West Bengal State Council of Technical & Vocational Education and Skill Development
(Technical Education Division)

Syllabus
of

Diploma in Electronics & Communication Engineering [ECE] & Electronics & Tele-Communication Engineering [ETCE]

Part-III (6th Semester)

2023

Further suggestion may be submitted to the syllabus committee. List of the coordinators for the branch of Diploma in Electronics & Tele Communication Engineering are:

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	WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION										

TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES

COURSE NAME:FULL TIME DIPLOMA IN ETCE & ECE

DURATION OF COURSE: 6 SEMESTERS

SEMESTER: SIXTH

BRANCH: ELECTRONICS & TELECOMMUNICATION ENGG. AND ELECTRONICS & COMMUNICATION ENGG.

SR. NO.	SUBJECT	CREDITS	PERIODS		EVALUATION SCHEME							Total Marks
			L	PR	THEORETICAL				PRACTICAL			
					TA	CT	Total	ESE	Internal	External		
1.	Engineering Economics and Project Management	3	3	-	20	20	40	60	-	-		100
2.	Entrepreneurship and Startups	3	3	-	20	20	40	60	-	-		100
3.	Industrial Automation or Control System and PLC	3	3	-	20	20	40	60	-	-		100
4.	Computer Networking and Data Communication	3	3	-	20	20	40	60	-	-		100
5.	Open Elective (Select any one) i) Industrial Management ii) Environmental Engineering & Science i) Renewable Energy Technologies	3	3	-	20	20	40	60	-	-		100
6.	Computer Networking and Data Communication Lab	1	-	2	-	-	-	-	60	40		100
7.	Industrial Automation Lab or Control System and PLC Lab	1	-	2	-	-	-	-	60	40		100
8.	Project	2	-	4	-	-	-	-	60	40		100
9.	Seminar	2	-	1	-	-	-	-	60	40		100
	Total	21	15	9	100	100	200	300	240	160		900

- **STUDENT CONTACT HOURS PER WEEK: 24 hours**
- **ACADEMIC CONTACT WEEKS PER SEMESTER:17 weeks(Teaching-15 weeks +Internal Exam-2 weeks)**
- **THEORY AND PRACTICAL PERIODS OF 60 MINUTES EACH**
- **ABBREVIATIONS:L- Lecture, PR-Practical, IA- Internal Assessment, CT- Class Test, ESE-End Semester Exam**
- **IA (Internal Assessment for Theoretical)=40 marks: CT=20 Marks, Attendance=10 marks and Quizzes/Assignment/Student Activity=10 marks.**
- **Minimum qualifying marks for both Theoretical and Sessional subjects (for internal assessment and external assessment separately) are 40%.**
- **IA (Internal Assessment for Practical)=60 marks:50 marks for continuous evaluation and 10 marks for Class attendance.**
- **Seminar topics should be relevant to the corresponding disciplines.**

Name of the course: Industrial Automation	
Course Code: ETCE/DIA/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical:2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks
Course Outcomes:	

After completion of the course students will able to

- Understand the role of control elements in a close (single) loop and open loop control for Industrial Process Automation.
- Identify proper control devices for defined process automation.
- Use ON-OFF and PID controller for a defined process during automation.
- Interface field devices (sensors/actuators) with PLC/SCADA/DCS.
- Develop control loop in PLC by using Ladder logic/block logic program.

Content(Name of the topic)		Periods
Group–A		
Unit 1	**Introduction to Industrial Automation**	**04**
	1.1 Introduction to Industrial process and automation. 1.2 Need of Automation - Quality, Safety, Sustainability and Economic aspect. 1.3 Process Control: Process definition, Process gain, Open Loop Control, Close loop Control. 1.4 Example of open loop control. 1.5 Example of close loop control - Temperature control loop, Level control loop (With their functional explanation).	
Unit 2	**Sensor and Actuators**	**14**
	2.1 Define automation components: Sensor, Transmitter, Controller, Actuator, A/D & D/A conversion, Signal conditioning (Conceptual schematic). 2.2 Working principle and types of i) pressure transmitter, ii) temperature transmitter, iii) level transmitter and iv) flow transmitter v) proximity transmitter. 2.3 Elements and standards of Signal Conditioning and transmitting. 2.4 Actuators: Type and examples of Hydraulic, Pneumatic and Electric actuators. Control Valve –Working principle and functional diagram of Pneumatic, Electric type and Solenoid valve. Motor Drives – Types (VFD, Soft starter) and Functional diagram only. 2.5 Calibration principle- Zero and Span setting with standards, Calibration Chain-Primary reference (National and International Standards), Secondary Reference (Standard Lab) and Working Standard (Only definition).	
Group–B		
Unit 3	**Control Engineering**	**05**

	3.1 Standard Test Signals: Unit Step, Unit ramp, Impulse function and their Laplace transform.		
	3.2 Transfer function definition – Poles and Zeros, 1st order system and 2nd order system. Example of 1st order and 2nd order system. Characteristics equations. Concept of stability using characteristics equation.		
	3.3 Time domain analysis of 1st order system by step input signal- Transient response and steady state response with example.		
Unit 4	**Control Actions and Process Controllers**		**10**
	4.1 Process control system – block diagram, elements. Role of Controllers in Process Industry.		
	4.2 Control actions - discontinuous & continuous modes; On - Off controllers: Neutral zone, Hysteresis Zone.		
	4.3 Proportional controllers (offset, proportional band); Integral &Derivative controllers - Functional block diagram and Equation.		
	4.4 Composite controllers -Functional block diagram and Equation of PI, PD, PID controllers.		
	4.5 Parameters of P, PI, and PID controllers and tuning concept.		
	Group–C		
Unit 5	**Automation and Control System**		**12**
	5.1 Communication Hierarchy in Process Automation- Field level, I/O level, Control level, HMI level, Enterprise level.		
	5.2 Piping and Instrumentation Diagram: Concept, symbols, reading procedure.		
	5.3 PLC- Functional Diagram, working principle, Analog I/O module, Digital I/O module- Source and Sink.		
	5.4 PLC programming basics– Ladder logic, Block logic (identify the problem for three input variables and two output variables both analog and digital).		
	5.5 DCS- Definition, functional diagram and distributed network and interfacing concept. Comparison between PLC & DCS and applicability.		
	5.6 SCADA- Introduction, Concept of Supervisory Control, Human-Machine Interface and Alarm handling.		
	5.7 Industrial Networking: Basic features ofFieldbus, Foundation Fieldbus,Profibus, HART, Ethernet, Modbus, Profinet.		
	Total		**45**

Sl.No.	Suggested List of Laboratory Experiments
1	Water level control using On-Off method.
2	Temperature control using PID controller.
3	Develop ladder/block program using three digital inputs and two digital outputs (combinational logic).
4	Test ladder program for pulse counting by using limit switch/proximity sensor.
5	Temperature control using RTD/Thermocouple, PLC (PID block), heating element.
6	PID control using Electro Pneumatic control valve/cylinder, I/P converter.
7	Use various functions of SCADA simulation editors to develop simple project.
8	Do any other experiment except above using PLC as per availability of sensor and actuators.
9	**Do at least one Mini-Project for automation using sensor, controller and actuators.**

References:

Sl No.	Title of Book	Author	Publication
1.	Process Control Instrumentation Technology	Johnson	Pearson
2.	Process Control	Bela G. Liptak	Elsevier Science (3rd Edition)
3.	Process Control Modeling, Design and Simulation	B. W. Bequette	PHI
4.	ElectronicMeasurementandMeasurementTechnique	Cooper	PrenticeHallofIndia
5.	Modern Electronic Instrumentation & Measurement Techniques	Helfrick & Cooper	Pearson
6.	Modern Control Engineering	Ogata	Pearson
7.	Control System Engg	J.J.Nagrath & M. Gopal	Wiley
8.	Modern Control System	Rameshbabu and R. Anandrajan	SCITECH
9.	Control System	Kumar	Tata McGraw-Hill
10.	Basic Instrumentation System & Programmable Logic Controller	Umesh Rathore	Katson Books
11.	Programable Logic Controller	Jadhav V. R.	Khanna Publisher, New Delhi
12.	SCADA	Boyar B. A.	ISA Publication New Delhi,
13.	Practical SCADA for Industry	Bailey, David; Wright, Edwin	Newnes (an imprint of ElsevierI International edition, 2003, ISBN: 0750658053

Name of the course: Control System and PLC	
Course Code: ETCE/DCSP/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical: 2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks
Course Outcomes:	

After completion of the course students will able to

- Identify different components and types of control systems and their representations.
- Analyze the response of a control system for standard inputs and comment on its stability.
- Evaluate the performance of various types of controllers.
- Identify various components of PLC and its hardware.
- Apply PLC in various control systems by its proper programming.

Content(Name of the topic)	Periods
Group–A	
Unit 1 **Basics of Control System**	**08**
1.1 Control Systems: Definition of Control System, Classification of Control Systems with block diagram- open loop and closed loop control system with examples, Comparison between open loop and close loop control system. 1.2 Mathematical Models of Physical systems: Concept of Transfer Function and deduction of transfer function of close loop control system, Block diagram reduction technique using Laplace Transform, Signal Flow Graphs and Messon's Gain formula for block diagram reduction technique with simple problems.	
Unit 2 **Time Domain Stability Analysis**	**16**
2.1 Time Response: Transient and Steady State Response 2.2 Standard Test Inputs: Unit Step, Unit Ramp, Unit Parabolic, Unit Impulse functions and their corresponding Laplace Transform. 2.3 Analysis of First and Second Order Control System: i) First Order System: Analysis for Unit Step Input, Concept of Time Constant, Steady State Error. ii) Second Order System: Analysis for Unit Step Input, Definition and Effect of Damping. iii) Time Response Specifications: Delay time, Rise time, Peak Time, Peak Overshoot, Settling time, Simple Numerical Problems. iv) Initial value and final value theorems and their use in control systems. v) Types of feedback control systems and error constants. 2.4 Stability: Concept of Poles and Zeroes , Concept of Stability, Root Locations in s-plane and Analysis – Stable System, Unstable System, Critically Stable Systems, Conditionally Stable System. 2.5 Routh's Stability Criteria: Steps and Procedures to find Stability by using Routh's Stability Criteria with simple problems.	
Group–B	
Unit 3 **Process Controllers**	**06**

3.1 Process Control System: Block Diagram with example, Functions of Each Block
3.2 Control Actions:
i) Discontinuous Mode: ON-OFF Controllers, Neutral Zone.
ii) Continuous Modes:
  a) Proportional Controller – Offset, Proportional Band
  b) Proportional, Integral and Derivative Controllers – Output Equation, Response, Characteristics
  c) Composite Controllers: PI, PD, PID Controllers – Output Equation, Response Characteristics	

Unit 4 **Fundamentals of PLC and its Hardware**	**07**
4.1 Introduction – Advantages of PLC Based Control over Conventional Relay Based Control, Classification of PLC (Fixed and Modular PLCs) 4.2 Architectural Details of PLC: Block Diagram of PLC, CPU and Program Scan, Input Modules (Discrete and Analog), Output Modules (Discrete and Analog), Memory (its organization and addressing), Power Supply and Programming Devices - Function of each block. 4.3 PLC Installation.	
Group–C	
Unit 5 **Basics of PLC Programming**	**08**

	5.1 PLC Instruction Set: Relay Instructions, Logical Instructions, Program Control instructions, Timer and Counter Instructions, Data Handling Instructions. 5.2 Ladder Logic Diagram: Elements of Ladder Diagram, Evaluation of Rung, Program examples and Problems.	
	Total	**45**

Sl.No.	Suggested List of Laboratory Experiments
1	To study the step response of R-C Circuit (First Order System).
2	To study the step response of R-L-C Circuit (Second Order System).
3	To study the operation of an ON-OFF controller.
4	To study the operation of a Proportional controller.
5	To study the operation of a PI controller.
6	To study the operation of a PD controller.
7	To study the operation of a PID controller.
8	To study MATLAB simulation for different types of Control System.
9	To Identify and test different parts of a PLC.
10	To develop Ladder Diagram to test the functionality of different logic gates.
11	To develop Ladder Diagram for Adder and Subtractor by using PLC
12	To develop Ladder Diagram for ON-OFF control of a lamp using Timer and Counter.
13	To develop Ladder Diagram for Traffic Light Control System
14	To develop Ladder Diagram for Stepper Motor Control

References:

Sl No.	Title of Book	Author	Publication
1.	Control System Engg	J.J.Nagrath & M. Gopal	Wiley
2.	Modern Control Engineering	K. Ogata	Pearson
3.	Modern Control System	Rameshbabu and R Anandrajan	SCITECH
4.	Automatic Control Systems	K Sridhar	Wiley India
5.	Automatic Control System	B.C. Kuo	PHI
6.	Control System	Kumar	Tata McGraw-Hill
7.	Modern Control Theory	Brogan	Pearson
8.	Programmable Logic Control- Principles and Applications	NIIT	PHI
9.	Basic Instrumentation System & Programmable Logic Controller	Umesh Rathore	Katson Books
10.	Programmable Logic Controller	Frank Petruzella	McGraw Hill
11.	Programmable Logic Controller	W Bolton	Newnes

Name of the course: Computer Networking and Data Communication	
Course Code: ETCE/DCNDC/S6	Semester: Sixth
Duration: One Semester (Teaching– 15 weeks + Internal Exam-2weeks)	Maximum Marks:100 Marks
Teaching Scheme:	**Examination Scheme:**
Theory: 3contact hrs./week	Class Test(Internal Examination):20 Marks
Practical: 2contact hours/week	Attendance=10 marks and Quizzes/Assignment/Student Activity= 10 marks
	End Semester Examination:60 Marks
Credit:4(TH:3+PR:1)	Practical:100 Marks

Course Outcomes:

After completion of the course students will able to
- Explain basic concepts of LAN, MAN, WAN, different Network Topologies and concept of different types of switching.
- Analyze the services and role of each layer of OSI model
- Analyze, specify and design the topological and routing strategies for an IP based networking infrastructure
- Explain the different protocols used at application layer i.e. HTTP, SMTP, SNMP, FTP, TELNET and VPN.
- Analyze performance of various communication protocols.
- Explain basic knowledge of the use of cryptography and network security.

Content(Name of the topic)	Periods
Group–A	
Unit 1 NETWORK BASICS: STRUCTURE & REFERENCE MODEL	**10**
1.1 **Idea of computer network** – Network components 1.2 **Types of Network** – Classify networks by their Geography- LAN, MAN & WAN; Classify Networks by their Network role: Peer to Peer, Client- Server Model. 1.3 **Network topology**- Bus Topology, Ring Topology, Star Topology, Mesh Topology, Tree Topology, Hybrid Topology. 1.4 **SWITCHING**: Circuit Switching – Message Switching – Packet Switching. 1.5 **Layered architecture of network system** – Seven-layer OSI model – Functions of each OSI layer – Other ISO structure – TCP / IP Layer Structure, Comparison between OSI and TCP/IP models.	
Unit 2 TRANSMISSION MEDIA AND NETWORKING DEVICES	**10**
2.1 **Classification of Transmissions Medium:** Compare between Unguided and Guided medium. Twisted Pair Cable (UTP, STP), Coaxial Cable, Optical Fiber Cable and Wireless Transmission Media (IR, Microwave). 2.2 **Network Hardware Components** – NIC, Hubs, Switches - Layer 2 and Layer 3 Switches, Routers, Bridges, Repeaters, Gateways, Modems. 2.3 **Routing Algorithms**: Concept of Static Routing, Dynamic Routing, Distance Vector Routing Algorithm and Routing Information Protocol.	
Group–B	
Unit 3 **IP Protocol and Network Applications**	**12**

	3.1 **IP addressing:** IP v4 Classful and Classless addressing, Subnetting and Super netting, Subnet Mask and Default Mask, Class less Inter Domain Routing (CIDR). 3.2 **IPV6:** Types and advantages, Difference between IPV4 with IP V6. 3.3 TCP/IP Protocols, Configuring TCP/IP. 3.4 **Other Network Layer Protocols:** ARP, RARP, ICMP, UDP, Difference between TCP and UDP.		
Unit 4	**Application Layer Services**		**07**
	4.1 Structure and Objectives of Intranet & Internet, Use of Firewall and proxy server. 4.2 Working of Email – POP-3, SMTP, MIME; TELNET, FTP, SNMP, World Wide Web, URL, HTTP, Working of DNS and DHCP Server. 4.3 Working of VoIP, VPN and VSAT.		
	Group–C		
Unit 5	**NETWORK and CYBER SECURITY**		**06**
	5.1 **Different aspects of SECURITY:** Privacy – Authentication – Integrity – Non-Repudiation. 5.2 **ENCRYPTION / DECRYPTION:** Data Encryption System – Secret key method – Public key method (RSA algorithm), Digital signature. 5.3 Define Cyber Security, Types of Cyber Security Threats -Phishing, Ransom ware, Malware, Social Engineering, Emotet, Man in the Middle (MITM), Password Attack, Spyware, Hacking, Viruses, Trojan and Worm.		
	Total		**45**

Sl. No.	Suggested List of Laboratory Experiments
1	Compare and configure different Network Topologies physically or by using CISCO Packet Tracer software.
2	Compare and demonstrate Network directing devices: Repeater, Hub, Switch, Bridge, Router, Gateway.
3	Study of different types of Network cables and practically implement the cross wired cable and straight through cable by using crimping tool and RJ-45 Connector.
4	Connect the Computers in Local Area Network.
5	Study of different types of IP Addressing and Subnetting and Super netting concepts.
6	Configuring TCP/IP Network.
7	Study of basic Network and Network configuration commands.
8	Web page designing by using HTML.

References:

Sl No.	Title of Book	Author	Publication
1.	Computer Networks, 4th edition	A. S. Tanenbaum (2003)	Pearson Education/ PHI, New Delhi, India
2.	Data communication and Networking, 4th Edition	Behrouz A. Forouzan (2006)	Mc Graw-Hill, India
3.	Computer Networking: A top down approach	Kurose, Ross (2010)	Pearson Education, India
4.	Computer Networks	Bhushan Trivedi	Oxford University Press, 2013
5.	Computer Networks and Internets	Comer	Pearson
6.	Computer Networking with Internet Protocols	Stallings	Pearson

7.	A COURSE IN COMPUTER NETWORKS	Dr. Sanjay Sharma	S K Kataria & Sons

Syllabus of Engineering Economics & Project Management

Course Code:	OE302
Course Title:	Engineering Economics & Project Management
No. of Credits:	3 (L: 3, T: 0, P: 0)
Prerequisites:	NIL
Course Category:	Open Elective (Compulsory for all branches)

Course Objectives:
• To acquire knowledge of basic economics to facilitate the process of economic decision making.
• To acquire knowledge on basic financial management aspects.
• To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
• To develop an understanding of key project management skills and strategies.

Group-A

Unit-I (INTRODUCTION, THEORY OF DEMAND & SUPPLY) [9 hours]

1.1 Introduction to Engineering Economics, the relationship between Engineering and Economics

1.2 Resources, scarcity of resources, and efficient utilization of resources.

1.3 Opportunity cost, Rational Choice Theory

1.4 **Theory of Demand:**
- The law of demand
- Different types of demand (Individual demand & Market demand)
- Determinants of demand
- Demand function
- Change in demand (Shift of demand curve) and the change in quantity demanded.
- Definition and types of Elasticity of demand (price, income & cross price elasticity) with mathematical derivation, Concept of elastic and inelastic goods, Measurement of price elasticity of demand (Point elasticity and Arc elasticity), Variation of price elasticity on different points of a linear demand curve, ranging from zero to infinity, Relationship between price, total revenue and price elasticity of demand (mathematical derivation).

1.5 **Theory of Supply**:
- Definition of supply
- Determinants of supply
- Supply function
- Supply curve and shift of supply curve.

1.6 **Market mechanism:**
- Definition of Market
- Price mechanism: determination of equilibrium price and quantity demand & supply (Numerical examples with graphical illustration).
- Stability of equilibrium.
- Basic comparative static analysis: Change in equilibrium due shift of demand & supply curve (Numerical problems with graphical illustration).

Unit-II (THEORY OF PRODUCTION & COSTS) [10 hours]

2.1: **Theory of Production:** Concept of production (goods & services), Different factors of production (fixed and variable factors), Short-run Production function (Graphical illustration), law of return (graphical and mathematical derivation), and Long run production function (returns to scale).

2.2: **Theory of Cost:** Short-run and long-run cost curves with graphical illustration, basic concept on total cost, fixed cost, variable cost, marginal cost, average cost etc. with the diagrammatic concept., Relationship between AC AND MC.

2.3: Economic concept of profit, profit maximization (numerical problems)

UNIT-III (DIFFERENT TYPES OF MARKET AND ROLE OF GOVERNMENT) [4 hours]

3.1: Perfect Competition: Features of Perfectly Competitive Market.

3.2: Imperfect Competition: Monopoly, Monopolistic Competition, and Oligopoly.

3.3: Role of government in Socialist, Capitalist and Mixed Economy structure with example.

Group-B

Unit-I (CONCEPT OF PROJECT) [4 hours]

1.1: Definition and classification of projects

1.2: Importance of Project Management.

1.3: Project life Cycle [Conceptualization→Planning→Execution→Termination]

Unit-II (FEASIBILITY ANALYSIS OF A PROJECT) [10 hours]

2.1: Economic and Market analysis.

2.2: Financial analysis: Basic techniques in capital budgeting – Payback period method, Net Present Value method, Internal Rate of Return method.

2.3: Environmental Impact study – adverse impact of the project on the environment.

2.4: Project risk and uncertainty: Technical, economical, socio-political, and environmental risks.

2.5: Evaluation of the financial health of a project – Understanding the basic concept of Fixed & Working Capital, Debt & Equity, Shares, Debentures etc., and different financial ratios like Liquidity Ratios, Activity Ratios, Debt-equity ratio & Profitability Ratio (Basic concept only).

N.B: Knowledge of financial statements is not required; for the estimation of ratios the values of the relevant variables will be provided.

Unit-III (PROJECT ADMINISTRATION) [8 hours]

3.1: **Gantt Chart** – a system of bar charts for scheduling and reporting the progress of a project (basic concept).
3.2: **Concept of Project Evaluation and Review Technique (PERT)** and **Critical Path method (CPM)**: basic concept and application with real-life examples.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective type Question (MCQ, Fill in the blanks, and Very Short question-1 mark each): At least five questions from each unit. [Total marks: 20]

2. Subjective questions: Five questions to be answered taking at least two from each group. [Total marks: 5x8=40]

B. Assignment (10 Marks)

Guideline for Assignment (10 Marks)

Students may be instructed to prepare a report on a project (preferably the based on the Major Project in 6th Semester), using a popular project management software in IT/Computer Laboratory, under the guidance of the Lecturer in Computer Science & Technology and Lecturer in Humanities.

C. Class Test: Two examinations 20 marks each. Take best of two.

D. Attendance: 10 Marks

Suggested reference books:

1. Principles of Economics – Case and Fair, Pearson Education Publication

2. Principles of Economics – Mankiw, Cengage Learning

3. Project planning, analysis, selection, implementation and review – Prasannachandra – Tata McGraw Hill.

4. Project Management – Gopala krishnan – Mcmillan India Ltd

Course Title	Entrepreneurship and Start-ups
Course Code	HS 302
Number of Credits	3
Pre Requisites	None
Total Contact Hours	3(L: 2; T: 1)/week = 45 hrs
Course Category	HS

Course Learning Objectives

1. To raise awareness, knowledge and understanding of enterprise/ entrepreneurship.
2. To motivate and inspire students toward an entrepreneurial career.
3. To understand venture creation process and to develop generic entrepreneurial competences.
4. To introduce students to the basic steps required for planning, starting and running a business.
5. To familiarise students with the different exit strategies available to entrepreneurs.

Course Outcomes:

After completing the course students will able to:

CO 1	Identify qualities of entrepreneurs, develop awareness about entrepreneurial skill and mindset and express knowledge about the suitable forms of ownership for small business
CO 2	Comprehend the basics of Business idea, Business plan, Feasibility Study report, Project Report and Project Proposal
CO 3	Understand the concept of start-up business and recognise its challenges within legal framework and compliance issues related to business.
CO 4	Make a Growth Plan and pitch it to all stakeholders and compare the various sources of funds available for start-up businesses

Detailed Course Content

Unit	Name of the Topic	Hours

1.	**ENTREPRENEURSHIP – INTRODUCTION AND PROCESS**
	
	• Concept, Competencies, Functions and Risks of entrepreneurship
	• Entrepreneurial Values& Attitudes and Skills
	• Mindset of an employee/manager and an entrepreneur
	• Types of Ownership for Small Businesses
	    o Sole proprietorship
	    o Partnerships
	    o Joint Stock company- public limited and private limited
		10

		companies • Difference between entrepreneur and Intrapreneur	
2.		**PREPARATION FOR ENTREPRENEURIAL VENTURES** • Business Idea- Concept, Characteristics of a Promising Business Idea, Uniqueness of the product or service and its competitive advantage over peers. • Feasibility Study – Concept – Locational, Economic, Technical and Environmental Feasibility. Structure and Contents of a standard Feasibility Study Report • Business Plan – Concept, rationale for developing a Business Plan, Structure and Contents of a typical Business Plan • Project Report- Concept, its features and components • Basic components of Financial Statements- Revenue, Expenses (Revenue & capital exp), Gross Profit, Net Profit, Asset, Liability, Cash Flow, working capital, Inventory. Funding Methods-Equity or Debt. Students are just expected to know about the features and key inclusions under, Business Plan and Project Report. They **may not** be asked to prepare a Business Plan/ Project Report/ Project Feasibility Report in the End of Semester Examination.	20

3.		**ESTABLISHING SMALL ENTERPRISES**
		
		• Legal Requirements and Compliances needed for establishing a New Unit-
		  o NOC from Local body
		  o Registration of business in DIC
		  o Statutory license or clearance
		  o Tax compliances
			03

4.		**START-UP VENTURES** • Concept & Features • Mobilisation of resources by start-ups: Financial, Human, Intellectual and Physical • Problems and challenges faced by start-ups. • Start-up Ventures in India – Contemporary Success Stories and Case Studies to be discussed in the class. Case studies have been included in the syllabus to motivate and inspire students toward an entrepreneurial career from the success stories. No questions are to be set from the case studies.	04

5.	**FINANCING START-UP VENTURES IN INDIA** • Communication of Ideas to potential investors – Investor Pitch • Equity Funding, Debt funding – by Angel Investors, Venture Capital Funds, Bank loans to start-ups • Govt Initiatives including incubation centre to boost start-up ventures • MSME Registration for Start-ups –its benefits	06
6.	**EXIT STRATEGIES FOR ENTREPRENEURS** • Merger and acquisition exit, Initial Public Offering (IPO), Liquidation, Bankruptcy – **Basic Concept only**	02

Examination Scheme

❖ **End Semester Examination: 60 marks**

Suggested Question Paper Scheme for End Semester Examination

Group A: 20marks

Question Type	Number of questions to be set	Number of questions to be answered
MCQ, Fill in the blanks, True or False (Carrying 1 mark each)	25	20

Group B: 40marks

Question Type	Number of questions to be set	Number of questions to be answered
Subjective Type questions (Carrying 8 marks each)	10	5

❖ **Internal Assessment: 40 marks**
   o Class test : 20 marks
   o Assignment: 10 marks
   o Class attendance: 10 marks

Suggested Learning Resources

Sl. No.	Title of Book	Author	Publication
1.	Entrepreneurship Development	Sangeeta Sharma	Prentice Hall of IndiaLearning Private Ltd
2.	Entrepreneurship Development	S. Anil Kumar	New Age International
3.	Fundamentals of Entrepreneurship	Sangram Keshari Mohanty	Prentice Hall of India Learning Private Ltd
4.	Fundamentals of Entrepreneurship	Dr. G.K. Varshney	Sahitya Bhawan Publication
5.	Managing New Ventures: Concepts and Caseson Entrepreneurship	Anjan Raichaudhuri	Prentice Hall of India Learning Private Ltd
6.	How to Start a Business in India	Simon Daniel	Buuks, Chennai
7.	Entrepreneurship and Small Business Management	S.S. Khanka	S. Chand & Sons, New Delhi
8.	Entrepreneurship Development and Business Ethics	Abhik Kumar Mukherjee & Shaunak Roy	Oxford University Press
9.	Entrepreneurship Development and Business Ethics	Dr B Chandra & Dr B Biswas	Tee Dee Publications
10.	Entrepreneurship Development Small Business Entrepreneurship	Poornima Charantimath	Pearson Education India

PROPOSED SYLLABUS FOR ENVIRONMENTAL SCIENCE & ENGINEERING

Course Code	OE
Course Name	ENVIRONMENTAL SCIENCE & ENGINEERING
Number of Credits and L-T-P	3 [L – 3, T – 0, P - 0]
Course Category	OE
Prerequisites	NA

Course Objectives:

After completing this course, the students will be able

1. To increase the awareness towards Environmental Science and Engineering.
2. To recognize and apply the role of technology towards Environmental Science and Engineering.
3. To know the method and tools used for Environmental Science and Engineering.
4. To know about the environmental pollution management act.

Course Contents:

Unit No.	Description of Topic	Contact Hrs.
01	**Environment and Ecology** 1.1 Classification of Environment 1.2 Environmental descriptors 1.3 Environmental quality and descriptive parameters 1.4 Ecology: Definition and classification 1.5 Environmental impact on ecology	08
02	**Water pollution and pollutants (Natural and Anthropogenic)** 2.1 Ground water: Sources and quality analysis 2.2 Surface water: Sources and quality analysis 2.3 Quality parameters in water treatment along with flow-sheets 2.4 Basic processes for potable water supply (Detailed technology not necessary) 2.5 Water pollution: Surface and ground water pollution, types of pollutants 2.6 Mode of water pollution 2.7 Parameters to be assessed for water pollution (Turbidity, pH, total suspended solids, total solids, BOD and COD:	10

	Definition, calculation)	
	2.8 Chemistry aspect for water pollution	
	2.9 Control of water pollution (Description only)	
	2.10 Fundamental of water treatment techniques.	
03	**Air quality, Air Pollution and Control, Noise Pollution** 3.1 Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler) 3.2 Air Pollutants: Types, Units of air pollutants 3.3 Atmospheric physics for air pollution 3.4 Particulate Pollutants: Effects and control strategies (Bag filter, Cyclone separator, Electrostatic Precipitator) 3.5 Advanced air pollution control methods 3.6 Noise pollution: sources of pollution, measurement of noise pollution 3.7 Noise measuring devices and their demonstration	10
04	**Solid waste and Soil pollution** 4.1 Definition of solid waste 4.2 Classification of solid waste 4.3 Overview on municipal, industrial, hazardous, hospital, plastic, E-waste.etc. 4.4 Solid waste management and disposal process. 4.5 Soil pollution ,Poor Fertility, Septicity, Concentration of Infecting Agents in Soil 4.6 Leaching and its impact on soil pollution.	06
05	**Renewable sources of Energy** 5.1 Energy Resources: Energy scenario, national and international status. 5.2 Solar Photovoltaics: Solar radiation and types, basic working principle of solar PV, solar cells and types, water pumping and applications of solar PV. 5.3 Solar Thermal system: basic working principle and applications of solar thermal energy, solar water	06

	heater and types, solar cooking, solar pond, Solar still etc. 5.4 Wind energy systems: basic principle, types of wind turbines, application of wind energy, 5.5 Bio-energy systems: bio thermal and chemical basic principle, gasifier and digesters. 5.6 Hydro energy systems: small and micro hydro systems and its basic working. 5.7 Geothermal energy: Basic working principle, types and application of geothermal energy. 5.8 Ocean & Tidal Energy: Basic working principle, applications and types of different types of energy generation through ocean and tidal systems	
06	**Environment Legislation system and Rules** 6.1 Environmental protection rules 6.2 Sustainable environmental management	02
	Total Hours	**42**

Weightage distribution in both objective, short and broad answer type questions:

Group	Unit Number	Weightage (%)
A	1 & 2	50
B	3 & 4	30
C	5 & 6	20

Course Outcomes:

At the end of the course, the student will be able to:

CO1	Recognize the relevance and the concept of Environmental Science and Engineering and different world-wide activities on this area.
CO2	Illuminate the different types of environmental pollutant, their effects and their sustainable solutions.
CO3	Discuss the environmental regulations act. and standards
CO4	Gather basic idea about conventional and non-conventional energy resources
CO5	Demonstrate the broad perspective of Environmental Science practices by utilizing engineering knowledge and principles

Text Books:

1. Environmental Studies- By N.N.Basak
2. Environmental Studies-By D .Srivastava
3. Introduction to Environmental Engineering— By Dr.Manindra Nath Patra.
4. Environmental Engineering- By A.K.Jain

Reference Books:

1. Environmental Engineering---By G.Killy
2. Environmental Engineering--- By Peavy, Rowe
3. Water and Waste Water Engineering— By S.Garg
4. Waste Water Engineering--By -Panmia
5. Non-conventional Energy Sources-4th Edition, By Prasad Rajesh K and Ojha
6. Non-conventional Energy Resources—By Chauhan and Srevastava
7. Non-conventional Energy Sources---By G.D.Rai (Khanna Publisher)
8. Ecology --By -Odum
9. Ecology---By -Das & Das
10. Environmental Law ---By -Gurdip Sing
11. Environmental Law----By Jaiswal Jaiswal Jaiswal
12. Environmental Law in India ---By -P.Leela Krishnan
13. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
14. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
15. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System