ET201N ELECTRONIC DEVICES AND CIRCUITS

Teaching Scheme	**:** 03L, Total: 03 hours/week	**Credits :**	03
Evaluation Scheme	**:** 10 ISA +30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course provides an in-depth understanding of amplifiers and transistors, covering their fundamental principles, biasing methods, and their applications with special emphasis on Metal Oxide Semiconductor Field Effect Transistors (MOSFETs). The course is helpful to students in gaining a comprehensive understanding of amplifier, its frequency response and transistor behavior across different frequency ranges and configurations. It also provides introductory knowledge of special purpose diodes and special purpose transistors.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic electronics engineering

COURSE OUTCOMES

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

1. illustrate construction, working principle and biasing techniques of MOSFET.
2. analyze single stage transistor amplifier at low frequency for small signal.
3. analyze single stage transistor amplifier at high frequency for small signal.
4. formulate frequency response of transistor amplifier and its correlation with square wave testing
5. demonstrate the understanding of operating principles and applications of special semiconductor diodes.

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									3		
2	3	2	2	2									3		
3	3	2	2	2									3		
4	1	1	2	2									3		
5		2	3	3									3		

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

COURSE CONTENT

Concept of amplifiers **[03 Hrs]**

Basics of amplification, types of amplifiers - voltage, current, trans-conductance and trans-resistance, Basics of frequency response, Ideal and practical frequency response, General Frequency Considerations, RC LP and RC HP circuits, Bode Plot

Transistors **[05 Hrs]**

Introduction, review of BJT, Concept of MOSFET, MOSFET Introduction, MOS capacitor, Accumulation, depletion and inversion, MOSFET characteristics, Drain current equations, Channel length modulation, Body effect, Short channel MOSFETs, Comparison of BJT and MOSFET.

Transistors at Low Frequency **[05 Hrs]**

Small signal low frequency models of MOSFET and BJT, basic CS, CD and CG configurations of MOSFET, basic CE, CC and CB configurations of BJT, CS with source degeneration, CE with R_E.

Transistor Biasing **[05 Hrs]**

Introduction, review of BJT Biasing, biasing by constant current source, MOSFET biasing, Current mirror, Use of current mirror for biasing, dc and ac load lines, Other biasing methods.

Amplifiers at Low Frequency **[10 Hrs]**

Analysis in CS, CG and CD configuration, CS amplifiers with and without source degeneration, Analysis in CE, CB and CC configurations of BJT, CE amplifiers with and without bypass capacitor, *h*-parameters, Use of *h*-parameters for analysis, *h*-parameters conversion, Comparison of amplifiers.

Transistors at High Frequency **[08Hrs]**

High frequency models of MOSFET and BJT, parameters and their variations – alpha cut off frequency (f_α), beta cut off frequency (f_β) and unity current gain frequency (f_T); short circuit current gain with resistive load, single stage frequency response and Gain Bandwidth (GB) product; Emitter follower and source follower at high frequency.

Frequency Response of Transistor Amplifiers **[06 Hrs]**

MOSFET and BJT Amplifiers, High frequency response of BJT and FET amplifier, Miller Effect Capacitance, Square-Wave Testing – parameters and correlation with frequency response parameters.

Other Diodes and Transistors **[03 Hrs]**

Switching and Schottky diode – construction, operating principle, specification and applications, Light Emitting Diode (LED), photodiodes, JFET, Phototransistors, etc

Text Books

1. Electronic Circuits: Analysis and Design, Donald A. Neamen, 3rd edition, McGraw Hill Education, 2006.
2. Microelectronics, Behzad Razavi, 2nd edition, Wiley, 2017
3. Electronic Devices and Circuits Theory, R. L. Boylestad, L.Nashelsky, 11thedition, Pearson Education India, 2015.

Reference Books

1. Electronic Devices and Circuits, D. A. Bell, 5th edition, Oxford University Press, 2002.
2. Microelectronic Circuits: Theory And Applications, A. S. Sedra, K. C. Smith, A. N. Chandorkar, 7th edition, Oxford University Press, 2017
3. Integrated Electronics, J. Millman, C. C. Halkias, 1991 edition, 48th reprint, Tata McGraw-Hill Education, 2008

ET202N ELECTRONIC MATERIALS AND COMPONENTS

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits :**	02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course introduces different types of components such as resistors, capacitors, inductors and electronic materials for fabrication of components, introduction to switches and relays. This course also focuses on single sided and double sided printed circuit boards (PCB), types of laminates.

DESIRABLE AWARENESS/SKILLS

Knowledge of engineering physics, basic electronics engineering and their concepts

COURSE OUTCOMES

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

1. understand concepts of various properties of materials.
2. apply the knowledge of electronic components.
3. exhibit the knowledge of printed circuit board
4. describe the process of fabrication of integrated circuits.

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		1									1	
2	2		3	1	1									1	
3	1		2		1										
4	1		2	1	1										

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

COURSE CONTENT

Materials **[4 Hrs]**

Matter and Energy, conducting materials – conductors, semiconductors, insulators, magnetic, special purpose, dielectrics and alloys

Properties of Materials **[8 Hrs]**

Electrical Properties of Materials: Electrical Conduction in Metals and Alloys, Semiconductor band structure, Intrinsic and extrinsic Semiconductors, Hall Effect, Compound Semiconductors, Electrical Properties of Polymers, Ceramics, Dielectrics, and Amorphous Materials, Semiconductor Devices.

Magnetic Properties of Materials: Magnetism, Diamagnetism, Para-magnetism, Ferromagnetism, Anti-ferromagnetism, Ferrimagnetisms, Molecular Field Theory

Optical Properties of Materials: Optical Constants, applications of optical properties: Spontaneous Emission, Stimulated Emission, Semiconductor Laser, Light-Emitting Diodes (LEDs), Liquid Crystal Displays (LCDs), Solar cell

Electronic Components **[6 Hrs]**

Passive Components: Resistors, Capacitors, Transformers and Inductors

Active Components: Bipolar Junction Transistor, Field Effect Transistor and Metal Oxide Field Effect Transistor

Relays- electromagnetic and reed relay; Chokes-A.F and R.F chokes

Manufacturing and Fabrication **[6 Hrs]**

Printed circuit boards and types, types of laminates, manufacturing of copper clad laminates, properties of copper clad laminates, PCB manufacturing process, manufacturing of single sided and double sided boards.

Text Books

1. Electronic Components and Materials, Dr. Madhuri A. Joshi, 3rd edition, Shroff Publishers, 2004
2. Electronics Components and Materials, S. M. Dhir, 1st edition, Tata McGraw Hill, 2012
3. Introduction to Electronic Materials and Devices, Sergi M.Rezende,Springer,2022
4. Electronic Properties of Materials, Rolf E. Hummel, 3rd Edition, Springer, 2001.

Reference Books

1. Basic Electronics Solid State, B. L. Therja, 2nd edition, S. Chand and Company ltd, New Delhi, 2006
2. Printed Circuit Boards:Design and Technology, W. C. Bosshart, 37th edition, Tata McGraw Hill, 2012.
3. Electrical Engineering Materials Physics Properties and applications, S. P. Seth,3rd edition Dhanpant Rai and Publication 2011

ET203N DIGITAL CIRCUITS AND SYSTEM DESIGN

Teaching Scheme	**:** 03L, Total: 03 hours/week	**Credits :**	03
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course introduces electronic circuits that are used to process and control digital signals. This course introduces number systems and their inter-conversions, the methods for simplifying Boolean expressions. The major focus of this course is to design and analyze combinational and sequential logic circuits. This course helps to understand the importance of digital logic verification and design for testability.

COURSE OUTCOMES

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

1. demonstrate the knowledge of number systems and their inter-conversions, codes, logic families, and semiconductor memories.
2. obtain minimized expressions using K-map tool and realize combinational logic circuits.
3. apply concept of sequential circuits for realizing counters and shift registers.
4. design combinational and sequential logic circuits for the given output requirements.

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		1										1		3
2	1		1	2										2	
3	2	2	1		1									2	3
4	2	2	1										1		

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

COURSE CONTENT

Number Systems and Codes **[06 Hrs]**

Types – Decimal, binary, octal and hexadecimal, representation of signed binary numbers, binary codes and types - Binary Coded Decimal (BCD) Code, Excess-3 code, Gray code, American Standard Code for Information Interchange (ASCII) code

Digital Logic Families **[06 Hrs]**

Characteristics of logic families, introduction to all types, Transistor-Transistor Logic (TTL), Emitter Coupled Logic (ECL) and Complementary Metal Oxide Semiconductor (CMOS) logic families and their characteristics and comparison, study of data sheet (TTL)

Combinational Logic Circuits **[10 Hrs]**

Concept of combinational and sequential circuit, Boolean algebra, simplification of Boolean expression using K-map method and its implementation using min-term (Sum of Products), max- term (Product of Sums) expression, universal gates, half and full adder, subtractor circuits, digital comparator - 1 bit, 2 bit, code convertors - binary to gray, gray to binary, multiplexer and de-multiplexer and their applications, Arithmetic and Logic Unit (ALU)

Sequential Circuits and Counters **[10 Hrs]**

Concept of Flip-flops, Types of flip-flops: S-R, J-K, master slave J-K, T, D with their applications, shift register and their applications, design of MOD-N synchronous and asynchronous counters, UP/DOWN (4bit) asynchronous counters, Ring and Johnson counters

Semiconductor Memory **[08 Hrs]**

Introduction, organization, operation, expansion, classification and types; read write memory, Random Access Memory (RAM), static and dynamic RAM, Read Only Memory (ROM), Programmable Read Only Memory (PROM), Erasable Programmable Read Only Memory (EPROM) and flash memories / Electrically Erasable Programmable Read Only Memory (EEPROM), content addressable memory (CAM), Charge Coupled Devices (CCD) memory

Text Books

1. Modern Digital Electronics, R. P. Jain, 4th edition, Tata McGraw Hill Education, 22nd Reprint 2018
2. Digital Principles and Applications, Leach, Malvino, 5th edition, Tata McGraw Hill,2002

Reference Books

1. Digital Electronics: Principles and Applications, R. L. Tokheim, 8th edition, Tata McGraw Hill, 2013
2. Digital Design, M. M. Mano, M. D. Ciletti, 5th edition, Pearson Prentice Hall, 2013
3. Digital Electronics: Circuits and Systems, V. K.Puri,13th reprint, Tata McGraw-Hill, 2006

ET204NX DIGITAL ELECTRONICS

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

COURSE DESCRIPTION

This course introduces principles and applications of digital electronic circuits to the students of disciplines other than Electronics and Telecommunication Engineering. This course introduces number systems and their inter-conversions, the techniques for simplifying Boolean expressions, combinational logic circuits and sequential logic circuits.

COURSE OUTCOMES

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

1. demonstrate the knowledge of number systems and their inter-conversions, codes, and semiconductor memories.
2. obtain minimized expressions using K-map tool and realize combinational logic circuits.
3. apply concept of sequential circuits for realizing counters and shift registers.
4. design combinational and sequential logic circuits for the given output requirements.

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

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

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

COURSE CONTENT

Number Systems and Codes **[06 Hrs]**

Number systems and their inter-conversions - Decimal, Binary, Octal and Hexadecimal, representation of signed binary numbers, binary codes and types - Binary Coded Decimal (BCD) Code, Excess-3 code, Gray code, American Standard Code for Information Interchange (ASCII) code

Principles of Combinational Logic Circuits **[08 Hrs]**

Concept of combinational and sequential circuit, Basic gates and Universal gates, Boolean algebra, simplification of Boolean expression using K-map method and its implementation using min-term (Sum of Products), max-term (Product of Sums) expression

Applications of Combinational Logic Circuits **[08 Hrs]**

Half and full adder, subtractor circuits, 1 bit, 2 bit and 4-bitdigital comparators, code convertors – binary to gray, gray to binary, digital multiplexer, de-multiplexer and their applications, Arithmetic and Logic Unit (ALU)

Sequential Circuits and Counters **[10 Hrs]**

Concept of Flip-flops, S-R, J-K, master slave J-K, T, and D flip-flops along with their applications, shift register and their applications, design of mod-N synchronous and asynchronous counters, UP/DOWN (4-bit) asynchronous counters, Ring and Johnson counters

Semiconductor Memory **[08 Hrs]**

Introduction, organization, operation, expansion, classification and types; read write memory, Random Access Memory (RAM), static and dynamic RAM, Read Only Memory (ROM), Programmable Read Only Memory (PROM), Erasable Programmable Read Only Memory (EPROM) and flash memories / Electrically Erasable Programmable Read Only Memory (EEPROM), content addressable memory (CAM), Charge Coupled Devices(CCD) memory

Text Books

1. Modern Digital Electronics, R. P. Jain, 4th edition, Tata McGraw Hill Education, 22nd Reprint 2018
2. Digital Principles and Applications, Leach, Malvino,5th edition, Tata McGraw Hill, 2002

Reference Books

1. Digital Electronics: Principles and Applications, R. L. Tokheim, 8th edition, Tata McGraw Hill, 2013
2. Digital Design, M. M. Mano, M. D. Ciletti, 5th edition, Pearson Prentice Hall, 2013
3. Digital Electronics: Circuits and Systems, V. K.Puri,13th reprint, Tata McGraw Hill, 2006

ET204NY Principles of Electronics Engineering

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

COURSE DESCRIPTION

This course provides knowledge about basic analog electronics components to familiarize students with construction, their working, operation, performance and applications. It also provides knowledge about fundamentals of communication systems and electronic measurement systems.

COURSE OUTCOMES

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

1. demonstrate operating principles of basic semiconductor devices like diodes, bipolar junction transistors and operational amplifiers.
2. compute various parameters of rectifier circuits and op-amp-based amplifier circuits.
3. illustrate the basic understanding of analog communication systems.
4. demonstrate the knowledge of fundamentals of measurement systems and sensors / transducers.

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

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

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

COURSE CONTENT

Diode Circuits **[8 Hrs]**

p-n junction diode and Zener diode, regulated power supply-introduction, block diagram and parameters, rectifiers- operation and derivations of rectifier parameters for half, full and bridge wave rectifier, Filters - necessity, types, wave shaping circuits - Clippers, Clampers and voltage multipliers.

Transistor **[8 Hrs]**

Bipolar Junction Transistors (BJT): Basic concept, working, Transistor configurations and their V-I characteristics (CB, CE and CC), alpha, beta and gamma and their inter-relation, DC load line analysis, Q-point and its significance, Transistor biasing - fixed and voltage divider bias. Field Effect Transistor (FET) - Construction, working, parameters of FET, drain characteristics and transfer characteristics of FET.

Operational Amplifier (Op-amp) **[6 Hrs]**

Introduction, symbol, block diagram, parameters, ideal Op-amp, practical considerations, Op-amp configurations- inverting, non-inverting and differential (open loop and closed loop), applications- adder, subtractor

Introduction to Electronic Communication **[6 Hrs]**

Block diagram of communication system, significance of electromagnetic spectrum, concept and need of modulation, amplitude modulation and frequency modulation: concepts, mathematical analysis, time and frequency domain representation.

Fundamentals of Measurements **[4 Hrs]**

Block diagram of measurement system, types of errors, significance of electrical measurement system, various electrical effects employed in measuring instruments, static and dynamic characteristics of measuring instruments, classification of measuring instruments.

Transducers **[8 Hrs]**

Definition-transducer and sensor, classification of transducers, characteristics and selection criteria, RTD, thermistor, LVDT, potentiometer, strain gauge transducers, transducers useful for agricultural and communication applications.

Text Books

1. Electronic Principles, A. Malvino, D. J. Bates, 7th edition, Tata McGraw Hill Education Private Limited, 13th reprint, 2012.
2. Electronic Instrumentation and Measurement Techniques, A. D. Helfrick and W.D. Cooper, Eastern Economy Edition, PHI Learning Pvt. Ltd., New Delhi, 2008.
3. Op-amps and Linear Integrated Circuits, R. A. Gaikwad, 4th edition, Pearson Education, 2015.
4. Principles of Electronic Communication Systems, Loui Frenzel, 3rd edition, McGraw Hill Education, 2017.

Reference Books

1. A Course in Electrical and Electronic Measurements and Instrumentation, A. K. Sawhney, 8th edition, Dhanpatrai and Sons, 2002.
2. Instrumentation Measurements and Analysis, B. C. Nakra and K. K. Chaudhry, Tata McGraw Hill Education, 2nd edition, 2004.
3. Electronic Instrumentation and Measurements, H. S. Kalsi, McGraw Hill Education Private Limited, 4th edition, 2022.

ET206N ELECTRONIC DEVICES AND CIRCUITS LAB

Teaching Scheme	**:** 02P, Total: 02 hours/week	**Credits :**	01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks:**	50
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course deals with the practical exposure to semiconductor diodes, Bipolar Junction Transistors (BJT), Field Effect Transistors (FET), FET and BJT amplifiers, Frequency Response of BJT Amplifiers, etc.

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET201N Electronic Devices and Circuits

COURSE OUTCOMES

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

1. demonstrate operation of diode circuits experimentally.
2. examine transistor characteristics experimentally.
3. build and test the biasing circuits of transistors.
4. analyze frequency response of transistor amplifier circuits experimentally.
5. simulate suitable transistor circuits using EDA tools.

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	1	3	2	2									3		
2	1	3	3	2									3		
3	1	3	3	2									3		
4	1	3	2	2										1	
5	1			2	3								2		

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

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of course ET201N. The list given below is just a guideline.

List of Experiments

- Diode-clipper and clamper circuits
- BJT characteristics
- MOSFET-characteristics
- BJT biasing and configurations(CE, CB,CC)
- MOSFET-biasing and configurations(CS, CG,CD)
- Measurement of *h*-parameters
- Frequency response of BJT amplifier (CE/CB)
- Frequency response of MOSFET amplifier (CS/CG)
- Square wave testing of CE amplifier
- F_β and f_T with resistive load of a single stage CE amplifier
- Characteristics of Photo-diode and LED

Note

- **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 internal continuous assessment format (S10).

- **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 out of institute.

ET207N DIGITAL CIRCUITS AND SYSTEM DESIGN LAB

Teaching Scheme	**:** 02P, Total: 02 hours/week	**Credits :**	01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks:**	50
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course provides hand on experience in designing and implementing digital and logic circuits. The laboratory exercises are designed to give ability to design, build and implement digital circuits and systems.

COURSE OUTCOMES

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

1. implement Boolean expression and code converters using gates.
2. realize combinational circuits such as adders, subtractors, using gates.
3. realize multiplexers, demultiplexers, comparators and parallel adders etc. using MSI ICs
4. design and implement sequential circuits such as asynchronous and synchronous counters using flip-flops and using MSI ICs.

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	1	3	3	2	1								1		
2	1	3	3	2	1									2	
3	1	3	3	2	1									2	
4	1	3	3	2	1									2	

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

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of course ET203N. The list given below is just a guideline.

List of Experiments

- Implementation of Boolean expression using universal gates
- Binary to Gray and Gray to binary code convertors
- Parallel adder /subtractor (IC 7483)
- Comparators (IC 7485)
- Multiplexer and de-multiplexer (IC 74151, 74154 etc.)
- ALU using IC 74181
- Flip-flops– SR, JK, T, D using suitable ICs
- Asynchronous counter using flip-flops
- Synchronous counter using flip-flops
- Mod-10 and Mod-12 Counters using corresponding ICs (IC 7490, 7492, 74190)
- Shift register using IC 7495

Note

- **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 internal continuous assessment format (S10).

- **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 out of institute.

SH202N ENTREPRENEURSHIP DEVELOPMENT

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 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 OUTCOMES

On the successful completion of this course; student shall 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.
6. utilize recent trends in entrepreneurship.

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

CO	PO											
	1	2	3	4	5	6	7	8	9	10	11	12
1						3	2	2	2	2	2	3
2						3	2	2	2	2	2	3
3						3	2	2	2	2	2	3
4						3	2	2	2	2	2	3
5						3	2	2	2	2	2	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., S. 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, Dr. S.S Khanka, S. Chand & Company, 2011 edition

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

ESE: End Semester Examination will be based on rest of the 75 % of rest of the syllabus (i.e. Excluding syllabus of MSE) and 25% syllabus of MSE.

ISA: ISA will be based on any one or combination of following components-

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

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

SH204N: UNIVERSAL HUMAN VALUES- II

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 30 MSE + 70 ISA	**Total Marks:**	100

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; student 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, R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
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: Mid Semester Examination will be based on 50 % of the syllabus
ESE: End Semester Examination will be based on rest of the 75 % of rest of the syllabus (i.e. excluding syllabus of MSE) and 25% syllabus of MSE.
ISA: ISA will be based on any one or combination of following components-

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

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

ET250N COMMUNITY ENGINEERING PROJECT / FIELD PROJECT

Teaching Scheme (Contact Hours): 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 be able to -

1. identify and define a problem statement from the requirements raised from literature survey /need analysis.
2. build and test electronic circuits/prototype for developing real life small electronic 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							3		
2			3		2		2	2						3	
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 small electronic applications. This work may be a complete hardware or hardware with small programming aspect. It should encompass electronics components, devices, analog or digital ICs, micro controller 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.

ET251N Electronic Circuit Analysis

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

COURSE DESCRIPTION

This course aims at imparting structural and functional understanding of amplifier circuits as applicable in the area of feedback topologies, class based amplifiers used in audio power applications, differential amplifier and its basic analysis. In addition, detailed study of power management circuits built on voltage regulators, waveform generators and oscillators also forms integral part of the course.

DESIRABLE AWARENESS/SKILLS

Knowledge of basic electronic devices and their electrical characteristics, basic electronic circuits and concepts of network analysis

COURSE OUTCOMES

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

1. analyze feedback and power amplifiers
2. implement suitable differential amplifier for various applications.
3. analyze and design various subsystems of function generators.
4. design and develop power supply modules for various electronic circuits/systems.

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	3	2	1	1								3		
2	2	3	2	1	1								3		
3	2	3	2	1	1								3		
4	2	3	2	1	1								3		

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

COURSE CONTENTS:

Feedback Amplifier **[8 Hrs]**

Classification of amplifier, concept of feedback, types of feedback (positive and negative feedback), general characteristics of negative feedback amplifier - transfer gain, input resistance and output resistance, negative feedback amplifier - analysis of voltage series, current series, voltage shunt and current shunt negative feedback amplifier

Large Signal Amplifier **[8 Hrs]**

Introduction, concept of load line, performance parameter- efficiency and distortion, classification; class A - operating principle and analysis of series fed, transformer coupled power amplifiers, class B - operating principle and analysis; push pull power amplifier with and without output transformer, concept of crossover distortion; class AB - operating principle and analysis; push pull power amplifier with and without output transformer; class C - operating principle.

Differential Amplifiers **[4 Hrs]**

Introduction - different modes of operation of differential amplifier, DC and AC analysis of differential amplifier for balanced and unbalanced operation, techniques to improve CMRR of differential amplifier.

Waveform Generators and Wave Shaping Circuits **[10 Hrs]**

Concept of oscillator, classification of oscillator, circuit, operation and detailed analysis of phase shift, Wien bridge, Hartley, Colpitt, Clap and crystal oscillator. Methods of generating a time base waveform, exponential sweep RC circuit, a transistor constant current sweep, an inductor circuit used to improve the linearity of RC sweep circuit, transistor current sweep circuit, a current sweep using current feedback to improve linearity. Transistor as a switch, astable, bistable and monostable multi-vibrators, Schmitt trigger circuit.

Regulated Power Supply **[10 Hrs]**

Block diagram of regulated power supply, filters–concept, C, L, LC, and CLC filters, voltage regulators - transistorized series and shunt, short circuit protection (using transistor and diode), fold back protection and protection circuit design, series regulator using op-amp, voltage regulator ICs – 723, 78XX series, 79XX series, 317, positive/negative and fixed/adjustable voltage regulators using IC 723 and /dual tracking voltage regulator using 78XX series, 79XX series.

Text Books

1. Electronic Devices and Circuits, J. Millman, C.C. Halkias, S. Jit, 3rd edition, McGraw- Hill Education (India) Private Limited, 2010
2. Pulse Digital and Switching Waveforms, J. Millman, 3rd edition, McGraw- Hill international education editions, 2015
3. Electronic Devices and Circuits Theory, R. L. Boylestad, L. Nashelsky, 9th edition, Prentice Hall of India, 2006

Reference Books

1. Electronic Devices and Circuits, D. A. Bell, 5thedition, Oxford University Press, 2008
2. Microelectronics Circuits, A. S. Sedra, K. C. Smith, A. N. Chandorkar, 5thedition, Oxford University Press, 2009
3. Electronics Devices and Circuits, S. Salivahanan, N. Sureshkumar, 3rd edition, Mc Graw Hill Education (India) Private Limited,2012

ET252N SIGNALS AND SYSTEMS

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

COURSE DESCRIPTION

This course provides an introduction to signals and systems. It also provides introduction of classification of signals, time frequency characterization. It covers the knowledge of convolution, continuous time Fourier series (CTFS), Fourier transform (CTFT), Laplace transform and random variables.

COURSE OUTCOMES

Upon successful completion of this course the students will be able to -

1. demonstrate the understanding of basic concepts of signals and systems.
2. analyse signals and systems in the time domain.
3. analyse signals and systems in frequency domain using CTFS/CTFT.
4. apply Laplace transform for analysis of continuous time linear and time invariant systems.
5. evaluate energy and power spectral density of random signals.

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									1	2	
2	2		3	2	2								1	2	1
3	3			2	2								1		
4	3			3	2								1		
5	3	3		1	2								1		1

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

COURSE CONTENT

Fundamentals **[6 Hrs]**

Introduction to natural, voice, speech, communication, biomedical signals, mathematical representation of signals: periodic and non-periodic, analog and digital, even and odd, deterministic and random, energy and power signals. Singularity functions: Impulse, step, ramp. Basic operations on signals, precedence rule for shifting and time scaling operation. Systems: Definition, properties: causality, linearity, time invariance, static and dynamic, stable and unstable.

Time Domain Representation of LTI Systems **[8 Hrs]**

System representation using block diagram, differential/difference equations, Concept of impulse response, analysis of continuous time linear time invariant (CTLTI) system using convolution integral and discrete time linear time invariant (DTLTI) system using convolution sum, properties of convolution operation and system interconnections, step response, analysis of system properties like memory, stability and causality using impulse response.

Frequency domain representations of LTI systems using Fourier transform **[10 Hrs]**

Concept of Eigen functions, Fourier series and transform with their properties. Fourier transform for applications to Linear Time Invariant (LTI) systems. Magnitude and phase representation of Fourier transform, frequency response of LTI systems, time domain properties of ideal frequency selective filters, time and frequency domain aspects of non-ideal filters.

Frequency Domain Representations of LTI Systems using Laplace transform **[8 Hrs]**

Definition, properties of Laplace transform, inversion of Laplace transform, unilateral Laplace transform, applications of Laplace transform for analysis of CTLTI systems.

Probability, Random variables and correlation **[8 Hrs]**

Fundamentals of probability theory, conditional probability and statistical independence, Bayes' theorem, Uniform and Gaussian probability models; Random variables: Continuous and Discrete random variables, cumulative distributive function (CDF), Probability density function (PDF), properties of CDF and PDF, statistical averages, mean, moments and expectations, standard deviation and variance.

Introduction to Correlation: Autocorrelation, Cross correlation, and their properties.

Text Books

1. Signals and Systems, S. Haykin, 2nd edition, Wiley, 2017
2. Fundamentals of Signals and Systems, M. J. Roberts, 2nd edition, Tata McGraw Hill, 2012
3. An Introduction to Analog and Digital Communication, Simon Haykins, Wiley India, 2nd edition, 2006

Reference Books

1. Signals and Systems, A. V. Oppenphim, A. S. Willsky and S. H. Nawab, 2nd edition, Pearson, 2016
2. Signal and System, B. P. Lathi, 1st edition, Oxford university press, 2010
3. Signals and Systems, Mahmood Nahvi, 2nd edition, Tata McGraw Hill, 2006

ET253N NETWORK ANALYSIS AND SYNTHESIS

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

COURSE DESCRIPTION

This course introduces the analysis and design concepts of electronic/electrical networks. It covers network theorems, concept of resonance, analysis and interconnection of two port networks. The course introduces the design of filters, and attenuators. The course makes familiar with transient analysis and Laplace transform of networks.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic electrical engineering and their concepts

COURSE OUTCOMES

Upon successful completion of this course the students will be able to –

1. demonstrate and illustrate the basic concepts of networks like graph theory, network theorems, resonance, two port network parameters, filters, attenuators, etc.
2. apply the above concepts and analyze the networks.
3. choose the proper method for network analysis and determine the required parameters.
4. design the different types of filters, symmetrical and asymmetrical attenuators.
5. analyze the networks in time and frequency domain.

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								1			1	1	
2	2	1		1	1								1	1	
3	2	3	3										1	1	
4	1	1		1	1								1	1	
5	1	1		1									1	1	

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

COURSE CONTENT

Graph Theory and Network Theorems (AC analysis) [9 Hrs]

Introduction, graph of a network, path, sub-graphs, trees, co-trees, loops, twigs, links, cut sets, incidence matrix, tie-set matrix and loop currents, cut set matrix and their properties, analysis of networks using graph theory. Network Theorems: superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem

Two Port Networks [9 Hrs]

Introduction, characterization of linear time-invariant two port networks, open circuit impedance parameters, short circuit admittance parameters, transmission parameters and hybrid parameters, interrelationships between the parameters, reciprocity theorem, and inter-connection of two port networks: series, parallel, series-parallel and cascade connections.
Characteristic impedance, propagation constant, image impedance and iterative impedance in terms of two port network, reduction of two port network to T and π network

Resonance [8 Hrs]

Concept of resonance, types of resonance, quality factor and its significance; Series resonance: resonant frequency with derivation, variation of impedance, admittance and current with frequency, bandwidth and selectivity, magnification in resonance; Parallel resonance: resonant frequency for a tank circuit, variation of impedance, admittance and current with frequency, and reactance curves

Filters and Attenuators [8 Hrs]

Filters: Fundamentals, frequency response in pass band and stop band, constant k prototype low pass filter, high pass filter, band pass filter, band stop filter, m-derived low pass filter, high pass filter and concept of composite filters;
Attenuators: definition and units, symmetrical and asymmetrical T and π attenuator, asymmetrical L section attenuator

Time Domain Analysis [5 Hrs]

Concept of transient and steady state response, dc response of RL, RC, RLC circuits, sinusoidal response of R-L, R-C, R-L-C circuits, solution of two mesh circuits with initial conditions

Laplace Transform [3 Hrs]

Review of Laplace Transforms, Transformed equivalent of resistance, inductance and capacitance in the transform domain -node analysis and mesh analysis of the transformed circuit.

Text Books

1. Circuits and Networks, A. Sudhakar and S. S. Palli, 4th edition, Tata McGraw-Hill, 2010
2. Networks, Lines and Fields, J. Ryder, 2nd edition, Prentice Hall of India, 2006

Reference Books

1. Network and Systems, D. R. Choudhary, 2nd edition, New Age International Publishers, 2014
2. Network Analysis, M.E. V. Valkenburg, 3rd edition, PHI Learning Private Limited, 2011.
3. Engineering Circuit Analysis, W. H. Hayt, Jr., J. E. Kemmerly S. M. Durbin, 8th edition, McGraw-Hill, 2012
4. Principles of Active Network Synthesis and Design, G. Daryanani, 2nd edition, Wiley India Pvt. Limited, 2009

ET254NX FUNDAMENTALS OF MICROPROCESSOR AND MICROCONTROLLER

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course introduces the basic fundamentals, history and evolution of microprocessors and microcontrollers that every engineer should know. It focuses on architecture, instruction set, addressing modes, assembly language programs and I/O and memory interfacing using 8085. The course introduces architecture, memory organization, interrupts, programming of microcontroller 8051.

DESIRABLE AWARENESS / SKILLS

Knowledge of basic electrical engineering and mathematical concepts

COURSE OUTCOMES

Upon successful completion of this course the students shall be able to -

1. illustrate architecture and instruction set of the microprocessor.
2. implement assembly language programs for data manipulation.
3. demonstrate I/O and memory interfacing of microprocessor.
4. illustrate the architecture, memory organization, addressing mode, instruction set and programming of microcontroller.

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	3	2							1		
2	2	2	2									
3	2	1	1									
4	1	1										

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

COURSE CONTENT

Introduction to Microprocessors and Microcontrollers [4Hrs]
Introduction, microprocessor, microcomputer, architecture of microprocessors, history of microprocessors, evolution of microprocessors, microprocessor applications, evolution of microcontrollers, applications of microcontrollers

Architecture, Instruction Set and Addressing Modes of 8085 Microprocessor [6Hrs]
Introduction. block diagram of the 8085 microprocessor, pin diagram of 8085 microprocessor, addressing modes, instruction set, instruction and data formats, symbols and abbreviations, 8085 instructions, instruction timing diagram, timing diagram

Assembly – Language Programs of the 8085 Microprocessor [4Hrs]
Introduction, machine language, assembly language, high-level language, stack, subroutines, time-delay loops, modular programming, macro, instruction format, assembly-language programs

I/O and Memory Interfacing Using 8085 [6Hrs]
Introduction, memory interfacing, interrupts of the 8085 microprocessor, interrupts of 8086/8088 microprocessor, 8259A programmable interrupt controller, programmable peripheral interface (8255), programmable counter/interval timer (8253)

Introduction to 8051 Microcontroller [4Hrs]
Introduction, architecture of 8051 microcontroller, memory organization, pin diagram of 8051 microcontroller, timers/counters, serial communication, interrupts

Instruction Set and Programming of the 8051 Microcontroller [4Hrs]
Introduction, addressing modes, 8051 instruction set, simple examples in assembly language programs of 8051 microcontroller, assembly-language programs, applications of microcontrollers

Text Books

1. Microprocessor Architecture, Programming and Applications with 8085, Ramesh S. Gaonkar, 5th edition, Prentice Hall, 2002.
2. Microprocessors and Microcontrollers: Architecture, Programming and Interfacing, Soumitra Kumar Mandal, Tata McGraw Hill Education Private Limited, 2017.

Reference Books

1. Microprocessors and Microcontrollers, A. Nagoor Kani, 2nd edition, Tata McGraw Hill Education Private Limited, 2012
2. The 8051 Microcontroller and Embedded Systems using Assembly and C, Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, 2nd edition, Pearson Education Limited, 2014
3. Microprocessors and Microcontrollers, Saurabh Chaudhury, Risha Mal, All India Council for Technical Education (AICTE), March, 2023

ET254NY FUNDAMENTALS OF TELECOMMUNICATION

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course covers basics of telecommunication and various aspects of multiplexing, transmission medium, and signal. This course also introduces digital communication system and its application. This course gives basic information about network organization and switching system, measurement of traffic and unit of traffic.

DESIRABLE AWARENESS/ SKILLS

Knowledge of basic electronics engineering

COURSE OUTCOMES

Upon successful completion of this course the students shall be able to -

1. identify the Radio frequency spectrum and the bands of different types of radio systems
2. analyze the power, efficiency and transmission bandwidth of Amplitude and Frequency Modulated signals.
3. convert the radio frequency to Intermediate frequency and explain the operation of radio receivers
4. explain the basic principles of different types of communication systems.

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

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

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

COURSE CONTENT

Introduction to Electronic Communication **[6 Hrs]**

Communication systems, Types of Electronic Communication, Modulation and Multiplexing, The Electromagnetic Spectrum, Bandwidth, Amplitude Modulation (AM) Fundamentals: AM concepts, Modulation Index and Percentage of Modulation, Sidebands and the Frequency Domain, AM Power

Fundamentals of Frequency Modulation **[8 Hrs]**

Basic principles of Frequency Modulation (FM), Modulation Index and Sidebands, Noise – Suppression Effects of FM, Comparison of AM and FM. Communication Receivers: Basic tuned radio frequency (TRF) receiver, Superheterodyne Receivers, intermediate Frequency and images

Digital Communication Techniques **[6 Hrs]**

Digital Transmission of Data, Parallel and Serial Transmission, half and full duplex communication, Data Conversion, Pulse Modulation - PCM, Principles of Digital Transmission, Modem Concepts and Methods – ASK, FSK, BPSK

Fundamentals of different Types of Communication Systems **[6 Hrs]**

Microwave, Optical fiber, Satellite Communication, Cellular Systems, Bluetooth and Wi-Fi

Text Books

1. Principles of Electronic Communication Systems, Louis E. Frenzel Jr., 4th edition, McGraw-Hill Education, 2016
2. Wayne Tomasi, Electronic Communications Systems, 5th Edition, Pearson Education, 2008

Reference Books

1. Principles of Communication Systems, Herbert Taub and Donald L. Schilling, 3rd edition, McGraw-Hill, 2007
2. Wireless Communications: Principles and Practice, Theodore S. Rappaport, 2nd edition, Prentice Hall, 2002

ET256N Electronic Circuit Analysis Lab

Teaching Scheme	**:** 02P, Total: 02 hours/week	**Credits:**	01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks:**	50
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course provides the practical exposure to feedback, large signal and differential amplifiers. In addition it also deal with the study of waveform generator, wave shaping circuits, regulated power supply, etc

DESIRABLE AWARENESS/SKILLS

Concepts and theory of the course ET251N electronic circuits and applications

COURSE OUTCOMES

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

1. find out frequency response of amplifier
2. build and test waveform generator circuits
3. design and implement regulated power supplies

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	3	2	2	2								3		
2	2	3	3	2	2								3		
3	2	3	3	2	2								3	1	

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

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of the course ET251N. The list given below is just a guideline.

List of Experiments

- Negative feedback amplifier
- Various multi-vibrator circuits
- Schmitt trigger circuit
- Class A power amplifier with resistive load
- Transformer coupled class A power amplifier
- Push-pull power amplifier
- Transistor constant current sweep generator
- Line and load regulation of regulated power supply
- Various R-C and L-C oscillators
- Short circuit protection and fold back protection circuit using transistor and diode
- Emitter coupled DIDO amplifier
- Design and implement regulated power supply (2turns)

Note:

- 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 internal continuous assessment format (S 10).

- 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 out of institute.

ET257N SIGNALS AND SYSTEMS LAB

Teaching Scheme	**:** 02P, Total: 02 hours/week	**Credits:**	01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks:**	50
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course provides a practical exposure to signals and systems and also classification of signals, time and frequency characterization. It also provides understanding and practically verifies the concepts of sampling, DFT, random variables and processes.

COURSE OUTCOMES

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

1. demonstrate the understanding of basic concepts of signals and systems.
2. analyze signals and systems in the time domain.
3. analyze signals and systems in frequency domain using CTFS/CTFT.
4. apply Laplace transform for analysis of continuous time linear and time invariant systems.
5. evaluate energy and power spectral density of random signals.

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									1	2	
2	2		3	2	2								1	2	1
3	3			2	2								1		
4	3			3	2								1		
5	3	3		1	2								1		1

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

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of the course ET252N Signals and systems as per sample list given below, using MATLAB or equivalent software packages. Sample list is given below but any experiment related to signals and systems can be included.

List of Experiments

- Signal representation CT and DT: Sinusoidal, triangular, sawtooth, square, step, ramp, parabolic, etc
- Signal operations: addition, subtraction, multiplication, folding, shifting, etc
- Convolution
- Simulation of continuous time LTI system.
- Simulation of discrete time LTI systems.
- Impulse response
- Step response
- Synthesis of signal using CTFS
- Frequency response of analog filter
- Correlation
- Power spectral density of signal
- Probability density function

Note

• **ICA** –It shall support regular performance of minimum 10 practical's and its regular assessment. In addition; it shall be based on knowledge/skill acquired and record submitted by the student (journal) based on practical performed by student. The performance shall be assessed experiment wise using internal continuous assessment format(S10).

• **ESE**–It shall be based on performance in one of the experiments performed by the 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 out of institute.

ET258N NETWORK ANALYSIS AND SYNTHESIS LAB

Teaching Scheme	**:** 02P, Total: 02 hours/week	**Credits:**	01
Evaluation Scheme	**:** 30 ICA + 20 ESE	**Total Marks:**	50
ESE Duration	**:** 03 Hrs		

COURSE DESCRIPTION

This course deals with the practical exposure to verification of network theorems, two port network parameters, frequency response of series and parallel resonance circuits, response of series RL and RC circuits, design of filters, attenuators etc.

COURSE OUTCOMES

Upon successful completion of this course the students shall be able to -

1. verify network theorems.
2. measure and verify two port network parameters.
3. build and test filters and attenuators.
4. analyze frequency response of resonant circuits.
5. analyze transient and steady state response of R-L and R-C networks.

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								1			1	1	
2	2	1		1	1								1	1	
3	2	3	3										1	1	
4	1	1		1	1								1	1	
5	1	1		1									1	1	

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

COURSE CONTENT

Minimum eight experiments shall be performed to cover entire curriculum of course ET253N. The list given below is just a guideline.

- Thevenin's theorem
- Norton's theorem
- Maximum power transfer theorem
- Superposition theorem
- Two port network parameters- Z parameters
- Two port network parameters – Y parameters
- Two port network parameters – ABCD parameters
- Two port network parameters – h parameters
- Response of series RL circuits
- Response of series RC circuits
- Frequency response of Constant k low pass filter
- Frequency response of Constant k high pass filter
- Frequency response of m derived low pass filter
- Frequency response of m derived high pass filter
- Frequency response of series resonant circuit
- Frequency response of parallel resonant circuit
- Symmetrical T/π attenuator
- Asymmetrical T/π attenuator

Note

- **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 the student (journal) based on practical performed by him/her. The performance shall be assessed experiment wise using 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 out of institute.

SH201N Project and Finance Management

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 10 ISA + 30 MSE + 60 ESE	**Total Marks:**	100
ESE Duration	**:** 03 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 OUTCOMES

On the successful completion of this course, students shall 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											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1						2			2	3	3	3
2						2			2	3	3	3
3						2			2	3	3	3
4						2			3	3	3	3
5						2			2	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. Chandra Bose, 2nd edition,PHI,2010
5. Project Management: The Managerial Process, Erik Larson , Clifford
6. Gray, 6th edition, McGraw Hill Education, 2017
7. Project Management, Megha Jain, Sultan Chand&Sons,2020

REFERENCE BOOK:

1. Projects: Planning, Analysis, Selection, Financing, Implementation, and Review, Prasanna Chandra., 10thedition, McGraw Hill Education, 2022
2. Project Management–The Complete Process(with Case Studies from Renewable Energy Sector), Vishwanath Murthy, S. 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, 8thedition,Taxmann Publications Pvt. Ltd, 2020

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.

SH203N: ENVIRONMENTAL SCIENCE

Teaching Scheme	**:** 02L+00T, Total: 02 hours/week	**Credits:**	02
Evaluation Scheme	**:** 20 ISA + 30 MSE	**Total Marks:**	100

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

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.

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

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, biogeographical 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 Chemistry, A. K. De, 3rd Edition, New Age International Publishers Ltd, 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**