

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)
SYLLABUS FOR BACHELOR OF TECHNOLOGY IN ROBOTICS
(Effective from academic session 2020-21)

Semester-VII

Subject Code: PC-ROB701	Category: Professional Core Courses
Subject Name: Automation in Manufacturing	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: Manufacturing Processes, Manufacturing Technology	

Course Objectives:

1. To understand the importance of automation in the of field machine tool based manufacturing
2. To get the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC
3. To understand the basics of product design and the role of manufacturing automation

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing.	6
2	Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods; Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC-Adaptive Control	3
3	Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies Introduction to Modeling and Simulation: Product design, process route modeling, Optimization techniques, Case studies & industrial applications.	3
4	Mechanical Advanced Machining Processes: Need and classification of nontraditional machining processes – Material removal in traditional and nontraditional machining processes - considerations in process selection. Ultrasonic machining – Working principle, mechanism of metal removal – Theory of Shaw, elements of the processes, tool feed mechanism, effect of parameters, applications and numerical. Abrasive jet machining, Water jet machining and abrasive water jet machine - Basic principles, equipment's, process variables, mechanics of metal removal, MRR, application and limitations.	6

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5	<p>Electric Discharge Machining: Working principle of EDM, Power circuits for EDM - RC pulse generator and controlled pulse generator– Analysis of R-C Circuits – Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, characteristics of spark eroded surface and recent development in EDM. Wire EDM – Working principle, process variables, process characteristics and applications. Electric discharge grinding and electric discharge diamond grinding - working principle, process capabilities and applications.</p>	6
6	<p>Laser, Electron Beam, Ion Beam and Plasma Arc Machining: General working principle of laser beam machining – Generation of Laser, types of Lasers, process characteristics and applications. Electron Beam Machining - Equipment for production of Electron Beam, theory of EBM, thermal and non-thermal type, process characteristics and applications. Ion Beam Machining - Mechanism of metal removal and associated equipment's, process characteristics and applications. Plasma Arc Machining - Metal removal mechanism, process parameters, process characteristics, types of torches, applications.</p>	6
7	<p>Advanced Finishing Processes: Abrasive flow Machining (AFM)- working principle, AFM system, process variables, process performance and applications. Magnetic abrasive finishing (MAF)- working principle, MAF system, material removal and surface finish, process variables and applications. Chemo mechanical polishing, working principle, material removal and surface finish and applications.</p>	6
8	<p>Micro-fabrication techniques LIGA Process: Lithography, etching, Micro-joining etc. Application examples; Case studies Examples of Mechatronic Systems from Robotics Manufacturing, Machine Diagnostics, Road vehicles and Medical Technology</p>	3

Course Outcomes:

Student will be able

1. To understand non- traditional machining processes and the effect of process parameters
2. To differentiate the various non-traditional machining processes
3. To demonstrate micromachining technology

Learning Resources:

1. A. Ghosh and A.K. Mallik, Manufacturing Science, Affiliated East west Press Ltd, 2001.
2. V.K. Jain, Advanced Machining Processes, Allied Publishers Pvt. Ltd. 2002
3. H. El-Hofy, Advanced Machining Processes, McGraw-Hill, New York, 2005.
4. G.F. Benedict, Nontraditional Machining Processes, Marcel Dekker Inc., New York, 1987.
5. J.A. McGeough, Advanced Machining Methods, Chapman and Hakk, London, 1988.
6. M. Adithan, Modern Machining Methods, Khanna Publishers, New Delhi, 2008.
7. P.K. Mishra, Nonconventional Machining, The Institution of Engineers (India) Text Book Series, Narosa Publishing House, New Delhi, 1997.
8. V. K. Jain, Introduction to Micromachining, Alpha Science International Limited, 2010.
9. J. A. McGeough, Micromachining of Engineering Materials, Taylor & Francis, 2001.

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Subject Code: PE –ROB702	Category: Professional Elective Courses
Subject Name: Embedded System	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Overview of Embedded System: Embedded System, Embedded Processor in System, Components of Embedded System, Brief introduction to Embedded software in system, Design Process in Embedded System.

Embedded Hardware:

Processor & Memory: Brief overview of 8051 Architecture and real world interfacing, Introduction to advanced Processor Architectures-ARM, Processor and Memory organization, Parallelism in instruction level, Processor and memory selection.

I/O Types: Serial and Parallel Communication Ports, Timer and Counting devices, Watchdog timers, real time clock, Serial bus Communication Protocols- I2C, CAN, and Parallel Communication Protocol- ISA.

Interrupt Service Mechanism: Concept of ISR, different interrupt sources, Interrupt handling Mechanism, Multiple Interrupts, Interrupt Latency and deadline.

Embedded Software Development-

Software Development: Programming concept in ALP (assembly language programming) and High level Language-C, Processor directives, functions and macros and other programming elements, Embedded C++ concept only.

RTOS (Real time operating System)- OS overview, Process, Interrupt and memory management, RTOS overview, Basic Design rule using RTOS, Task scheduling using Priority based scheduling, cyclic scheduling and round robin scheduling.

Embedded system Design using PIC microcontroller: Introduction to Microchip PIC16 family, PIC16F873 processor architecture- features, memory organization, on chip peripherals, Watchdog timer, ADC, Data EEPROM, Asynchronous serial port, SPI mode, I2C mode, Interfacing with LCD, ADC, sensors, stepper motor, key board, DAC.

Case study of different types of Embedded System: Design of Automated Chocolate Vending Machine, Digital Camera.

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Text Book

1. Microcontrollers Theory and Application, Ajay V. Deshmukh, TMH, 2011.
2. Embedded Systems: Architecture, Programming & Design, Raj Kamal, TMH, 2011 319

Reference Book

1. Embedded System Design: A unified Hardware/ Software Introduction, by Frank Vahid, Willey, 2011.
2. Design with PIC Microcontrollers, J. B. Peatman, Pearson India, 2008

Subject Code: HM-HU701	Category: Humanities and Social Sciences including Management Courses
Subject Name: Economics for Engineers	Semester: Seventh
L-T-P: 2-0-0	Credit: 2
Pre-Requisites: Nil	

Course Objectives:

To make general awareness among budding engineers regarding basic principles of economics and that needed to use in an industry.

To give basic understanding of engineering costs, estimation, depreciation analysis and basic accounting principles.

Course Contents:

Module No.	Description of Topic	Contact Hrs.
1	Economic Decisions Making- Overview, Problems, Role, Decision making process.	2
2	Engineering Costs & Estimation- Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring and Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power- Sizing Model, Improvement & Learning Curve, Benefits.	4
3	Present Worth Analysis: End-of-Year Convention, Viewpoint of Economic Analysis Studies, Borrowed Money Viewpoint, Effect of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives.	4

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4	Cash Flow & Rate of Return Analysis- Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Break Even Analysis. Economic Analysis in the Public Sector- Quantifying and Valuing Benefits & drawbacks.	4
5	Depreciation- Basic Aspects, Deterioration & Obsolescence, Depreciation and Expenses, Types of Property, Depreciation Calculation Fundamentals, Depreciation and Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements of Tax Regulations For Depreciation and Capital Allowances.	4
6	Inflation and Price Change- Definition, Effects, Causes, Price Change With Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes in Engineering Economic Analysis, Cash Flows that inflate at different Rates	3
7	Accounting- Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	3

Course Outcomes:

Student will be able

1. To understand Economic Decisions Making criteria
2. To know basic principles of engineering costs, estimation and depreciation analysis.
3. To understand basic accounting principles.

Learning Resources:

1. J.L. Riggs, D.D. Bedworth and S.U. Randhawa, Engineering Economics, 4th Edition, McGraw Hill International Edition, 1996.
2. D. Newnan, T. Eschembach and J. Lavelle, Engineering Economics Analysis, Oxford University Press, 2019.
3. J.A. White, K.E. Case and D.B. Pratt, Principle of Engineering Economic Analysis, John Wiley, 2016.
4. W.G. Sullivan, E.M. Wicks and C.P. Koelling, Engineering Economy, 17th Edition, Pearson, 2018.
5. R. Panneerselvan, Engineering Economics, Prentice Hall of India, 1999.
6. M.R.Lindeburg, Engineering Economics Analysis:An Introduction, Professional Publication, 1993

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Subject Code: PC-ROB791	Category: Professional Core Courses
Subject Name: Robotics Laboratory IV (Advanced Manufacturing Technology)	Semester: Seventh
L-T-P: 0-0-3	Credit: 1.5
Pre-Requisites: Manufacturing Processes, Manufacturing Technology	

Course Objectives:

Students will gain a practical knowledge of various manufacturing processes in a hands-on environment through experiments and simulations.

Course Contents (12 Experiments/ Problems/ Studies are to do):

1. Programming on CNC Lathe using G and M Codes
2. Programming on CNC Lathe using APT
3. Programming on CNC Milling Machine using G and M Codes
4. Programming on CNC Milling Machine using APT
5. Programming on CNC machine Simulator and to observe virtual machining
6. Robot Programming
7. Study of and Solving problems on geometry of robot manipulator, actuators and grippers
8. Experiments on AJM/ USM/ WEDM/ EDM/ ECM/ LBM
9. Design and manufacture of products using Additive Manufacturing

Course Outcomes:

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

1. Develop a practical understanding of advanced manufacturing processes.
2. Understand the working of a robot and its programming
3. Identify and rectify defects in parts and manufacturing processes related problems.

Learning Resources:

1. M.P. Groover, Principles of Modern Manufacturing, 5th edition, Wiley, 2014.
2. E.P. DeGarmo, J.T. Black and R.A. Kohser, DeGarmo's Materials and Processes in Manufacturing, 11th Edition, John Wiley & Sons, 2011.
3. S. Kalpakjian and Schmid, Manufacturing processes for engineering materials, 5th edition, Pearson Education, 2010.

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Subject Code: PW-ROB781	Category: Project
Subject Name: Project-III	Semester: Seventh
L-T-P: 0-0-6	Credit: 3
Pre-Requisites: All courses	

Course Objectives:

To develop the ability to identify, formulate and analyze engineering problems through literature survey, recent trends in industries and by applying the knowledge of science and engineering fundamentals.

To train students in preparing project reports, to face reviews and viva voce examination.

Course Contents:

It is intended to start the project work early in the seventh semester and carry out both design and fabrication of a mechanical device whose working can be demonstrated. The design and formulation of the problem is expected to be completed in the seventh semester and the fabrication and demonstration will be carried out in the eighth semester. The students in a group of 4 to 6 works on a topic are to be approved by the head of the department under the guidance of a faculty member. The students prepare a comprehensive project report after completing the work to the satisfaction of the supervisor to be submitted at the end of the semester. The progress of the project is evaluated by a committee may be constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report may jointly by external and internal examiners constituted by the Head of the Department.

Course Outcomes:

Student will be able to carry out some project works based on some design or fabrication or experimental problems in a group building up team spirit and would get sufficient exposure for the way to proceed to solve a practical or design problem.

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Subject Code: PE –ROB701A	Category: Professional Elective Courses
Subject Name: Speech and Natural Language Processing	Semester: Seven
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Unit	Content	Hrs/Unit
1	Regular Expressions and Automata Recap) - Introduction to NLP, Regular Expression, Finite State Automata [2L] Tokenization - Word Tokenization, Normalization, Sentence Segmentation, Named Entity Recognition, Multi Word Extraction, Spell Checking – Bayesian Approach, Minimum Edit Distance [5L] Morphology - Morphology – Inflectional and Derivational Morphology, Finite State Morphological Parsing, The Lexicon and Morphotactics, Morphological Parsing with Finite State Transducers, Orthographic Rules and Finite State Transducers, Porter Stemmer [4L]	11
2	Language Modeling Introduction to N-grams, Chain Rule, smoothing – Add-One Smoothing, Witten-Bell Discounting; Backoff, Deleted Interpolation, N-grams for Spelling and Word Prediction, Evaluation of language models. [4L] Hidden Markov Models and POS Tagging Markov Chain, Hidden Markov Models, Forward Algorithm, Viterbi Algorithm, Part of Speech Tagging – Rule based and Machine Learning based approaches, Evaluation. [4L]	8
3	Text Classification Text Classification, Naïve Bayes’ Text Classification, Evaluation, Sentiment Analysis – Opinion Mining and Emotion Analysis, Resources and Techniques. [4L] Context Free Grammar Context Free Grammar and Constituency, Some common CFG phenomena for English, Top-Down and Bottom-up parsing, Probabilistic Context Free Grammar, Dependency Parsing [4L]	9
4.	Computational Lexical Semantics Introduction to Lexical Semantics – Homonymy, Polysemy, Synonymy, Thesaurus – WordNet, Computational Lexical Semantics – Thesaurus based and Distributional Word Similarity [4L] Information Retrieval Boolean Retrieval, Term- document incidence, The Inverted Index, Query Optimization, Phrase Queries, Ranked Retrieval – Term Frequency – Inverse Document Frequency based ranking, Zone Indexing, Query term proximity, Cosine ranking, Combining different features for ranking, Search Engine Evaluation, Relevance Feedback [5L]	9

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Text book and Reference books:

1. Speech and Language Processing, Jurafsky and Martin, Pearson Education
2. Foundation of Statistical Natural Language Processing, Manning and Schutze, MIT Press
3. Multilingual Natural Language Processing Applications from Theory to Practice: Bikel, Pearson.

Subject Code: PE –ROB701B	Category: Professional Elective Courses
Subject Name: Neural Network and Fuzzy Logic Control	Semester: Seven
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Neural Networks and Pattern Association:

Differences between biological and artificial neural networks – Typical architecture – Common activation functions– McCulloch – Pitts neuron – Simple neural nets for pattern classification – Linear separability – Hebb net –Perceptron – Adaline – Madaline – Architecture – Algorithm and simple applications – Training algorithms for pattern association – Hebb rule and delta rule – Hetero associative – Auto associative and iterative auto associative net – Bidirectional associative memory – Architecture – Algorithm – Simple applications.

Neural Networks based on Competition:

Kohonen self organising maps – Learning vector quantization – Counter propagation – Architecture – Algorithm and applications

Adaptive Resonance and Backpropagation Neural Networks:

ART1 and ART2 – Basic operation and algorithm – Standard back propagation architecture – Derivation of learning rules – Boltzmann machine learning – Architecture – Algorithm and simple applications

Fuzzy sets and Membership Functions:

Properties and operations on classical and fuzzy sets – Crisp and fuzzy relations – Cardinality – properties and operations – Composition – Tolerance and equivalence relations – Simple problems – Features of membership function – Standard forms and boundaries – Fuzzification – Membership value assignments – Fuzzy to crisp conversions – Lambda cuts for fuzzy sets and relations –De fuzzification methods.

Applications of Neural networks and Fuzzy logic:

Applications of neural networks – Pattern recognition – Image compression – Communication– Control systems

Applications of fuzzy logic – Fuzzy pattern recognition – Fuzzy image compression – Fuzzy logic controllers

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Text Book

1. Fundamentals of Neural Networks, Laurene Fausett, 2004, Pearson Education.
2. Fuzzy Logic with Engineering Applications, Timothy Ross, 1998, McGraw-Hill.

Reference Book

1. Introduction to Neural Networks Using Matlab 6.0, Sivanandam, S.N., Sumathi, S. and Deepa, S.N, 2005, TMH.
2. Fundamentals of Artificial Neural Networks, Mohammad H. Hassoun, 1st edition, 2010, PHI
3. Neural Networks and Fuzzy Systems, Bark Kosko, 1st edition, PHI

Course Outcome

1. Analyze and classify neural networks and its implementation algorithms.
2. Apply suitable algorithms on different cases.
3. Apply fuzzy logic and neural networks.
4. Analyze the applications of neural network and fuzzy logic in image processing

Subject Code: PE –ROB701C	Category: Professional Elective Courses
Subject Name: Wireless Sensor Networks	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks

Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks

Routing protocols, MAC protocols: Classification of MAC Protocols, S-MAC Protocol, B- MAC protocol, IEEE 802.15.4 standard and ZigBee,

Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols.

Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication.

Single-node architecture, Hardware components & design constraints,

Operating systems and execution environments, introduction to TinyOS and nesC.

Text/Reference Books:

1. Walteneus Dargie , Christian Poellabauer, “Fundamentals Of Wireless Sensor Networks Theory And Practice”, By John Wiley & Sons Publications ,2011
2. Sabrie Soloman, “Sensors Handbook" by McGraw Hill publication. 2009
3. Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Elsevier Publications,2004
4. Kazem Sohrby, Daniel Minoli, “Wireless Sensor Networks”: Technology,

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Protocols and Applications, Wiley-Inter science

5. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009

Course Outcomes:

At the end of the course the students will be able to

1. Design wireless sensor networks for a given application
2. Understand emerging research areas in the field of sensor networks
3. Understand MAC protocols used for different communication standards used in WSN
4. Explore new protocols for WSN

Subject Code: PE-ROB701D	Category: Professional Elective Courses
Subject Name: Industrial Automation & Control	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: Sensors, System Integration, Cloud and Network Security	

Sensors: Displacement sensors, Force sensors, Ultrasonic sensors, Temperature sensors, Pressure sensors etc

Actuators: Dc motors, Servo motors, Stepper motors, Piezo electric actuators, Pneumatic actuators etc.

Signal Conditioning: Filtering, Amplifying, Isolation, ADC, DAC, Sensor protection circuits, Signal transmission and noise suppression, Estimation of errors and calibration.

Controller tuning:

PI controller, PD controller, PID controller and tuning methods: *Ziegler-Nichols tuning method*, *Cohen coon tuning method*, Implementation of PID controllers (digital and analog).

Automation:

PLC (Programmable logic controllers): Overview, operation and architecture, PLC programming, Application examples.

DCS (Distributed Control Systems):

Overview, Advantages, Functional requirements of Distributed control systems, Communication for distributed control, Application examples. SCADA (supervisory control and data acquisition): Introduction to SCADA, SCADA system components, architecture and communication, SCADA applications.

Advanced control techniques: Feed forward control, Ratio control, Cascade control, Adaptive control, Duplex or split range control, Override control, internal mode control

Text book

1. Computer-Based Industrial Control, Krishna Kant, 2nd Edition Prentice Hall of India Ltd.
2. Chemical Process Control – Theory and Practice, Stephanopoulous, Prentice Hall of India Ltd, 1984.
3. Fundamentals of Industrial Instrumentation and Process Control, William C. Dunn, Tata McGraw Hill, 2009.

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Course Outcome:

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

1. Select suitable sensor to measure industrial parameters and the different types of actuators and it's working. They will be able to design proper signal conditioning circuit to the transducer.
 2. Determine the effect of proportional gain, integral time, derivative gain constant on the system performance and will be able to tune the controller using tuning methods, implement pid using electronic, digital, pneumatic and hydraulic methods.
 3. Design the ladder logic to implement any process with given problem statement.
 4. Analyze dcs hardware and its merits/demerits in an industrial automation
 5. Analyze scada hardware and software and its merits/demerits in industrial automation.
- Design the complex control scheme to a particular process

Subject Code: OE-ROB701A	Category: Open Elective Courses
Subject Name: Industrial Pollution and Control	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: Basic Chemistry, Thermodynamics, Fluid Mechanics	

Course Objective:

1. To know about the various types of pollution caused by the industries and their effects on the environment.
2. To learn specifically about the causes, processes and control techniques of air pollution.
3. To know specifically about the causes, processes and control techniques of water pollution. To know specifically about the causes, processes and control techniques of noise pollution.

Course Content:

Module No.	Description of Topic	Contact Hrs.
1	Introduction; classification of pollution; effects of pollution on human beings, plants and animals.	8
2	Air pollution: physical effects; atmospheric dispersion and diffusion; method of sampling and analysis; modeling technique; practical control of air pollution and abatement.	10
3	Water pollution: water quality parameters; dispersion and diffusion of pollutants in water; control and abatement of water pollution.	9
4	Noise pollution: physics of sound generation and transmission; physical characters of noise; physiological effects of noise; measuring instruments and technique; assessment of noise; noise control principle, practice and laws.	9

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Course Outcomes:

After completing this course, the students will

1. Know about the various types of pollution caused by the industries and their effects on the environment.
2. Know specifically about the causes, processes and control techniques of air pollution.
3. Know specifically about the causes, processes and control techniques of water pollution.
4. Know specifically about the causes, processes and control techniques of noise pollution.

Learning Resources:

1. P.N. Chermisinoff, Air Pollution Control and Design for Industry, Taylor & Francis, 1993.
2. N.J. Sell, Industrial Pollution Control: Issues and Techniques, Wiley–Blackwell, 1992.

Subject Code: OE-ROB701B	Category: Open Elective Courses
Subject Name: Entrepreneurship	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

UNIT-I:

New Industrial Policy of 1991, Meaning and Definition of Entrepreneurship, Incentives and benefits available to SSI Units and New Entrepreneurs. Dearth of entrepreneurial talent in India, Growth of SSI in India. Procedures to start SSIs.

UNIT-II:

Market survey and research pricing and techniques, Distribution Channel, Sales promotion activities. Raising Finance and enterprise launching.

UNIT-III:

Financial Management, Working Capital Management, Costing, Book Keeping, Break-Even- Analysis. Taxation: Income Tax, Excise duty, Sales tax and VAT.

UNIT-IV:

Decision making – Types, Forecasting-Qualitative and Quantitative methods, Personal Management, Motivation and theories of motivation. Preliminary Project Report (PPR), Detailed Project Report (DPR) writing.

Text Book

1. Entrepreneurial Development. S.S.Khanka. S.Chand, 2007.

Reference Book

1. Industrial Organisation and Engg. Economics. Sharma & Banga. Khanna Publication, 2003.
2. Entrepreneurship New Venture Creation. David H.Holt. Prentice Hall. PHI, 2013.

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Course outcome: At the end of the course the students will be able to:

1. Know the contribution of an entrepreneur and role of SSI units in growth and development of socioeconomic condition of our country.
2. Learn market survey, sales promotions and management of working capital through costing and book keeping.
3. Know different decision making technique and benefit of personal management system as well as motivational methods of an enterprise.
4. Learn how to prepare a project report and knowledge about different tax system of an enterprise

Subject Code: OE-ROB701C	Category: Open Elective Courses
Subject Name: Object Oriented Programming	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Paradigm:

Evolution of programming paradigm, structured versus object-oriented development, Introduction to Object oriented programming concepts: Objects, classes, encapsulation and abstraction, inheritance, polymorphism, dynamic binding, message passing.

Moving from C to C++:

Introduction to C++, streams based I/O, name space, scope resolution operator (: :), variable declaration at the point of use, variable aliases-reference variables, strict type checking, parameter passing by reference, inline function, function overloading, default arguments.

Object and Classes:

Specifying and using classes, access specifiers: private, public, functions and data members, default arguments, function overloading, friend functions, static members.

Objects: memory considerations for objects, new and delete operators.

Constructors - default constructor, parameterized constructor, constructor with dynamic allocation, copy constructor, destructors.

Operator overloading- overloading through friend and member functions Binary operators: arithmetic, relational, assignment, insertion, extraction Unary operators: unary minus, post and pre-increment, post and pre- decrement, Conversion functions: class to basic, basic to class, class to class.

Inheritance:

Derived and base classes, Class hierarchies, public, private, and protected derivations, constructors in derived classes, destructors in derived classes, constructor's invocation and data member's initialization in derived classes, classes within classes, virtual base class.

Polymorphism:

Pointer to objects, pointer to derived class object, this pointer, run time and compile

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time polymorphism, virtual functions, pure virtual functions, abstract class, virtual destructor. **Files and Streams:**

Introduction to file handling, hierarchy of file stream classes, opening and closing of files, file modes, file pointers and their manipulators, sequential access, random access.

Exception handling and Templates:

Introduction to exception handling, throw point outside try, Multiple catch, Catch-all, throwing objects. Introduction to templates, class templates, function templates

Text Book

1. Object Oriented Programming with C++, E. Balaguruswamy, 6th Edition, 2013 TMG Hill

Reference Book

1. Object Oriented Programming with C++, Reema Thareja, OXFORD University Press, 1st Edition, 2015.
2. C++ completes reference, Herbert Schildt, TMG Hill, 4th Edition, 2002.
3. C++ How to Program, Deitel and Deitel, Pearson Education Asia, 8th Edition, 2011.
4. Object Oriented Programming with Ansi and Turbo C++, Ashok N Kamthane, Pearson Education, 1stEdition, 2003.
5. Object-Oriented Programming in C++, Robert Lafore, CourseSams Publishing, 4th Edition

Course Outcome: At the end of the course, the students will be able to:

1. Differentiate between structures oriented programming and object oriented programming.
2. Use object oriented programming language like c++ and associated libraries to develop object oriented programs.
3. Understand and apply various object oriented features like inheritance, data abstraction, encapsulation and polymorphism to solve various computing problems using c++ language.
4. Apply concepts of operator-overloading, constructors and destructors.
5. Apply exception handling and use built-in classes from stl.

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(Effective from academic session 2020-21)

Subject Code: OE-ROB701D	Category: Open Elective Courses
Subject Name: Cyber Law & Intellectual Property Rights	Semester: Seventh
L-T-P: 3-0-0	Credit: 3
Pre-Requisites: NA	

Cyber World:

An Overview, The internet and online resources, Security of information, Digital signature

An Overview Cyber Law:

Introduction about the cyber space, Regulation of cyber space – introducing cyber law Scope of Cyber laws – ecommerce; online contracts; IPRs (copyright, trademarks and software patenting); e-taxation; e-governance and cybercrimes, Cyber law in India with special reference to Information Technology (Amendment) Act, 2008

IPR:

Introduction: Origin and Genesis of IPR, Theories of IPR – Locke’s, Hegel and Marxian Ethical, moral and human rights perspectives of IPR, Intellectual Property Rights: International Relevance, Internationalization of IP protection – Paris Convention, Berne Convention, TRIPS Agreement – basic principles and minimum standards – limits of one-size-fit for all flexibilities under TRIPS

Intellectual Property: Issues and Challenges:

Geographical Indications, Layout designs of Integrated Circuits and Protection of Plant Varieties and Farmers' Rights. Copyright protection with reference to performers rights and Artist rights, Global governance towards Patents, Trade Marks: Legal recognition, Comparative analysis in India, EU and USA, Trade secrets: Legal recognition, Comparative analysis in India, EU and USA

Intellectual Property: Contemporary Trends

Benefit sharing and contractual agreements – International Treaty on Plant Genetic Resources for Food and Agriculture – issues on patent policy and farmers’ rights- CBD, Nagoya Protocol and Indian law, UNESCO – protection of folklore/cultural expressions Developments in WIPO on traditional knowledge and traditional cultural expressions

Text Book

1. Duggal Pavan, Cyber Law - An exhaustive section wise Commentary on The Information Technology Act along with Rules, Regulations, Policies, Notifications etc. UNIVERSAL LAW PUBLISHING CO. PVT. LTD. C-FF-1A, Dilkhush Industrial Estate, (Near Azad Pur Metro Station) G. T. Karnal Road, Delhi -110033, INDIA2014

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Reference Book

1. Intellectual Property Rights in India: General Issues and Implications Prankrishna Pal
2. Jonathan Rosenoer, "Cyberlaw: The Law of the Internet", Springer-verlag, 1997.
3. W. Cornish & Llewelyn – Intellectual Property: Patent, Copyrights, Trade Marks & Allied Rights", London Sweet & Maxwell.
4. Nard Madison- The Intellectual Property, Aspian Publication.
5. Carlosm Correa- Oxford commentaries on GATT/ WTO Agreements Trade Related aspects of Intellectual Property Rights, Oxford University Press.
6. Cornish William – Intellectual Property. Cambridge University Press.

Course Outcome: At the end of the course, the students will be able to:

1. Understand the role of intellectual property rights
2. Identify the main types of intellectual property rights
3. Understand the steps for successful registration and protection of intellectual property rights at national, regional and international levels
4. Search patent and trademark databases
5. Understand the legal aspects for intellectual property protection