Open Electives at Institute Level (B. Tech VII Semester AY 2025-26)

Sr. No	Course Title	Department Offering Elective Course	Students from following Disciplines can Select the Course
1	Sustainable Development	Civil	All Disciplines Excluding Civil
2	Introduction to Nano Electronics	EXTC	All Disciplines Excluding Electronics & EXTC
3	Industrial Automation	Electrical	All Disciplines Excluding Electrical
4	Energy Conservation & Management	Mechanical	All Disciplines Excluding Mechanical
5	Entrepreneurship Development	Production	All Disciplines Excluding Production
6	Structural Composites	Textile	All Disciplines Excluding Textile
7	Sustainability: Industry Perspectives for a Greener World	Chemistry	All Disciplines
8	Deep Learning	MCA	Computer, IT, Electrical, EXTC, Electronics
9	Corporate Leadership	Humanities	All Disciplines
10	Engineers and Society	Humanities	All Disciplines

Course Code R4CE4106S Course Title: Sustainable Development (Open Elective)
Prerequisite: NIL

COURSE OUTCOME

After completion of course students will be able to

1. Describe sustainable development, development processes and relate impact of various levels of development
2. Formulate the methodology for assessment of sustainability of project using various indicators.
3. Apply environmental legislations to various development processes and projects

COURSE CONTENTS:

Module I	Development Goals and means of development, MDG's and SDG's sustainable development, Comparing levels of development, GDP, GNP, global development level
Module II	Industrialization and Post-industrialization era Major structural shifts, knowledge revolution, implications for development sustainability
Module III	Environmental episodes Ozone depletion, global warming, greenhouse effect, Bhopal gas tragedy etc.
Module IV	Pollutions Major sources, permissible standards and controls of urban air pollution, water pollution, Solid and hazardous waste disposals
Module V	Climate Change The Risk of Global Climate Change
Module VI	Environmental legislation Legislative provisions and measures towards sustainability
Module VII	Indicators of Development Sustainability Composition of National wea1th, Accumu1ation of National Wealth as an Indicator of Sustainable Development, Development Goals and Strategies, Gross happiness index, Millennium Development Goals, Role of National Development Policies, Life cycle assessment, Carbon foot print
Text Books:	Tatyana P. Soubbotina, Beyond Economic Growth: An Introduction to Sustainable Development, World Bank Institute Learning Resources Series, 2nd edition, 2004. (ISBN: 0-8213-5933-99) P. P. Roger, F. J. Ja1a1 and J. A. Boyd, An Introduction to Sustainable Development, Earthscan Publications, 2nd edition, 2008. (ISBN: 9781844075201/1844075206)
Reference Books:	T. Strange and A. Bayley, Sustainable Development: Linking Economy, Society, Environment, 2008. (ISBN: 9789264047785) H. G. Brauch, Sustainable Development and Sustainability Transition Studies, Series: Springer Briefs in Environment, Security, Development and Peace,Series Ed. G. Marletto, S. Franceschini, C. Ortolani and C. Sillig, Mapping Sustainability Transitions: Networks of Innovators, Techno-economicCompetencesand Political Discourses, SpringerBriefs in Business, 2016. (ISBN: 9783319422725/9783319422749)

Course Code R4ET4601S

Course Title: Introduction to Nano Electronics

Prerequisite: NIL

COURSE OUTCOME

1. The student should be familiar with certain nano electronic systems and building blocks such as: low-dimensional semiconductors, hetero structures, carbon nanotubes, quantum dots, nanowires etc.
2. Design of electronic nano systems like memory elements & Logic devices.
3. Finally, a goal is to familiarize students with the present research front in Nano electronics and to be able to critically assess future trends.

COURSE CONTENTS:

Module 1	**Introduction**
	CMOS Scaling, Scaling Issues, Limit to Scaling, System Integration limit, Interconnect Issues, Shrink down approach, Strained Silicon, High k dielectric, Advance MOSFET concept, UTB – Ultra Thin Body, and Metal Gate
Module 2	**FINFET**
	Structure, working, power optimization, logic design using FINFET, modes of operation, TCMS circuit, logic design using TCMS, FINFET SRAM Design
Module 3	**Resonant Tunneling Diode (RTD)**
	Electron Tunneling, Coulomb blocked RTD Structure, working, V-I characteristics, equivalent circuit, programmable logic gates, multi Valued logic gates and MOBILE circuit.
Module 4	**Single Electron Devices**
	Single Electron BOX, Single Electron Transistor (SET), and Application of Single Electron Devices for logic circuit
Module 5	**Module 5. Quantum dots**
	Electronics properties, structure, Quantum Cellular Automata (QCA) , and Circuit Design using QCA
Module 6	**Carbon Nano Tubes**
	Physical Properties, Band Structure, Band Modulation, Electrical properties of CNTs, CNT Transistor, CNT based Electronics Devices, Field Emission Devices, MEMS, Electrical Sensor, and SRAM Cells
Module 7	**Spintronics**
	Physical properties of Spintronic Devices, Spin Relaxation Mechanisms, Spin Injection, Spin Detection. Spintronic Devices, Spin Filter, Spin Valves, Spin Pumps, Spin Diodes, Spin Transistors, Spin-Based Optoelectronic Devices, Spintronic Computation
Module 8	**Molecular Electronics Devices**
	Electrical Conduction of Molecules, Molecular Electronics Devices, Molecular Architectures for Nano electronics, Molecular-Based Optic and Optoelectronics Devices, Molecular Computing Devices
Text Books:	Introduction to nanotechnology, C.P.Poole JV, F.J.Owens, Wiley (2003). Nano electronics and information technology (Advanced electronic materialsand Novel Devices Waster Ranior, Wiley VCH (2003)
References:	Nano electronics: Principles and Devices, 2nd Edition, M. Dragoman, D.Dragoman,Artech House – 2008 Nano electronic Circuit Design, Niraj K. Jha, Deming Chen, Springer - 2010.

Programme Name	B. Tech. (Electrical Engineering)	Semester –VII			
Course Code	**R4EE4601S**	**L**	**T**	**P**	**Credit**
Course Title	**INDUSTRIAL AUTOMATION (OPEN ELECTIVE II)**	3	-	-	3

COURSE OUTCOMES

Students should be able to:

1. State the advanced automation system used in industrial level.
2. Outline the different parts of PLC and different languages used in PLC.
3. Illustrate PLC hardware configuration for given application.
4. Analyse the given application and prepare a ladder logic program.
5. Propose a scheme for trouble shooting a PLC system.

COURSE CONTENTS

Module I	**Introduction to Automation and PLC Fundamentals**
	Automation – Definition, Need, Benefits, Different tools for automation Evolution of PLC in automation, difference between relay control and PLC Control. Block diagram and description of different parts: CPU - Function, scanning cycle, speed of execution. Power supply- function, Block diagram. Memory – function & organisation of ROM & RAM. Input modules- function, diff. input devices used with PLC (only name & their uses)Output modules- function, diff. output devices used with PLC(only name & their uses)Fixed and Modular PLCs & their types. Specialty I/O modules: communication module, high speed encoder, RTD input module, stepper motor control module, Thermocouple module. Redundancy in PLC modules
Module II	**PLC Hardware**
	Discrete input modules: AC input modules- block diagram, description, typical wiring details, specifications. DC input modules- block diagram, description, typical wiring details, sinking and sourcing concept & specifications. Analog input modules- block diagram, description, typical interfacing of input devices & specifications. Discrete output modules: AC output modules- block diagram, description, typical wiring, and specifications. DC output modules- block diagram, description, typical wiring details, sinking and sourcing connections & specifications.Relay and Isolated o/p modules.(only description). Analog output modules- block diagram, description, typical wiringdetails & specifications.I/O module selection criterion.
Module III	**PLC Instruction Set**
	I/O addressing of PLC.Relay type instructions - NO, NC, One shot, Latch, and Unlatch.Timer instructions - On delay timer, off delay timer, Retentive timer, and Timer reset.Counter instructions - up counter, down counter, high speed counter, counter reset.Comparison instructions – Equal, Not equal, Greater, Greater than equal, Less, Less than equal.Data handling instructions – Move, Masked Move, and Limit test.Logical instructions – AND, OR, EX-OR, NOT. Miscellaneous instructions – Sequencer instructions, scale with parameter, subroutine and PID instructions.
Module IV	**Programming and Applications**
	Different PLC programming languages (only introduction) - FBD,Instruction list, structured text, sequential function chart, and ladder logic.Simple programming examples using ladder programming language based on relay, timer, counter, logical, comparison, Data handling and miscellaneous instruction.Application development based on description such as-Motor

	sequence control, Traffic light control, Elevator control, Tank level control, Reactor control, Conveyor system, Stepper motor control. (Any specific application can be considered in each above area to develop a ladder program). Speed Control of AC/ DC Motor using Programmable Drives
Module V	**Installation and Troubleshooting**
	PLC installation- enclosures, rack, master control relay, grounding, noise suppression, maintenance guidelines.PLC troubleshooting- input and output troubleshooting using module LED status, troubleshooting of ladder program.

Text Books:	1. "Introduction to programmable logic control", by Gary Dunning, Cenage Learning 2. "Programmable logic controllers", by F.D. Petruzella (Third edition) Tata-McGraw-Hill 3. "Programmable logic controllers", by John Hackworth and Federic Hackworth, Pearson education

Reference Books:	1. "Industrial automation and process Control", by Jon Stenerson,Prentice Hall

Course Code R4ME4602S

Course Title: Energy Conservation and Management

Prerequisite: NIL.

Course Outcome

The student should be able to –

1. Illustrate the current energy scenario, challenge of climate change & peak oil, importance of energy conservation and need for alternative energy resources.
2. Examine various parameters in energy systems and energy auditing.
3. Apply Energy Planning and forecasting techniques for performing energy analysis.
4. Integrate energy economics and relevance of sound energy policies for sustainable development.

Course Content

Module 1	Introduction Energy Scenario-world and India. Energy Resources Availability in India. Energy consumption pattern. Energy conservation potential in various Industries and commercial establishments. Energy intensive industries - an overview. Peak oil. Challenge of climate change - Energy conservation and energy efficiency – needs and advantages.
Module 2	Pollution from energy generation Coal and Nuclear based Power Plants – Fly Ash generation and environment impact, Fly ash utilization and disposal, nuclear fuel cycle, radioactive wastes – treatment and disposal Environmental pollution limits guidelines for thermal power plant pollution control Environmental emissions from extraction, conversion, transport and utilization of fossil fuels Greenhouse effect- Global warming.
Module 3	Energy auditing Energy Conservation Act 2001. Energy auditing - Definition, need, types of energy audit methodologies, barriers. Role, Duties and responsibilities of energy managers and auditors. Energy audit questionnaire. Energy management (audit) approach: Understanding energy costs, bench marking, energy performance, matching energy use to requirement, optimizing the input energy requirements; Fuel & energy substitution

Module 4	Energy conservation Energy Efficiency in relevant utilities Mechanical/Thermal – Boilers, Steam System, Furnaces, Insulation and Refractories, Cogeneration, Waste Heat Recovery, Heat Exchangers Electrical – Electrical Systems, Electric motors, Compressed air system, HVAC and refrigeration system, Fans and Blowers, Pumps and pumping system, Cooling Tower, Lighting system, Diesel/Natural Gas Power generating system Civil – Energy Conservation in buildings and ECBC Textile – Textile industry
Module 5	Energy economics Investment - need, appraisal and criteria, financial analysis techniques - break even analysis-simple payback period, return on investment, net present value, internal rate of return, cash flows, DSCR, financing options, ESCO concept.
Module 6	Energy forecasting Energy forecasting techniques - Energy demand – supply balancing, Energy models, Simulation and forecasting of future energy demand consistent with macroeconomic parameters in India. Basic concept of Econometrics (OLS) and statistical analysis (Multiple Regression), Econometrics techniques used for energy analysis and forecasting with case studies from India.
Module 7	Energy policies National energy policy in the last plan periods, Energy use and Energy supply, Overview of renewable energy policy and the Five-Year Plan programmes, Basic concept of Input-Output analysis, Concept of energy multiplier and implication of energy multiplier for analysis of regional and national energy policy- Carbon Trading- Renewable Energy Certification – CDM. The Sustainable Energy Utility (SEU) Model

Recommended Readings:	General Aspects of Energy management and Audit, Guide book for energy manager and energy auditor, Bureau of energy efficiency 2. Energy Efficiency in Thermal Utilities, Guide book for energy manager and energy auditor, Bureau of energy efficiency 3. Energy Efficiency in Electrical Utilities, Guide book for energy manager and energy auditor, Bureau of energy efficiency 4. Energy Performance Assessment for Equipment and Utility Systems, Guide book for energy manager and energy auditor, Bureau of energy efficiency
Reference Books:	YP Abbi and Shashank Jain, Handbook on Energy Audit and Environment Management, TERI Publications, 2009. 2. Steve Doty, Wayne C. Turner, Energy Management Handbook 3. Jason Houck, Wilson Rickerson, The Sustainable Energy Utility (SEU) Model for Energy Service Delivery, http://online.sagepub.co

Course Code R4PE4601S

Course Title: Entrepreneurship Development

Prerequisite: NIL

Course outcomes

On the completion of this course, the learner will able to

1. Describe what it takes to be an entrepreneur
2. Analyze business opportunities and the basics to create, launch and manage new businesses
3. Develop Business Model for their Idea/Problem
4. Create MVP (Minimum Viable Product).

COURSE CONTENTS:

Module I	**Introduction** Discover yourself – Find you Flow, Effectuation, Identify your entrepreneurial style
Module II	**Problem Identification and Idea generation** Identify Problems worth Solving, Introduction to Design Thinking, generate ideas that are potential solutions to the problem identified, GOOTB: Run problem interviews with prospects, Class Presentation: Present the problem you "love", Team Formation.

Module III	**Customer Study and Value Proposition** Identify Your Customer Segments and Early Adopters - Market Types, Segmentation and Targeting, Defining the personas; Understanding Early Adopters and Customer Adoption Patterns, Customer identification, Market, Creative solution; Craft Your Value Proposition - Come up with creative solutions for the identified problems, Deep dive into Gains, Pains and "Jobs-To-Be-Done" (using Value Proposition Canvas, or VPC), Identify the UVP of your solution using the Value Proposition section of the VPC, Outcome-Driven Innovation.
Module IV	**Business Model Canvas** Get Started with Lean Canvas - Basics of Lean Approach and Canvas; Types of Business Models (B2B; B2C), Sketch the canvas- "Document your Plan A", Intro to Risks; Identify and document your assumptions (Hypotheses); identify the riskiest parts of your Business Plan, Risk identification, Class Presentation: Present your Lean Canvas.
Module V	**Validation** Develop the Solution Demo - Build solution (mock-ups) demo, how to run solution interviews, GOOTB: Run Solution interviews, does your solution solve the problem for your customers: The problem-solution test. Sizing the Opportunity - Differences between a Start-up venture and a small business; Industry Analysis: Understanding what is Competition and its role, Analyse competition; Building an MVP - Identification of MVP, Solution development, building products/services, Build- measure-learn loop for development
Module VI	**Money** Revenue streams, Pricing and cost, Financing Your New Venture - Venture financing, Investor expectations
Module VII	**Team building** Shared leadership, role of good team, how to pitch to candidates to join your startup Collaboration tools and techniques - Brainstorming, Mind mapping, Kanban Board, #Slack
Module VIII	**Marketing and sales** Positioning of Product/Services, Channels and strategies, Building Digital Presence and leveraging social media, Budgeting and planning. Sales planning - Buying decisions, Sales planning, setting targets, Unique Sales Proposition (USP); Art of the sales pitch (focus on customers' needs, not on product features), Follow-up and closing a sale; Asking for the sale.

Module IX	**Support** Planning and tracking - Importance of project management to launch and track progress, Understanding time management, workflow, and delegation of tasks. Business Regulation - Basics of business regulations of starting and operating a business; Importance of being compliant and keeping proper documentation; How to find help to get started.

Text Books	1. Roy R.: Entrepreneurship, Oxford University Press. 2. Maurya A.: Running Lean: Iterate from Plan A to a Plan That Works. O'Reilly Media
References	1. Jeffry A: New venture creation, Tata McGraw Hill 2. Osterwalder, A and Pigneur Yves: Business Model Generation: A Handbook for Visionaries,Game Changers and Challengers. 3. Gupta T. S: Intellectual Property Law in India, Kluwer Law International. 4. Saraswathi S.D: Effectuation: Elements of Entrepreneurial Expertise. Edward Elgar Publishing. 5. Kim W. C. and Mauborgne R: Blue Ocean Strategy, Harvard Business School Press. 6. Ries, E.: The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to CreateRadically Successful Businesses, The Crown Publishing Group

Course Code R4TT3602T Course Title: Structural Composites
Prerequisite: Basic knowledge of Engineering Physics and Engineering Chemistry.

Course Outcome

After attending this course, students will be able to:

1. Understand the composite materials and impact of aggregation of constituent materials.
2. Depict the approach and methodology of fabrication of such aggregate.
3. Schooled various models analyzing the design and performance of composite materials.
4. Understand the composite modulus, strength and fracture behavior for structural applications.

Course Content

Module I	Introduction: Definition of composite material, Classification based on matrix and topology, Constituents of composites, Interfaces and Interphases, Distribution of constituents, Nano-composites.
Module II	Performance of Structural Composites: Combination effects (Summation, Complementation and Interaction), Basic analytical concepts. Performance analysis by various models (Law of Mixtures, Shear lag model, Laminated plate model – the rmoelasticity, plasticity and creep), Strengthening mechanisms, Stress distribution in fibre and the matrix (shear stress and axial tensile stress in the fibre along its length), critical length of fibre for full strengthening, Analysis of uniaxial tensile stress-strain curve of unidirectional continuous and short fibre composites, Estimation of the required minimum amount of fibre and critical amount of fibre to gain a composite strength, Analysis of strength of a composite during loading at an angle to the fibres, Nano-structured composites.
Module III	Performance of Composite in Nonstructural Applications: Composites in Electrical, Superconducting and Magnetic Applications, Nano-composite devices.

Module IV	Fabrication Composites: Fabrication of Metal Matrix Composites: Commonly used Matrices, Basic Requirements in Selection of constituents, solidification processing of composites - XD process, Spray processes - Osprey Process, Rapid solidification processing, Dispersion Processes. Fabrication of Polymer Matrix Composites – Commonly used Matrices Basic Requirements in selection of Constituents, Moulding method, Low pressure closed moulding, pultrusion, Filament winding, Fabrication of ceramic matrix composites - Various techniques of vapour deposition, Liquid phase method and Hot pressing etc., Fabrication of nano-composites.
Module V	Characterization of Composites: Control of particle/fibre and porosity content, particle/fibre distribution, Interfacial Reaction of matrix-reinforcing component, Coating of reinforcing component, Strength analysis.
Module VI	Secondary Processing and Joining of Composite: Forging and extrusion of composites – critical issues, dynamic recovery and dynamic recrystallization, mechanical properties; Induction Heating, Fusion Bonding, Ultrasonic welding, Gas tungsten arc welding, Gas metal arc welding, Resistance spot & seam welding, Resistance brazing, Resistance spot joining, Resistant spot brazing, Resistance welding of thermoplastic graphite composite, Weld bonding, Brazing of MMC.
Module VII	Industrial Application of Composite Materials: Civil constructions of structures/pannels, Aerospace industries, Automobile and other surface transport industries, Packaging industries, House hold and sports components etc.
Module VIII	Fracture & Safety of Composite: Fracture behaviour of composites, Mechanics and Weakest link statistics, Griffith theory of brittle fracture and modification for structural materials, Basic fracture mechanics of composite (Fracture toughness, COD and J- integral approaches, Fatigue crack growth rate), Fracture Mechanics of brittle matrix fibre composite, Fracture mechanics of metal matrix fibre composite, Experimental evaluation (composite), Elementary reliability analysis.

Recommended Readings:	1. Nanocomposite Science and Technology, P. M. Ajayan, L. S. Schadler, P. V. Braun, (2003), Wiley-VCH Verlag GmbH Co. KGaA, Weinheim. 2. Mechanics and Analysis of Composite Materials, V.V. Vasiliev and E.V. Morozov, (2001), Elsevier Science Ltd, The Boulevard, Langford Lane, Kidlington, Oxford OX5 lGB, UK. 3. Ceramic matrix composites, K.K. Chawala, 1st ed., (1993) Chapman & Hall, London.
Reference Books:	1. Sanjay Mazumdar, Composites Manufacturing-Materials, Product and Process Engineering, 2002, CRC Press, ISBN 0-8493-0583-3. 2. Fibrous and composite materials for civil engineering applications, edited by R. Fangueiro, 2011, WPI, ISBN 978-1-84569-558-3. 3. Textile advances in automotive industry, edited by R. Shishoo, Woodhead Publishing inTextiles: No. 79, ISBN 978-1-84569-331-2.

Open Elective Course: Sustainability: Industry Perspectives for a Greener World

Course Code:

SN	Course Code	Course Title	L-T-P (Hours/Week)	Credit	TA	MST	ESE	ESE hours
		Sustainability: Industry Perspective for Greener World	3-0-0=3	3	20	30	50	3

Course Outcomes:

After completion of course students will be able:

1. CO1: To describe the concept of sustainability and its importance in the industry.

2. CO2: To examine and interpretate the key factors such as raw materials, process, and energy used in the industry and finding the alternative techniques to reduce the environmental impact.

3. CO3: To calculate the greenhouse gas emissions released from various sources from industry.

4. CO4: To relate the concept of UN SDG goals and its importance in the industry.

5. CO5: To outline the importance of various regulatory compliances and standards with respective to sustainability.

Modules	Description	Contact Hours
Module 1	**Overview of various industrial process:** Outline of chemical, textile, mechanical, automotive, forging, FMCG industry process. Concept of Industry Revolution along its merits and demerits and its importance towards sustainability. Process management and overview of various parameters such as material, energy and influents and its environmental implications etc.	4
Module 2	**Fundamentals of Sustainability:** Concept and basics of sustainability, Significance of Sustainability in Industry. The triple bottom line: Environmental, Social and Economic Dimensions and its significance in the industry. Concept of Corporate Sustainability and Sustainable Finance.	6
Module 3	**Waste Management and Principles of Circularity:** Overview of different types of waste from various industries. Concept of solid and liquid waste management with relevant examples. Recycling, upcycling, and zero waste models: Case studies and demonstration.	8
Module 4	**GHG Emissions, Calculation, and its Control Techniques:** Introduction to GHG emissions. Classification of GHG emissions: Scope 1, Scope 2, and Scope 3 etc. Basic parameters and emission calculations. Methods of estimating GHG emissions. Introduction to best available techniques along with its merits and demerits.	6
Module 5	**ESG Principles, Reporting and Climate Change:** Introduction to key concept of Environmental, Social, and Governance (ESG). Climate change and risk assessment. Corporate Carbon Neutrality and Offsetting Programs etc.	8
Module 6	**Regulatory and Compliance Management and its Role in Sustainability:** Introduction to regulatory and compliance management and its need. Overview of various materials and its impact on health and aquatic hazards. Handling hazardous materials: Green Logistics, Transportation, and its implementation. Responsible Sourcing and Fair-Trade Practices with successful case studies from industry.	6

Programme Name		***SEMESTER VII***
Course Code		
Course Title	**Deep Learning**	

PREREQUISITIES

1. Basic Machine Learning and Data mining algorithms
2. Mathematical and statistical Foundations

COURSE OUTCOMES:

1. Demonstrate concepts, architectures and algorithms of Neural Networks to solve real world problems.
2. Identify deep feed-forward networks and different regularization techniques used in Deep Learning.
3. Identify challenges in Neural Network optimization and different optimizationalgorithms used in Deep learning models
4. Analyze deep learning algorithms which are more appropriate for varioustypes of learning tasks in various domains
5. Apply deep neural networks from building to training models
6. Analyse detection and recognition tasks using convolution/adversarial neural networks.

COURSE CONTENT:

ANN Algorithms:

Supervised Learning Network- McCulloch–Pitts Unit and Thresholding logic, LinearSeparability, Multi-layer Perceptron Networks, Back-Propagation Network, factorsaffecting Backpropagation Training, Unsupervised Learning Networks- MaxNet.Mexican Hat Net.

Deep Feed-forward Networks:

Introduction to Deep Learning, Learning XOR, Gradient-Based Learning, Hidden Units,Architecture Design, Other Architectural Considerations, Applications of Deep neural networks.

Regularization:

Regularization for Deep Learning - Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying andParameter Sharing, Sparse Representations, Bagging and Other Ensemble Methods,Dropout.Regularized Linear Regression.

Optimization for Training Deep Models:

Need for Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, and Algorithms with Adaptive Learning Rates-AdaGrad, RMSProp, and Approximate Second-Order Methods-Newton's Method, Conjugate Gradients Method.

Convolutional Networks:

Motivation, Pooling, Convolutional layers, Additional layers, Residual Nets, Applications of deep learning, Application of CNN.

Recurrent and Recursive Nets:

Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs,Encoder - Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Application of RNN.

Recommended Reading:

1. Deep Learning, Ian Goodfellow, Yoshua Bengio and Aeron Courville, MIT Press,First Edition, 2016.
2. Deep Learning, A practitioner's approach, Adam Gibson and Josh Patterson, O'Reilly, First Edition, 2017.
3. Yoav Goldberg, A Primer on Neural Network Models for Natural Language Processing, 2015
4. Hands-On Learning with Scikit-Learn and Tensorflow, Aurelien Geron, O'Reilly, First Edition, 2017.
5. Deep Learning with Python, Francois Chollet, Manning Publications Co, First Edition, 2018.
6. Python Machine Learning by Example, Yuxi (Hayden) Liu, First Edition, 2017.
7. A Practical Guide to Training Restricted Boltzmann Machines (link is external), Geoffrey Hinton, 2010

Open Elective Course: Corporate Leadership

Course Objectives:

• To develop a foundational understanding of leadership in corporate settings.

• To differentiate leadership from management and explore various leadership styles.

• To understand motivational strategies and techniques of directing teams effectively.

• To assess the role of leaders in managing change and crisis situations.

Unit I: Fundamentals of Corporate Leadership

• Meaning of Corporate
• Concept of Vision, Mission, and Values
• Leadership: Definition, Meaning, and Importance
• Leader: Definition, Meaning, and Functions
• Influence – The Core of Leadership: Concept, Elements, Techniques of Influencing
• Are Leaders Born or Made?
• Leadership vs Management
• Leaders' vs Managers

Unit II: Leadership Styles and Theories

• Styles of Leadership: Autocratic, Democratic, Laissez-Faire, Bureaucratic, Charismatic, Transactional, Transformational, People-oriented, Task-oriented
• Theories of Leadership: Trait Theory, Behavioural Theories (Ohio State & Michigan), Contingency Theories (Hersey & Blanchard, Fiedler), Path-Goal Theory, Likert's Styles, Blake & Mouton's Grid
• Types of Leaders: Positive, Negative, Consensus, Formal, Informal, Servant, Innovative, Thought, Visionary, Level Five

Unit III: Motivation, Directing, and Change Leadership

• Motivation: Concept, Types, Strategies
• Morale Building: Advantages of High Morale, Indicators of Low Morale
• Directing: Concept, Principles, Process, Techniques, Issuing Orders, Good Order

Characteristics

• Feedback and Feedforward: Concept, Types, Process, Advantages

• Leading Positive Change: Meaning, Framework, Role in Crisis Management

• Case Examples of Leaders

Suggested Readings:

1. Leadership – Daft, Richard L., Cengage Learning India Pvt. Ltd.
2. Leadership – Saxena and Awasthi, Prentice Hall
3. Leadership and Management – Dr. A. Chandra Mohan, Himalaya Publishing House
4. Principles of Management – T. Ramasamy, Himalaya Publishing House
5. Principles of Management – Rupal Jain, Richa Jain, Himalaya Publishing House

Open Elective Course: Engineers and Society

The role of the transformative engineer

1. Emotional Intelligence
2. Conflict resolution and negotiation skills
3. Teamwork and collaboration in engineering projects
4. Ethical frameworks for engineering decision-making
5. Balancing competing interests and values
6. Leadership and leading change in Engineering Organizations
7. Corporate ethics and social responsibility.