SANT GADGE BABA AMRAVATI UNIVERSITY, AMRAVATI

B.E. in Electronics & Telecommunication Engineering Syllabus
(Semester- III)

PROGRAM CORE COURSE –I (PCC-I)
3ET200PC Electronic Devices and Circuits

Course Requisite:

1. Engineering Physics.

Course Objectives:

1. To understand the basics of diodes.
2. To illustrate the applications of diodes.
3. To understand Bipolar Junction Transistor in details.
4. To describe basics of JFET, MOSFET.
5. To explain the feedback concept, topologies and their applications.
6. To Describe the Multistage Amplifiers.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Describe the working of diodes.
2. Illustrate the application of diodes.
3. Describe Bipolar Junction Transistor in details.
4. Understand basics of JFET, MOSFET, UJT and their operational parameters.
5. Explain the feedback concept, topologies and their applications.
6. Describe the Multistage Amplifiers.

Unit No.	Contents	No. of lectures
1	**Introduction to Diodes:** **PN junction diode:** Construction, Working, diode equation, V-I characteristics. **Zener diode:** Construction, Working, V-I characteristics **LED:** Construction, Working and V-I Characteristics. **Photodiode:** Construction, Working and V-I Characteristics.	06

2	**Applications of Diodes:** **PN junction diode:** As a Switch, rectifier, analysis of Half Wave Rectifier, Full Wave Rectifier, filters C, L, LC and CLC filters, Clipping and Clamping circuits. **Zener diode:** As a voltage regulator.	**06**
3	**Bipolar Junction Transistors:** BJT configurations: CB, CE and CC with characteristics and parameters, transistor as a switch, Transistor switching times, dc load line, transistor biasing methods, bias stability, h-parameters and hybrid Model.	**06**

4	**JFET:** Theory, construction and characteristics, parameters (μ, gm & rd) **MOSFET:** Theory, construction and characteristics of enhancement & depletion type MOSFET. **UJT:** Theory, construction and characteristics; UJT as relaxation oscillator.	**06**
5	**Feedback amplifiers:** Feedback concept, effects of negative feedback, basic feedback topologies. **Sinusoidal Oscillators:** Barkhausen's criteria, Hartley, Colpitts, RC Phase shift, Wein bridge and crystal oscillators.	**06**
6	**Multistage Amplifiers:** Need of multistage, RC coupled amplifier, transformer coupled amplifier, direct coupled amplifier, emitter follower, Darlington emitter follower, Bootstrapping principle.	**06**

Text Books:

1 Electronic Devices and Circuits, David Bell Oxford University Press, 2010

2 Integrated Electronics Milliman and Halkias Tata McGraw Hill, New Delhi

References:

1 Electronic Devices and Circuit theory, Robert L.Boylestad Publ. Pearson Education

2 Electron Devices Floyd Pearson Asia 5th Edition, 2001

3 Electronic Circuit Analysis and Design Donald A Neamen Tata McGraw Hill, 3rd Edition, 2003

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PROGRAME CORE COURSE –II (PCC-II)
3ET201PC Electro Magnetic Waves

Course Requisite:

1. Engineering Mathematics-I
2. Engineering Mathematics-II
3. Applied Physics

Course Objectives:

1. To understand fundamentals of orthogonal coordinate systems and interrelation with 1-D, 2-D & 3-D vectors.
2. To impart knowledge of Static Electric field, Static Magnetic field and the associated laws with various boundary conditions for static and time varying electric and magnetic fields.
3. To analyze and understand the concepts of propagation of EM waves.
4. To understand, analyze and evaluate the radiation of electromagnetic wave.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Apply vector calculus for solution to electric and magnetic field problems.
2. Elaborate and analyze the concepts of Electrostatic fields.
3. Elaborate and analyze the concepts of static magnetic fields.
4. Describe and analyze Boundary conditions in electromagnetic and Maxwell's equations.
5. Describe the electromagnetic wave and its propagation in different homogeneous media.
6. Illustrate and analyze the concept of electromagnetic radiation.

Unit No.	Contents	No. of lectures
1	**Review of Vector Analysis:** Cartesian, Cylindrical and Spherical Co-ordinate Systems, Vector products, Projection of Vectors, Gradient, Divergence and Curl, line, surface, volume integrals, Divergence Theorem and Stokes theorem.	07
2	**Electrostatics**: Coulomb's Law, Electric field intensity, Evaluation of Electric field intensity due to line charge, Surface charge and Volume charge distribution, Electric flux and Electric flux density, Gauss Law, Electrostatic potential, Potential gradient, Electric dipole and Polarization.	05

3	**Magnetostatics:** Biot–Savart Law, Ampere's Circuital Law, Magnetic field intensity, Magnetic field intensity evaluation due to infinite, finite and circular current carrying conductors, Magnetic flux and Flux density, Magnetic dipole and Magnetization.	**06**
4	**Boundary Conditions & Maxwell's Equations:** Boundary condition at Dielectric – Conductor interface, Dielectric – Dielectric interface, Boundary conditions for magnetic materials interface, Current continuity equation, Maxwell's equations.	**06**
5	**Electromagnetic wave propagation:** Electromagnetic wave equation for free space, lossy dielectric material and perfect conductor, Propagation constant, Attenuation constant & Phase shift constant, Skin depth, Poynting Theorem, Reflection of a plain wave in a normal incidence at Dielectric – Dielectric interface	**06**
6	**Radiation:** Scalar and Vector magnetic potential, Retarded potential, Electric & Magnetic fields, Power radiated and Radiation resistance due to oscillating dipole, Quarter wave monopole & Half wave dipole.	**06**

Text Books:

1. Hayt W.H.: "Engineering Electromagnetic" Tata Mc Grawhill

2. Jordan E.C. and Balamin K.C.: "Electromagnetic Waves and Radiating System "Prentice Hall of India Private Limited

References:

1. Mathew N.O., Sadiku "Principles of Electromagnetics" (Fourth Edition), Oxford University Press

2. Kranss J.D.: "Electromagnetic" Mc Grawhill Books co. (Third Edition)

3. Ramo S. and Whinnery R.: "Fields and Waves in Communication Electronics" John Wiley and sons, New Delhi.

4. Dr. TVS Arun Murthy, "Electromagnetic Fields (Theory & Problems)" S. Chand & Company Ltd.

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PROGRAM CORE COURSE –III (PCC-III)

3ET202PC Signals & Systems

Course Requisite:

1. Engineering Mathematics
2. Transform Techniques

Course Objectives:

1. Understand the fundamental characteristics of signals and systems.
2. Understand signals and systems in terms of the time and transform domains.
3. Develop the mathematical skills to solve problems involving Convolution, Sampling and Reconstructions, building the basic LTIC system, etc.

Course Outcomes:

After successfully completing the course, students will be able to:

1. Understand the continuous time signals and systems mathematically and their classification along with the mathematical operations.
2. Understand the spectral characteristics of continuous-time periodic signals using Fourier series.
3. Analyse the spectral characteristics of continuous-time aperiodic signals and systems using Fourier Transform.
4. Apply the Laplace transform for analysis of continuous-time systems.
5. Understand the Discrete Time signals and systems mathematically and analysis their classification with the mathematical operations.
6. Analysis the spectral characteristics of Discrete Time signals and systems using Discrete Time Fourier Transform.

Unit No.	Contents	No. of lectures
1	**Continuous time signals and systems**: Signal types, Signal Classification, Signal properties, Standard Signals, Energy and Power Signal, Signal Operations, Signal models, Even and Odd functions, Convolution, System Classification.	07
2	**Continuous-Time Signal Analysis -The Fourier Series:** Periodic Signal Representation by Trigonometric Fourier Series, Existence and Convergence of Fourier Series, Exponential Fourier Series.	05
3	**Continuous-Time Signal Analysis-The Fourier Transform:** Aperiodic Signal Representation by Fourier Integral, Properties of Fourier Transform, Signal Transmission through LTI Continues Systems, Signal energy, Inverse Fourier Transform, Fourier Spectrum, Sampling of Signals.	06

4	**Continuous-Time System Analysis Using Laplace Transform**: Laplace Transform, Region of convergence, Inverse Laplace transforms Application of Laplace transform for determination of solution of differential equation and System realization up to second order, Frequency response of LTI continues system.	**06**
5	**Time-Domain Analysis of Discrete-Time Signals & Systems:** Signal Operations, Classification of Discrete-Time Systems, Discrete-Time System Equations, System response to Internal condition, Unit Impulse Response, System response to External Input, Sampling theorem.	**06**
6	**Fourier Analysis of Discrete-Time Signals:** Discrete-Time Fourier Series (DTFS), Aperiodic Signal Representation by Fourier Integral, Properties of DTFT, Relationship between DTFT & CTFT.	**06**

Text Books:

1. Lathi B. P., "Principles of Linear Systems and Signals" Second Edition (International Version) Oxford University Press.
2. Alan V. Oppenheim & Alan S. Willsky with S. Hamid Nawab, "Signals & Systems" PHI Publication, Second Edition.

Reference Books:

1. Ambardar A., "Analog and Digital Signal Processing", Thomson Learning-2005.
2. Simon Haykin, Barry Van Veen, "Signals & Systems", II Edition, Wiley Pub.
3. Michael J. Roberts, "Signals and Systems Analysis Using Transform Methods and MATLAB", Mc Hill Publication.

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3ET400EL Community Engagement Project/ Field Project

Course Requisite:

1. All courses / laboratories from I, II Semesters.

Course Objectives:

Students shall UNDERTAKE and EXECUTE a Mini Project through a group of students to:-

1. Understand the "Project Development Cycle", through Mini Project.
2. Inculcate hardware and software knowledge implementation skills.
3. Develop students‟ abilities to transmit technical information clearly through Technical Report writing on the Mini Project work carried out.

Course Outcomes:

After successfully completing the course, students will be able to:

1. Acquired knowledge within the chosen area of technology for project development.
2. Identify, reproduce, improve and refine the technical aspects of the chosen project with a comprehensive and systematic approach.
3. Work as an individual or in a team in development of technical projects and communicate and report effectively project related activities and findings.
4. Do the social survey, analyses it, identify problem and find probable solution for the befit of society.

Minor Project Work:

Group Size:

Minimum 5 and maximum 10 students can form a group for the mini project.

Project Type:

The selected mini project should be based on any of the following,

- Design and development of a prototype electronics system/product.
- Design and development of laboratory equipment's.
- Industry needs based basic survey or Testing or Analysis etc.
- Investigate performance of govt. schemes for society benefits.
- Parametric analysis of components / systems / devices
- Investigation of optimum process/material for product development.
- Solution for society/industry problems

General guidelines:

Project domain may be from the following, but not limited to:

- Solar Systems. / IOT / RFID

- Robotics Mechanisms/Digital systems
- Mini modal/ Hardware/Software
- Analysis of varies apps
- Automation and Control Systems
- Microcontroller based Systems/Ardino
- Agriculture system.
- Smart systems using AI

Project Report:

A project report with following contents shall be prepared:

1. Title, Certificate and Index
2. Objectives.
3. Introduction
4. Literature survey
5. Methodology-Experimental Method/Data collection and Analysis methods (using Google Form)/case study/survey Method /Research Method
6. Analysis-Graphical representation /Simulation/experimentation/survey/testing etc.
7. Problem Identification
8. Probable solution
9. Conclusion.
10. References.

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PROGRAM CORE COURSE -II (PCC-II)

3ET203PC Electronics Devices & Circuits Lab

Course Requisite:

1. Electronics Devices and Circuits.
2. Engineering Physics

Course Objectives:

1. To demonstrate the characteristics of various diodes and transistors.
2. To demonstrate the applications of diodes and transistors.
3. To compare the characteristics of diodes, transistors and oscillators.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Demonstrate the characteristics of various diodes and transistors.
2. Demonstrate the applications of diodes and transistors.
3. Compare the characteristics of diodes, transistors and oscillators.

Expt. No	Experiment
1.	To verify V-I characteristics of p-n junction diode and obtain static and dynamic resistance values
2.	To verify V-I characteristics of Zener junction diode and obtain static and dynamic resistance values
3.	To calculate efficiency and ripple factor of Half wave, Full wave and Bridge wave Rectifier.
4.	To study different types of filter circuits and calculate its ripple factor for C-filter
5.	To study Zener diode as a voltage regulator
6.	To obtain output characteristics of the clipping circuits for different reference voltages and to verify the responses.
7.	To study and observe the performance of various clamper circuit.
8.	To verify characteristics of CE mode of BJT and compute its parameters such as gain (β), input and output Impedance.
9.	To compare calculate and observe frequency response of oscillations of 3 stage RC phase shift oscillator
10.	To compare calculate and observe frequency response of oscillations of RC Wien Bridge oscillator.
11.	To plot frequency response of RC coupled amplifier and determine its bandwidth.
12.	To plot frequency response of Transformer coupled amplifier and determine its Bandwidth.
13.	To sketch the drain and transfer characteristics of n-channel JFET and determine ac drain resistance, trans-conductance and amplification factor
14.	To sketch V-I characteristics of UJT and determine Intrinsic stand-off ratio

* Minimum 08 experiments should be conducted out of above enlisted.

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PROGRAM CORE COURSE -III (PCC-III)

3ET204PC Signal & System Lab

Course Requisite:

1. Signals & Systems

Course Objectives:

1. To use software to visualize analysis of Signals and System
2. To manipulate the time signals and identify the type of given system.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Generate different plots and explore results to draw valid conclusions and inferences in Signal Processing
2. Enable on how to approach for requirement of signal processing and system design using simulation tools
3. Familiarize with the concepts of sampling.

Expt. No	Experiment
01	Study of Signal Processing Functions used in MATLAB / SCILAB
02	Program to generate standard continuous Time Signals
03	Program to generate standard discrete Time Signals.
04	Program to perform basic operations on signals.
05	Program to find Even and Odd parts of a signal.
06	Program to check Periodicity of signals.
07	Program to find the Energy and Power of a Signal.
08	Program to identify a given system as linear/ non-linear, time variance/ invariance property of a given system.
09	Program to demonstrate the time domain sampling of band limited signals (Nyquist theorem).
10	Program to find Fourier transform of given signal.
11	Implement system equation using Simulnk/Xcos to find output of system for different input signals.

* Minimum 08 experiments should be conducted out of above enlisted.

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MULTIDISCIPLINARY MINOR –I (MDM-I)

3ET205MD Fundamentals of Digital Electronics

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To study basic concepts of Boolean algebra, number systems and codes.
2. To study techniques of minimization of Boolean expression.
3. To study the formal procedures for the analysis and design of combinational & Sequential circuits.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Use number systems and its conversion.
2. Use Boolean algebra to solve logic functions, minimization techniques, arithmetic functions.
3. Identify, analyse and design combinational and sequential circuits.

Unit No.	Contents	No. of lectures
01	**Number System:** Number system and their conversions: Binary, octal, Decimal, Hexa-decimal number, BCD code, Grey Code, Excess 3 Code, binary arithmetic, one' s and two 's complements.	08
02	**Boolean Algebra:** Boolean Algebra, Boolean laws, Simplifications of logic expression using Boolean Algebra, logic Gates, Universal gates, Realization of logic gate using Universal gates. Simplifications of logic expression using Karnaugh-Map upto 4 variables	08
03	**Combinational Circuits & Sequential Circuits:** **Combinational Circuits:** Combinational logic circuits such as Adder, Subtractor, Multiplexer, Demultiplexer, Encoder, Decoder etc, **Sequential Circuits** : Flipflops, Introduction to Registers ,(Asynchronous), Up counter and down counter	08

Text Books:

1. M.Morris Mano and M.D.Ciletti, "Digital Design", Pearson Education.
2. R P Jain, "Modern Digital Electronics", TMH.
3. Anand Kumar, "Fundamentals of digital circuits" 1st edition, Prentice Hall of India, 2001.

Reference Books:

1. Wakerly, "Digital Design: Principles and Practices", 3rdedition, Pearson Education, 2004.
2. Charles H. Roth, "Fundamentals of Logic Design", 4th Edition, Jaico Publication.
3. Lee S.C, "Digital Circuits and Logic Design", PHI.
4. Richard S. Sandige, "Modern Digital Design", McGraw-Hill Series in Electrical Engineering.

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OPEN ELECTIVE –I (OE-I)
3ET206OE Analog Communication

Course Requisite:

1. Engineering Physics

Course Objectives:

1. To explain the Fundamentals of Analog Communication.
2. To illustrate the working of AM Generation and Demodulation.
3. To explain the FM Generation and Demodulation.
4. To explain the concept noise in Analog Communication.
5. To illustrate the working of Radio Receivers.
6. To explain the Fundamental concepts of Antenna.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Explain the Fundamentals of Analog Communication.
2. Illustrate the working of AM Generation and Demodulation.
3. Explain the FM Generation and Demodulation.
4. Explain the concept noise in Analog Communication.
5. Illustrate the working of Radio Receivers.
6. Explain the Fundamental concepts of Antenna.

Unit No.	Contents	No. of lectures
1	**Fundamentals of Analog Communication:** Block diagram of Analog communication system. Types of communication: baseband vs. pass band. Need for Modulation. Bandwidth requirements for analog signals.	06
2	**Amplitude Modulation (AM) Systems:** Introduction, Types of AM **AM Generation and Demodulation:** Square-law modulator, balanced modulator, Envelope detector, synchronous detection. Power and Efficiency Calculations.	06
3	**Angle Modulation Basics:** Introduction to Frequency Modulation (FM), Phase Modulation (PM). Modulation index and frequency deviation. Narrowband vs. Wideband FM **FM Generation and Demodulation:** Direct (VCO) and indirect (Armstrong) methods. Phase- Locked Loop (PLL).	06

4	**Noise:** Introduction, Sources of noise, Classification of noise, Noise calculations (thermal noise), SNR, Noise figure, Noise Factor, Noise Temperature.	**06**
5	**Radio Receivers:** Introduction, Performances characteristic of receivers: Sensitivity, Selectivity, Fidelity, Image frequency and Intermediate Frequency Rejection Ratio, Tracking and Double spotting, Super heterodyne receivers.	**06**
6	**Antennas:** Antennas fundamentals, Radiation mechanism, Concept & definition of polarization, bandwidth, beam width, antenna resistance, directivity, antenna gain, power density. Dipole antenna, Half wave dipole antenna, Radiation pattern, Folded dipole antenna & its radiation pattern.	**06**

Text Books

1. H. Taub, D. L. Schilling, and G. Saha, Principles of Communication Systems, 4th ed. New York, NY, USA: McGraw-Hill Education, 2008.
2. S. Haykin, Communication Systems, 5th ed. Hoboken, NJ, USA: Wiley, 2009.
3. B. P. Lathi and Z. Ding, Modern Digital and Analog Communication Systems, 5th ed. Oxford, UK: Oxford University Press, 2020.
4. G. Kennedy and B. Davis, Electronic Communication Systems, 4th ed. New York, NY, USA: McGraw-Hill Education, 1993.

Reference Books

1. H. P. Hsu, Analog and Digital Communication, 2nd ed. New York, NY, USA: McGraw-Hill Education, 2003.
2. J. G. Proakis and M. Salehi, Communication Systems Engineering, 2nd ed. Upper Saddle River, NJ, USA: Pearson, 2002.
3. S. Sharma, A. K. Gautam, and T. L. Singal, Analog Communication. New Delhi, India: Pearson, 2018.
4. S. Haykin and M. Moher, An Introduction to Analog and Digital Communications, 2nd ed. Hoboken, NJ, USA: Wiley, 2007.

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OPEN ELECTIVE –I (OE-I)

3ET206OE Digital Communication

Course Requisite:

1. Engineering Physics
2. Digital Electronics

Course Objectives:

1. To explain the block diagram of Digital Communication.
2. To explain the concepts of information theory.
3. To illustrate the different pulse modulation techniques.
4. To illustrate the different digital modulation techniques
5. To explain the Pulse Code Modulation.
6. To explain the various multiple access techniques and Spread spectrum.

Course Outcomes:

After successfully completing the course, the students will be able to:

1. Explain the block diagram of Digital Communication.
2. Explain the concepts of information theory.
3. Illustrate the different pulse modulation techniques.
4. Illustrate the different digital modulation techniques
5. Explain the Pulse Code Modulation.
6. Explain the various multiple access techniques and Spread spectrum.

Unit No.	Contents	No. of lectures
1	**Introduction to Digital Communication System:** Functional Blocks of Digital Communication System, Line Coding: Need for Line coding, Properties of Line Coding, Types of Line Coding, Scrambler and Unscrambler.	06
2	**Information Theory:** Information Theory: Measure of Information, Entropy and Information Rate of Long Independent and Dependent Sequences, Huffman Encoding, Information Transfer over Discrete Channel and Continuous Channel: Shannon Hartley Theorem for channel capacity.	06

3	**Pulse Modulation:** Sampling and Quantization theorem in time domain, Nyquist criteria, Types of sampling, Aliasing & Aperture effect. Quantization and its types. Analog Modulation techniques: PAM, PWM & PPM, Generation and Reconstruction.	**06**
4	**Digital Modulation:** ASK, DPSK generation and reception, QPSK, MSK Transmitter and Receiver.	**06**
5	**Pulse Code Modulation:** Digital representation of Analog signal, PCM Generation and Reconstruction: Quantization, Quantization Noise, Differential Pulse Code Modulation, Delta Modulation.	**06**
6	**Multiple Access Techniques:** TDMA, FDMA and CDMA **Spread Spectrum Communication:** Frequency Hopped Spread Spectrum, Slow and Fast frequency Hopping.	**06**

Text Books :

1. Shanmugam K. S., "Digital & Analog Communication Systems", John Wiley & Sons, New York, 1996.
2. Lathi B. P., "Modern Digital and Communication Systems", Holt Rinchart and Winston Inc., New York, 1993.
3. Simon Haykin, "Digital Communication", John Wiley and Sons,Pvt. Ltd., Singapore.

References:

1. Proakis J. K., "Digital Communication", Mc-Graw Hill Book Co., London (Second Edition).
2. Taub, Herbert, Schilling D. L., "Principles of Communication Systems", Mc-Graw Hill International Book Co., Tokyo.
3. W. C. Y. Lee, "Mobile Cellular Telecommunications Systems", Mc-Graw Hill International Editions, 1990.
4. Glover and Grant, "Digital Communication", Prentice Hall Publication

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3ET207EM - Entrepreneurship Development

Course Objectives:

1. To understand the fundamentals of entrepreneurship and its role in economic development.
2. To understand the innovation and design thinking to develop business ideas.
3. To study the feasibility study and basic business plan for entrepreneurial ventures.

Course Outcomes:

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

1. Explain the fundamentals of entrepreneurship and its role in economic development.
2. Apply innovation and design thinking to develop business ideas.
3. Prepare a feasibility study and basic business plan for entrepreneurial ventures.

Unit No.	Contents	No. of lectures
1	**Unit I: Fundamentals of Entrepreneurship** Definition and Characteristics of Entrepreneurship, Types of Entrepreneurs: Startup Entrepreneurs, Social Entrepreneurs, Technopreneurs, Role of Entrepreneurship in Economic Development, Entrepreneurial Competencies and Traits, Difference Between Entrepreneur and Manager, Problems faced by Entrepreneurs, Myths and Misconceptions About Entrepreneurship.	08
2	**Unit II: Entrepreneurial Process and Innovation** Steps in the Entrepreneurial Process: Opportunity Identification, Idea Generation, and Validation, Feasibility Study: Market, Technical, and Financial Feasibility, Business Model Development: Business Model Canvas (BMC), Role of Innovation in Entrepreneurship, Introduction to Design Thinking for Problem Solving, Overview of Intellectual Property Rights (IPR).	08
3	**Unit III: Business Planning and Startup Ecosystem** Importance and Components of a Business Plan: Executive Summary, Marketing Plan, and Financial Plan, Legal Structures for Startups: Sole Proprietorship, Partnership, and Company, Government Support for Entrepreneurs: Startup India, Make in India, MSME, and DIC, Role of Incubators, Accelerators, and Venture Capitalists, Elevator Pitch and Presentation Skills for Business Ideas, Introduction to Emerging Trends: Social Entrepreneurship and Green Entrepreneurship.	08

Textbook:

1. "Entrepreneurship Development and Small Business Enterprises" by Poornima M. Charantimath, Pearson Education.

Reference Books:

1. "Entrepreneurship" by Hisrich, Peters, and Shepherd, McGraw-Hill Publication
2. "Innovation and Entrepreneurship" by Peter F. Drucker.
3. “Entrepreneurial Development” by Dr. S. S. Khanka, S. Chand Publication
4. Government Resources on Entrepreneurship (e.g., startupindia.gov.in)

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Value Education Course
3AL208VE – Environmental Science

Course Objectives:

1. To develop an understanding of the interdisciplinary nature of environmental studies and its relevance to engineering applications, promote sustainable engineering solutions.
2. To identify and differentiate between renewable and non-renewable resources, and understand their engineering implications.
3. To foster problem-solving and decision-making skills related to environmental issues in engineering design and planning, to raise awareness of environmental policies, laws.

Course Outcomes (Cos):

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

1. Demonstrate an interdisciplinary understanding of environmental issues and explain their relevance to various engineering domains.
2. Identify and compare renewable and non-renewable resources, and analyze their usage and limitations from an engineering perspective, Evaluate the impact of engineering activities and industrialization on ecosystems, biodiversity.
3. Apply critical thinking and problem-solving skills to propose eco-friendly and sustainable solutions in engineering design and planning.

Unit No.	Contents	No. of lectures
1	**Unit I: Environmental Concepts and Resource Management (9M)** Environmental Science Definition scope and importance, Natural Resources: Classification: Renewable and Non-renewable, Growing energy needs and technological solutions, Role of engineers in resource conservation, Sustainable resource use Equitable use of resources for sustainable lifestyles, Energy-efficient and eco-friendly practices in engineering.	09
2	**Unit II: Ecosystems, Biodiversity, and Pollution (12M)** Ecosystems: Concept, structure, and function, Producers, Consumers, Decomposers, and Energy flow, Ecological succession, food webs, pyramids, Major ecosystems: Forest, Grassland, Desert, Aquatic, Biodiversity:, Levels, hotspots in India, importance in technology and agriculture Threats and conservation methods, Pollution: Types: Air, Water, Soil, Noise – sources and effects, Solutions for pollution control Solid Waste Management: 3Rs (Reduce, Reuse, Recycle)	12
3	**Unit III: Sustainable Development, Ethics, and Environmental Legislation** Sustainable development: Definition, need and importance, Urban issues: water harvesting, energy, resettlement of displaced people, Smart cities and green building concepts Environmental ethics:	09

	Environmental awareness and responsibilities of engineers, Environmental legislation:, Key Acts: Air Act, Water Act, Forest Conservation Act, Wildlife Protection Act, Role of institutions, NGOs, engineers in implementation.	

Testbooks:

1. Textbook of Environmental Studies – Erach Bharucha (UGC)
2. Environmental Studies – Shanta Satyanarayan, Dr. Suresh Zade, Dr. Shashikant Sitre& Dr. Pravin Meshram (Allied Publishers).

Reference Books:

1. Essentials of Ecology and Environmental Science by Dr. S. V. S. Rana, PHI Learning Pvt Ltd, Delhi.
2. Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited
3. Environmental Science by T.G. Miller, Wadsworth Publishing Co., 13th Edition.
4. Ecology and Environment by P.D. Sharma, Rastogi Publications.
5. Fundamental concepts in Environmental Studies by Dr. D. D. Mishra, S. Chand Publications.
6. Perspective in Environmental Studies by A. Kaushik and C. P. Kaushik, New Age International (P) Limited.

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