easy storage and reproduction, immunity to noise and interference, flexibility in processing, different transmission options, and very importantly, inexpensive building blocks in the form of integrated circuits. Digital systems represent and manipulate digital signals. Such signals represent only finite number of discreet values. A signal can be discreet by nature whereas, a continuous signal can be discretized for digital processing and then converted back. Manipulation and storage of digital signal involves switching. This switching is done through electronic circuits. Basic gates made from electronic circuits are primary building blocks of digital systems. These gates combine in different ways to develop digital circuits that are associated with different functionalities. This is helped by an understanding of Boolean Algebra. The functional blocks in turn, combine to generate a complex digital system

DESIRABLE AWARENESS / SKILLS

Knowledge of basic analog electronics and their concepts

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. Demonstrate the understanding and working of logic families and logic gates
2. Develop a digital logic and apply it to solve real life problems
3. Design, implement and analyze various Combinational circuits
4. Design, implement and analyze various Sequential logic circuits

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1										3	2	
2	3	3	3										3	2	
3	3	3	3										3	2	
4	3												3	2	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamental Concepts of Digital Circuits [12 Hrs]

Introduction; Relation between switching and logic operation; Use of Diode and Transistor as switch; Concept of noise margin, fanout, propagation delay; TTL, Schottky TTL, Tristate; CMOS Logic, Interfacing TTL with CMOS

Basic logic gates, Universality of NAND, NOR gates, AND-OR-Invert gates, Positive and Negative Logic; Boolean algebra axioms and basic theorems; Standard and canonical representations of logic functions, Conversion between SOP and POS; Simplification of logic functions, Karnaugh Map, Don't Care Conditions

Combinational Logic Design [14 Hrs]

Minimization using Entered Variable Map, Minimization of multiple output functions, Minimization using QM algorithm; Static-0, Static-1 and Dynamic Hazards and their cover

Multiplexer; Demultiplexer / Decoder, BCD to 7-segment decoder driver; Encoder, Priority encoder; Parity generator and checker

Number systems-binary, Signed binary, Octal, hexadecimal number; Binary arithmetic, One's and two's complements arithmetic; Codes, Code converters; Adder, Subtractor, BCD arithmetic

Carry look-ahead adder; Magnitude comparator; ALU; Error detecting and correcting codes

Sequential Logic Design [14 Hrs]

Bistable latch, SR, D, JK, T Flip-Flop: level triggered, edge triggered, master – slave, various representations of flip-flops; Analysis and synthesis of circuits that use flip-flop

Register, Shift register, Universal shift register; Application of shift register: ring counter, Johnson counter, sequence generator and detector, serial adder; Linear feedback shift register

Up and down counter, Ripple (asynchronous) counters, Synchronous counters; Counter design using flip flops, Counter design with asynchronous reset or preset; Applications of counter.

Text Books

1. "Modern Digital Electronics", R. P. Jain, 4thedition, Tata McGraw-Hill, 2009

Reference Books

1. "Digital logic and Computer design", Network and Systems, M. M. Mano, 2nd edition, Pearson Education India, 2016
2. "Fundamentals of Digital Circuits", A. Kumar, 3rd edition, Prentice Hall India, 2016

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN254NX: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

Teaching Scheme	**:** 02L + 00 T; Total: 02hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is structured to explore the basics of electrical/ electronic measurement system. It encompasses the fundamentals and AC/DC measurements with various analog and digital instruments such as ammeters, voltmeters and oscilloscopes. This course also provides knowledge of signal generators and analyzers.

DESIRABLE AWARENESS / SKILLS

ET151N: BASIC ELECTRONICS ENGINEERING

COURSE OUTCOMES

On the successful completion of this course, students will be able to:

1. demonstrate an understanding of measuring electrical quantities
2. understand the construction and operating principles of electrical/electronic instruments
3. extend range of ammeters and voltmeters
4. analyze the signals using signal analyzers
5. select suitable instrument for given application

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3											2	2	2	1
2	3	2										2	2	2	1
3	3	2	3										3	3	1
4	3	3			3	2							3	3	1
5	3	3	2	1	1	2						2	1	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Fundamentals of Measurements [6 Hrs.]

Block diagram of measurement system, types of errors and its remedies, static and dynamic characteristics of measuring instruments, calibration of instruments,. classification of measuring instruments , d'Arsonval type galvanometer ,principle of operation and construction of PMMC, range extension of ammeters and voltmeters, ohmmeter , introduction to electrodynamometer type of instruments

Bridge Circuits [6 Hrs.]

DC bridges: Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges **AC bridges**: Maxwell bridge, Hey bridge, Schering bridge, Wein bridge, storage and dissipation factor, applications of AC bridges

Potentiometers and Recorders [6 Hrs.]

Potentiometers: principle, calibration, sensitivity of potentiometer. self balancing potentiometer, multi-range potentiometer, applications of potentiometer. Recorders: Rectilinear recorder, inject, ink pen, thermal galvanometric recording, magnetic, paperless, oscilographic, hybrid recording, Y-T, X-T single, driving systems for pen and chart, chart speed and their applications.

Electronic Instruments [6 Hrs.]

Oscilloscopes: General purpose oscilloscope, construction, front panel controls, deflection sensitivity, dual trace CRO, measurement of electrical parameters like voltage, current, frequency, phase, Z-modulation, digital storage oscilloscope ,Q-meter, digital voltmeters, digital multi-meters, automation in digital instruments, digital frequency meter, universal counter,

Signal Generators and Analyzers [6Hrs.]

Fixed and variable AF oscillators, square and pulse generator, sweep generator, function generator, frequency synthesizer, , harmonic distortion analyzer, wave analyzers, spectrum analyzer

Text Books

1 A course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, 9th edition, Dhanpat Rai & co, 2011

2. Modern Electronic Instrumentation and Measurement Techniques by Helfrick and Cooper, Publisher- PHI, 1990.

3. Circuits and Networks, A. Sudhakar, 4th edition, Tata McGraw Hill, 2011

4. Networks and Systems, Ashfaq Husain, 2nd edition, Khanna publishing company

Reference Books

1. Engineering Circuit Analysis, William H. Hayt Jr., Jack E. Kemmerly, Steven M. Durbin, Tata McGraw:Hill, 6 the dition.

2. Network Analysis, M.E. Van Valkenburg, Prentice Hall,2nd edition.

3. Introduction to Circuit Analysis, Boylestad Robert L. Charles E., Merril Publishing Company.

4. Circuit Analysis, John R. OMalley, Prentice Hall.

5. Network & Systems, D. Roy Choudhary, 2nd edition, New Age publications, 2010.

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Fabrication of working model

However, apart from above components, the course coordinator can choose any other component and shall declare method of evaluation at beginning of course.

ESE: End Semester Exam will be based on 100% of the syllabus

IN254NY: AUTOMATIC CONTROL SYSTEMS

Teaching Scheme	**:** 02 L + 00 T; Total: 02 hours/week	**Credits**	**:** 02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks**	**:** 100
ESE Duration	**:** 3 Hrs.		

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency for modeling, characteristics, and performance of feedback control systems and analyze the stability using root locus, frequency response methods.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic Laplace transform and basics of differential equations

COURSE OUTCOMES

On the successful completion of this course, students will be able to:
1. Demonstrate the understanding and working of open and closed loop control systems
2. Demonstrate and Analysis of time domain specifications
3. Demonstrate and Analysis of frequency domain specifications
4. Analysis from root locus, Bode plots and Nyquist/Polar plots

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3	2	1										2	3	
2	3	3	3										2	2	
3	3	3	3										1	2	
4	3												3	3	

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Review of Laplace and inverse Laplace transform, Introduction to control systems, Introduction to design process, classification of control system, Concept of transfer function, modeling of mechanical, electrical, electromechanical systems. **[6 Hrs.]**

Block diagram reduction techniques, signal flow graph, Mason's gain formula, signal flow graph from block diagram. **[6 Hrs.]**

Standard test signals, Time response analysis, 1st, 2nd and higher order systems, effect of addition of poles and zeros, steady state errors (SSE) for feedback systems, static error constants and system types, steady state errors for external disturbances. Design of system parameters from SSE. **[6 Hrs.]**

Stability of open loop and closed loop systems, Concept of Stability in s domain, classification of Stability (BIBO stability and asymptotic stability), Routh-Hurwitz criterion, Stability and Performance analysis. **[6 Hrs.]**

Root locus techniques, root locus construction rules, sketching of root locus, relative stability study from root locus. Frequency response analysis, Bode plot, Gain Margin, Phase Margin via Bode plot. **[6 Hrs.]**

Text Books:

1. Control System Engineering, Norman Nise, Wiley International, sixth Edition, 2011
2. Control System Engineering, Nagrath and Gopal, New Age International Publication, Fifth Edition, 2003.

Reference Books:

1. Control System Design, G. Goodwin, S. Graebe, Mario Salgado, Pearson Education, 2000.
2. Feedback Control of Dynamic Systems, G. Franklin, J. Powell, A. Naeini, Pearson Education, Sixth Edition, 2010.
3. Control Engineering- K. Ogata, Modern Prentice Hall Publications, Fifth Edition, 2010

ASSESMENT:

MSE: Mid Semester Exam will be based on 50% of the syllabus

ISA: ISA will be based on any one and/or two of following components-

1) Declared test
2) Surprise test
3) MCQ Test
4) Assignments
5) PPT presentation
6) Quiz
7) Any other teaching-learning approach declared at start of semester or at least two weeks before commencement of activity

However, apart from above components, the course teacher/coordinator can choose small community projects in the groups. This can be communicated to students at the beginning of semester

ESE: End Semester Exam will be based on 100% of the syllabus

IN256N: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION LAB

Teaching Scheme **:** Practical 02; Total: 02 hours/week **Credits:** 01
Evaluation Scheme **:** 30 ICA + 20 ESE **Total Marks :** 50
ESE Duration **:** 3 Hrs.

COURSE DESCRIPTION

This course consists of minimum 8 experiments based on theory syllabus of **IN256N**. Experiments should involve simulation/performance/design of practical, result and conclusion based on it. The sample list given below is just a guide line.

DESIRABLE AWARENESS / SKILLS

IN251N: ELECTRONIC MEASUREMENTS AND INSTRUMENTATION

COURSE OUTCOMES

On the successful completion of this course, students will be able to:
1. demonstrate an understanding of measuring electrical quantities
2. understand the construction and operating principles of electrical/electronic instruments
3. extend range of ammeters and voltmeters
4. analyze the signals using signal analyzers
5. select suitable instrument for given application

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3											2	2	2	1
2	3	2										2	2	2	1
3	3	2	3									2	3	3	1
4	3	3			3	2							3	3	1
5	3	3	2	1	1	2						2	1	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course **IN256N**.

List of Experiments:

1. Design of multi-range ammeter.
2. Design of multi-range voltmeter.
3. Design of series type ohmmeter.
4. Design of shunt type ohmmeter.
5. Design of Wheat stones bridge.
6. Measurement of low resistance using Kelvin double Bridge
7. Measurement of capacitance using Schering Bridge.
8. Measurement of frequency using Wein Bridge
9. Voltage, frequency and phase measurement on CRO using lissajous pattern.
10. Study of recorders.
11. Study and application of universal counter

12 Study of arbitrary waveform generator

13. Study of RLC Q meter
14. Study of distortion analyser
15. Study of spectrum analyzer.

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

IN257N: AUTOMATIC CONTROL SYSTEMS LAB

Teaching Scheme : Practical 02; Total: 02 hours/week **Credits:** 01
Evaluation Scheme : 30 ICA + 20 ESE **Total Marks:** 50
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The course is intended to develop the basic understanding as well as the competency for modeling, characteristics, and performance of feedback control systems and analyze the stability using root locus, frequency response methods. At the end of the laboratory work, students will demonstrate the ability to Stability analysis of Control System., Develop mathematical model for systems, Analyze second order systems and validate using suitable tool and develop time domain/frequency plots.

DESIRABLE AWARENESS / SKILLS

Concepts and theory covered in the course IN252N

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

1. Simulate open loop and closed loop system.
2. Simulate and obtain time/frequency domain specifications.
3. Develop Program or simulation for root lous
4. Develop Program or simulation for Bode/Nyquist plots

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	2											1	2	2	
2	3	3	3	3								1	3	2	1
3	3	2	3	3								1	3	2	1
4	3	3	3	2								1	3	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course IN252N.

List of Experiments:

1. Study of single variable control system.
2. Analysis of second order (R-L-C) system in time domain.
3. Analysis of type 0 and type 1 system
4. Study of signal flow graph with suitable example
5. To find the transfer function of unknown system (electrical network)
6. Write a program to find time domain parameters
7. Develop simulation model to obtain impulse, step input response of second order system.
8. Write a program to find Routh table and comment on its stability
9. Write program to find gain for stability
10. Write a program to design controller using root locus technique
11. Write a program to draw bode plot of a given transfer function
12. Write a program to find step and ramp response of a second order system and verify with physical system
13. Write a program to draw Nyquist plot of a given transfer function
14. Develop a Simulink model to find steady state error for a type 0, type 1 and type 2 system.
15. Any other experiment decided by course teacher/coordinator

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

IN258N: DIGITAL CIRCUIT DESIGN LAB

Teaching Scheme : Practical 02; Total: 02 hours/week **Credits:** 01
Evaluation Scheme : 30 ICA + 20 ESE **Total Marks** : 50
ESE Duration : 3 Hrs.

COURSE DESCRIPTION

The world of digital provides easy storage and reproduction, immunity to noise and interference, flexibility in processing, different transmission options, and very importantly, inexpensive building blocks in the form of integrated circuits. Digital systems represent and manipulate digital signals. Such signals represent only finite number of discreet values. A signal can be discreet by nature whereas, a continuous signal can be discretized for digital processing and then converted back. Manipulation and storage of digital signal involves switching. This switching is done through electronic circuits. Basic gates made from electronic circuits are primary building blocks of digital systems. These gates combine in different ways to develop digital circuits that are associated with different functionalities. This is helped by an understanding of Boolean Algebra. The functional blocks in turn, combine to generate a complex digital system

DESIRABLE AWARENESS / SKILLS

Concepts and theory covered in the course IN253N: Digital Techniques (MDM-II)

COURSE OUTCOMES

On the successful completion of this course; student shall be able to

5. verify TT of basic logic gates and circuits.
6. design Arithmetic circuits and code converters.
7. build and test multiplexers, de-multiplexers, encoder, decoder, FF
8. build, test and analyze register and counter

RELEVANCE OF COURSE OUTCOMES (COs) WITH POs AND PSOs (WITH STRENGTH OF CO-RELATION)

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	3											1	3	2	1
2	3	3	3	3								1	3	2	1
3	3	3	3	3								1	3	2	1
4	3	3	3	3								1	3	2	1

1-Weakly correlated 2 – Moderately correlated 3 – Strongly correlated

COURSE CONTENT

Minimum **eight** experiments from the list of experiments provided below shall be performed to cover entire curriculum of course IN253N.

List of Experiments:

1. Design a two input RTL NOR gate
2. Truth table verification of logic gates: OR, NOT, NAND, NOR, E X-OR, EX-NOR. Verification of truth table of various TTL logic gates
3. Verification of Boolean algebra laws.
4. Verification of given logical expression using universal gates.
5. Design a logic circuit for the addition of two one-bit numbers. Design of Half adder and Full adder
6. To Design and test adder circuits (half and full adder) using K-map
7. Design binary to gray code converter. Test binary to gray code converter circuits and test using IC7486
8. To Design and test BCD to Exess-3 code converter circuit.
9. To Design and test one bit comparator circuit using K-map.
10. Study of Multiplexer and De-multiplexer Circuit. Verification of truth table of multiplexer using IC74153. Verification of truth table of De-multiplexer using IC74155
11. Verification of BCD to 7-segment display using IC7447
12. Verification of ring counter using IC7493
13. To study and test 8x 3 encoder & 3 x 8 decoder and circuit
14. Implement S-R Flip-flop on breadboard using basic gates
15. Design and study of 8:1 mux and 1:8 demux.
16. Implement J-K Flip-flop on breadboard using basic gates
17. Study of Characteristics of various types of Flip-Flops. Design experiments using flip flops
18. Study of Event Counter
19. Study Parity Generator & Checker
20. Study of 4 Bit Parallel in Serial out Shift Register
21. Study of Johnson Counter

Evaluation Methodology:

- **ICA –** It shall support for regular performance of practical and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using the prescribed internal continuous assessment format.
- **ESE –** It shall be based on performance in one of the experiments performed by student in the semester followed by sample questions to judge the depth of understanding/knowledge or skill acquired by the student. It shall be evaluated by two examiners, out of which one examiner shall be external examiner.

SH201N: PROJECT AND FINANCE MANAGEMENT

Teaching Scheme: 02L **Credit:** 02
Evaluation Scheme: 10 ISA+30 MSE + 60ESE **Total marks:** 100
MSE Duration: 1.5 Hrs. **ESE Duration:** 3.0 Hrs.

COURSE DESCRIPTION:

The course is intended to provide basic understanding of project and financial management to engineering students with the basic and fundamental concept of project and finance. This course introduces the student to selection, appraisal, organization and planning of the project management as well as project scheduling and resource management. Students will study fundamental concept, budget and budgetary control as well as leverage analysis and Working capital management.

COURSE OBJECTIVES:

The course is designed to achieve comprehensive learning outcomes across several key areas. Firstly, it introduces participants to the fundamental principles of project management, emphasizing techniques for project selection and appraisal to ensure alignment with organizational goals. Secondly, it covers project organization and planning strategies, including project scheduling and resource management techniques essential for efficient project execution. Additionally, the course delves into financial management principles, providing insights into leverage analysis and effective working capital management strategies to optimize financial resources within project environments. By integrating these topics, the course aims to equip participants with the knowledge and skills necessary to successfully manage projects while maintaining financial sustainability and achieving strategic objectives.

COURSE OUTCOMES:

On the successful completion of this course student will be able to

1. Apply the basic concept of project management
2. Demonstrate the ability to prepare projects and risk management
3. selection, appraisal, organization and planning of the project
4. assess the budget and budgetary control
5. analyze and evaluate the leverage and working capital management

COURSE OUTCOMES (COS) AND PROGRAM OUTCOMES (POS) MAPPING WITH STRENGTH OF CO-RELATION

CO	PO												PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1	-	-	-	-	-	2	-	-	2	3	3	3			3
2	-	-	-	-	-	2	-	-	2	3	3	3			3
3	-	-	-	-	-	2	-	-	2	3	3	3			3
4	-	-	-	-	-	2	-	-	3	3	3	3			3
5						2	-	-	2	3	3	3			3

1-Weakly correlated 2-Moderately correlated 3-Strongly correlated

COURSE CONTENT

Introduction to Project Management: What is a project? Evolution of project management, Importance of project management, Where is project management appropriate? Project Management Today—An Integrative Approach, Characteristics of projects, Characteristics of project management, Projects in contemporary organizations, Project lifecycle, Job conflict, Labour conflict, Material conflict.

Project Selection and Appraisal: Brain storming and concept evolution, The Strategic Management Process: An Overview, The Need for an Effective Project Portfolio Management System, A Portfolio Management System, Applying a Selection Model, Managing the Portfolio System, Types of appraisals, SWOT analysis, Cash flow analysis, Payback period, and Net present value.

Project Organization and Planning: Project manager, Cross-functional team, Dedicated project organization, Influence project organization, Matrix organization, Advantages and disadvantages of project organizations, Selection of project organization, Work Breakdown Structure (WBS), Integration of project organization and WBS, WBS and responsibility matrix, Risk Management Process, Contingency Planning

Project Scheduling and Resource Management: Gant chart, Milestone chart, Network techniques: PERT and CPM, AON and AOA representation, Three time estimates, Using probability distributions for time computation, Probability of project completion, Time scale version of network, Early start and late start schedules, Resource allocation, Resource loading and leveling, Constrained resource scheduling, Multi-project scheduling and resource allocation, Crashing a project.

Introduction to Financial Management: Finance and other discipline, nature and scope of financial management, Functions of financial management; Objectives of the firm, Sources of finance, long term sources, short term sources; Introduction and analysis of financial statement; Introduction& definition of **budget** and budgetary control, objectives, essential requirements, advantages and disadvantages, types of budgets- cash and flexible.

Leverage Analysis and Working Capital Management: Concepts, Operating leverage, Financial leverage, Combined leverage, Working capital management: Operating cycle, Determinants of working capital, Types of working capital, Importance of working capital, Components of working capital, measuring working capital requirements

Text books:

1. Project Planning and Management with CPM and PERT, Kundan Singh & Dr.

M.L. Kansal, HP Hamilton Limited, 2021.
2. Project Management Planning and Control Techniques, Rory Burke, 4th Edition, Wiley India Pvt. Ltd, 2010.
3. Project Management, Planning and Control, Albert Lester, 5th edition, Butterworth-Heinemann, 2007
4. Fundamentals of Financial Management,D.ChandraBose,2nd edition,PHI,2010
5. Project Management: The Managerial Process, Erik Larson , Clifford Gray, 6th edition, McGraw Hill Education, 2017
6. Project Management, Megha Jain, Sultan Chand&Sons,2020

Reference Book:

1. Projects: Planning, Analysis, Selection, Financing,I mplementation, and Review, Prasanna Chandra., 10th edition, McGraw Hill Education, 2022
2. Project Management–The Complete Process (with Case Studies from Renewable Energy Sector), Vishwanath Murthy, Sultan Chand & Sons 2018
3. Project Management, Harvey Maylor, 5th edition, Pearson, 2021
4. Financial Accounting for Management, Paresh Shah, 3rd edition, Oxford University Press, 2019.
5. Financial Management Text, Problems and Cases, Khan& Jain, 8th edition, Tata McGraw Hill, 2018
6. Financial Management, Dr. P. C. Tulsian, 5th edition, S.Chand and company, 2017.
7. Financial Management, Ravi Kishore, 8th edition, Taxmann Publications Pvt. Ltd, 2020

ASSESMENT:

MSE: The Mid-Semester Examination will cover 50% of the syllabus.
ESE: The End-Semester Examination will cover 75% of the remaining syllabus (excluding the MSE syllabus) and 25% of the MSE syllabus.

ISA: The Internal Sessional Assessment (ISA) will be based on any one or a combination of the following components:

1. Declared Test
2. Surprise Test
3. MCQ Test
4. Performance in Tutorials
5. Assignments/Tutorials/Punctuality/Attendance

Additionally, the Course Coordinator may select other components and will announce the method of evaluation at the beginning of the course.

SH203N: ENVIRONMENTAL SCIENCE

Teaching Scheme: L: 02 T: 00 P: 00 **Credits:** 02
Evaluation Scheme: 20 ISA+30 MSE **Totalmarks:**50
MSE Duration: 1.5 Hrs. **ESE Duration:** 3.0 Hrs.

COURSE DESCRIPTION:

This course provides basic scientific knowledge and understanding of how our word works from an environmental perspective. Topics covered include energy resources, basic principles of ecosystem function; biodiversity and its conservation; human population growth; water, air and noise pollution; climate change and green chemistry.

DESIRABLE AWARENESS/SKILLS:

Basic knowledge of environment and importance of its protection

COURSE OBJECTIVES:

The course in Environmental Science is designed to achieve a comprehensive understanding of key environmental issues and principles. It begins by exploring the nature of the environment, including its components and interactions. The course then focuses on natural resources, highlighting their significance, sustainable management, and conservation strategies. Additionally, it delves into the structure and function of ecosystems, emphasizing their resilience and importance in maintaining ecological balance. Furthermore, the course addresses biodiversity and its conservation, emphasizing the preservation of species and habitats. It also covers environmental pollution and the principles of green chemistry, aiming to mitigate pollution and promote sustainable practices. Moreover, it examines social issues related to the environment, such as environmental justice, sustainable development, and the impacts of human activities on natural systems .Overall, the course aims to equip students with the knowledge, critical thinking skills, and practical insights necessary to understand and address contemporary environmental challenges effectively. Through a multidisciplinary approach, students will develop a holistic understanding of environmental science and its implications for sustainable development and human well-being.

COURSEOUTCOMES:

On the successful completion of this course, student shall be able to–

1. demonstrate the primarily environmental problems.
2. remember the concept of ecology, their structure and types, different components and their functions.
3. understand abiotic and biotic factors and their relation to each other.
4. apply various types of ecosystem, function, components of ecosystem and their stability.
5. analyze the social issues and apply environmental acts.

RELEVANCE OF PROGRAM OUTCOMES (POS) AND STRENGTH OF CORELATION:

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1	-	-	-	-	-	2	2	-	-	-	-	-
2	-	-	-	-	-	2	2	-	-	-	-	-
3	-	-	-	-	-	2	2	-	-	-	-	-
4	-	-	-	-	-	2	2	-	-	-	-	-
5	-	-	-	-	-	2	2	-	-	-	-	-

1- Weakly Correlated 2 – Moderately Correlated 3 - Strongly Correlated

COURSE CONTENT

Nature of Environment: Definition, scope and importance, multidisciplinary nature, need of public awareness.

Natural Resources:

Renewable and non-renewable resources: Natural resources and associated problems.

Forest resources: Use and over-exploitation, deforestation, case studies, timber extraction, mining, demand and their effects on forest and tribal people

Water resources: use and overutilization of surface and groundwater, floods, drought, conflicts over water, dams-benefits and problems

Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources

Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: growing energy needs renewable and non-renewable energy resources Land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification. Roll of individual in conservation of natural resources.

Ecosystem- Concept, structure and function of ecosystem, producers, consumers and decomposers, energy flow in ecosystem, ecological succession, food chain, food web and ecological pyramid, types of ecosystem-forest, grassland, desert and aquatic.

Biodiversity and Its Conservation- Introduction, definition, genetic, species and ecosystem diversity, bio geographical classification of India, India as mega diversity nation, hot spots of biodiversity, threats to biodiversity, habitat loss, poaching of wildlife, man wildlife conflicts, endangered and endemic species of India, conservation of biodiversity-In-situ and ex-situ conservation of biodiversity.

Environmental Pollution and Green Chemistry- Definition, causes, effects and control measures of –air pollution, water pollution, soil pollution, noise pollution, thermal pollution, nuclear hazards, role of individual in prevention of pollution, concept of green chemistry, principles of green chemistry.

Social Issues and the Environment-Water conservation, rain water harvesting, watershed management, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents, environmental protection act, air (prevention and control of pollution) act, water (prevention and control of pollution) act, wildlife protection act, forest conservation act.

Text books:

1. A Textbook of Environmental Studies for Undergraduate Courses, Erach Bharucha, 4th edition, University Press, 2004.
2. A Textbook of Environmental Chemistry, O. D. Tyagi and M Mehta, 4th edition, Anmol publication, 2016.
3. A Text book of environmental studies for undergraduate courses, Dr. D. K. Asthana, Dr. Meera Asthana, 2nd edition, S. Chand publication, 2012.

References:

1. Green Chemistry Environmental Friendly Alternatives, Rashmi sanghi, M.M. Shrivastawa, 3rd edition, Narosa publication, New Delhi, 2008.
2. Green Chemistry-Theory and Practice, Paul T Anastas and John C. Warner,1st Edition, Oxford University Press, 2000 V.K.
3. Environmental ChemistryA.K.De,3rdEdition,NewAgeInternationalPublishersLtd, New Delhi, 2010.
4. New Trends in Green Chemistry, V.K. Ahluwalia, M.Kidwai,1st Edition, Springer Publisher, 2004.
5. Environmental Studies,BennyJoseph,3rdEdition,TataMcGraw-Hill publication, 2017.

Evaluation Methodology:

MSE: The Mid-Semester Examination will cover 50% of the syllabus.
ESE: The End-Semester Examination will cover 75% of the remaining syllabus (excluding the MSE syllabus) and 25% of the MSE syllabus.

ISA: The Internal Sessional Assessment (ISA) will be based on any one or a combination of the following components:

1. Declared Test
2. Surprise Test
3. MCQ Test
4. Performance in Tutorials
5. Assignments/Tutorials/Punctuality/Attendance

Additionally, the Course Coordinator may select other components and will announce the method of evaluation at the beginning of the course.

SH205N: मराठी लेखन कौशल्य (Marathi Writing Skills)

एकूण तासिका : ०२ तास प्रति आठवडे **शैक्षणिक जमा गुणसंख्या (Credits) :०२**

मध्य सत्र परीक्षा : ३० गुण; अंतर्गत मुल्यांकन : २० गुण **एकूण: ५० गुण**

मध्यसत्र परीक्षा कालावधी: १.५तास

उद्दिष्टे:

- प्रभावी लेखनकौशल्य विकसित करणे.
- व्यावसायिक व शैक्षणिक उद्देशांसाठी विविध लेखनतंत्रांची समज व उपयोग करणे.
- मराठी साहित्याची महत्ता व तांत्रिक शिक्षणातील त्याचे महत्त्व समजून घेणे.
- स्पष्ट आणि संक्षिप्त लेखनशैली विकसितकरणे.
- तांत्रिक व व्यावसायिक संवाद कौशल्य विकसित करणे.
- विविध प्रकारच्या तांत्रिक दस्तऐवजीकरणासाठी मानके आणि प्रारूप शिकविणे.

घटक विश्लेषण:

मराठी भाषाआणि लेखनाचीओळख **(०२ तास)**

तांत्रिक शिक्षणात मराठीचे महत्त्व,मराठी व्याकरण (वाक्यरचना) संक्षिप्त परिचय,मूलभूत वाक्यरचनाआणि वापर.

लेखन कौशल्य विकास **(०४ तास)**

लेखनाचे प्रकार: वर्णनात्मक, कथात्मक, विवरणात्मक, आणि पटवून देणारे लेखन,प्रभावी लेखनतंत्रे,स्पष्टआणि संक्षिप्त लेखनशैली विकसित करणे.

व्यावसायिकआणितांत्रिकलेखन **(०४ तास)**

अधिकृतपत्रे, ईमेल्स आणि अहवालांचे लेखन,तांत्रिक दस्तऐवज आणि मार्गदर्शक तयार करणे,प्रकल्प प्रस्तावआणि संक्षिप्त सारांशलेखन.

सृजनशील लेखन **(०२ तास)**

कथालेखन आणि निबंधलेखन, कविता आणि तिचे प्रकार,माध्यमांसाठी लेखन: लेख, ब्लॉग्स, आणि स्तंभलेखन.

प्रस्तुतीकरण, संवाद आणि सारांशलेखन कौशल्य: **(०६ तास)**

मराठीत प्रस्तुतीकरण तयार करणे,सार्वजनिक बोलणे आणि मौखिक संवाद कौशल्य,मराठीत सेमिनारआणि गटचर्चाआयोजित करणे.वाचनाच्या प्रमुखअंगांचे संक्षेपीकरण,पाठ्यपुस्तकांचे संक्षेपीकरण आणि सारांश.

पत्रलेखनाचे नियम, तत्त्व,प्रकार: **(०४ तास)**

पत्रलेखनात अनुसरण करण्याचे सर्वोत्तम नियम,अभिप्राय व्यक्तकरण्याचे तंत्र. पत्रलेखनाचे बाबीचे मूलसिद्धांत,पत्रलेखनाचे प्रकार: अनौपचारिक, औपचारिक, व्यावसायिक. व्यक्तिगतपत्र (आधिकारिक, अआधिकारिक),व्यावसायिकपत्र (निवेदन, विवादपत्र, मागणीपत्र, तक्रारपत्र),

अनौपचारिक पत्र (आभारपत्र, निमंत्रणपत्र)

निबंध लेखनाचे मूलसिद्धांत, प्रकार, उपयोगी तंत्रे: (०४ तास)

निबंध लेखन बाबीचे मूलसिद्धांत आणि नियम, सामाजिक, राजकीय, वैज्ञानिक, सांस्कृतिक, कल्याणकारी विषयांवर निबंधलेखन,निबंधाच्या लेखनात संप्रेषण करण्याचे तंत्र.

अभ्यासक्रमाचे परिणाम:

1. तांत्रिक संकल्पनांचे स्पष्ट आणि प्रभावी लेखन क्षमता विकसित करणे.
2. व्यावसायिक संदर्भात सुसंवाद आणि प्रभावी प्रस्तुती करणाची क्षमता विकसित करणे.
3. विविध प्रकारच्या तांत्रिक दस्तऐवज स्वतंत्रपणे तयार करणे.
4. सर्जनशील विचारांच्या माध्यमातून आकर्षक आणि मनोरंजक साहित्य निर्मिती करणे.
5. मराठीत प्रभावी सार्वजनिक बोलणेआणि प्रस्तुतीकरण कौशल्य विकसित करणे.

RELEVANCE OF COURSE OUTCOMES [COS] WITH POS AND PSOS [WITH STRENGTH OF CO-RELATION]:

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1	-	-	-	-	-	2	2	1	2	-	-	3
2	-	-	-	-	-	2	2	1	2	-	-	3
3	-	-	-	-	-	2	2	1	2	-	-	3
4	-	-	-	-	-	2	2	1	2	-	-	3
5	-	-	-	-	-	2	2	1	2	-	-	3

1-Weakly correlated 2 –Moderately correlated 3–Strongly correlated

संदर्भपुस्तके:

1. "सारांश आणि संक्षेपणकला" – मीना देशपांडे
2. "मराठी सारांशलेखन कौशल्य" – विजय देशमुख
3. "सर्जनशील लेखनाचे मार्ग" – शिवाजीसावंत
4. "लेखनप्रेरणाआणि तंत्र" – अनुपमानिरंजन
5. "व्यावसायिक आणि तांत्रिकलेखनाची कला" – कृष्णास्वामी

6. उत्कृष्ट मराठी निबंध" - संकलन, लोकवाङ्मयगृह
7. "मराठी निबंधलेखन कौशल्य" - प्रो. सुधाकर पाटील
8. "मराठी विचारमंच" – विश्वास प्रकाशन

वर्गातील कमीत कमी उपस्थिती ७५% असणे अनिवार्य असेल अन्यथा गुणांकन केले जाणार नाही.

मध्य सत्र परीक्षेचा अभ्यासक्रम हा एकुण अभ्यासक्रमाच्या ५० टक्के असेल.

तांत्रिक संकल्पनांची स्पष्ट आणि प्रभावी लेखन क्षमता	व्यावसायिक संदर्भात सुसंवादआणि प्रभावी प्रस्तुती करणाची क्षमता	विविध प्रकारच्या तांत्रिक दस्तऐवज स्वतंत्रपणे तयार करण्याची क्षमता.	सर्जनशील विचारांच्या माध्यमातूनआकर्षकआणि मनोरंजक साहित्य निर्मिती करण्याची क्षमता	मराठीत प्रभावी सार्वजनिक बोलणेआणि प्रस्तुतीकरण कौशल्य विकसित करण्याची क्षमता
०४	**०४**	**०४**	**०४**	**०४**