



IPS ACADEMY INDORE

INSTITUTE OF ENGINEERING & SCIENCE

(AN AUTONOMOUS INSTITUTE BY UGC)

DEPARTMENT OF CHEMICAL ENGINEERING

V SEMESTER SCHEME & SYLLABUS

Semester V (Third Year)

S. No.	Course Code	Course Title	Hrs./ week			Credits
			L	T	P	
1	PCC-CH501	Mass Transfer-II	3	1	2	4
2	PCC-CH502	Computational Methods in Chemical Engineering	3	1	2	4
3	PCC-CH503	Chemical Reaction Engineering-I	3	1	2	4
4	PEC-CH501	Professional Elective-I	3	1	0	4
5	OEC-CH501	Professional Open Elective-I	3	1	0	4
6	PCC-CH504	Simulation Lab-I	0	0	4	2
7	PROJ-CH501	Seminar-I	0	0	2	1
Total			15	05	12	23
Total academic engagement and credits			32			23

	Professional Elective-I	Professional Open Elective-I
A	Chemical Technology	Entrepreneurship
B	Food Technology	Principles of Management & Managerial Economics
C	Process Piping Design	Intellectual Property Right
D	--	Digital Marketing & Search Engine Optimization

Course Code	Semester	Course Title	Load	Credit
PCC-CH501	V	Mass Transfer-II	3L:1T:2P (06 hrs)	Credits:04

Prerequisite(s): Chemical Process Calculation, Mass transfer-I

Course Objective: The objective of this subject is to introduce the undergraduate students with the most important separation equipments in the process industry, and provide proper understanding of unit operations. At the end of study the student will come to know basic operations of cooling towers, dryer, as well as design of a adsorber and calculations involved in liquid-liquid extraction and solid liquid extraction.

Course content:

Module 1:

9 hrs

Adsorption: Physical and chemical adsorption, adsorbents, adsorption equilibrium and isotherms. Heat of adsorption, batch and continuous adsorption, Single-stage, multi-stage cross-current and multi-stage counter current operations, equipments for adsorption such as fluidized bed, moving bed & fixed bed, concept of adsorption wave, break through curves, pressure swing adsorption.

Module 2:

7 hrs

Humidification and Dehumidification: Humidification : General Theory, psychometric chart, fundamental concepts in humidification & dehumidification, wet bulb temperature, adiabatic saturation temperature, measurement of humidification, calculation of humidification operation, cooling towers and related equipments.

Module 3:

7 hrs

Drying: Equilibrium mechanism of drying, theory of drying, various types of moisture in drying, drying rate curve, time of drying, batch and continuous drying, drying equipments such as tray dryers, rotary dryers, drum dryers, spray and tunnel dryers, fluidized bed dryers, etc.

Module 4:

10 hrs

Leaching and Crystallization: Solid-Liquid extraction(Leaching) fundamentals, Solvent selection, equilibrium relationship, single stage, multistage concurrent and counter current operation, equipments for solid-liquid extraction, their design procedure and selection criteria.

Crystallization: Theory of crystallization, saturation, supersaturation, nucleation and crystal growth, various types of equipment for crystallization, their operational and design characteristics.

Module 5:

9 hrs

Liquid –Liquid extraction: Fundamentals, Selection of Solvent , ternary liquid-liquid equilibrium, tie line data, plait point, extraction equipments such as mixer settler, packed & spray column, stage-wise contact: single stage, multistage concurrent and counter current operation for immiscible and partially miscible systems.

Course Outcomes:

After completion of this course, the students are able to:

- CO1: Knowledge about adsorption theory, types of adsorption. Calculation of single and multistage adsorption problem.
- CO2: Describe the concept of humidification and dehumidification. Design of cooling tower & related equipments.
- CO3: Explain theory of drying for batch and continuous drying. Apply the concept of drying to calculate time of drying and moisture content.
- CO4: Define principle of leaching and crystallization. Calculate the no. of stages for Co-current and counter current system.
- CO5: Evaluate the number of stages by Ponchon –Savarit method & Mc-Cabe-Thiele method. Design of extraction column.

Text/Reference Book:

- McCabe W.L., Smith J.C. and Harriott P. (2017) Unit Operations of Chemical Engineering”, 7th Ed., McGraw Hill.
- Coulson J. Richardson M., (2013) Chemical Engineering (5th Edition) Vol 2; Oxford:Butterworth Heinmann.
- Treybal R.E., (1981) Mass Transfer Operation (3rd Edition), New York: Mc. Graw Hill
- Sherwood, T.K., Pigford R.L. and Wilke, C.R.,(1975) Mass Transfer;New York: Mc. Graw Hill.
- Dutta. B.K., (2007) Principles of Mass Transfer and Separation Processes (1st Edition), Delhi:PHI Learning.

List of Experiment (Pl. expand it):

- To study the rate dissolution of a rotating cylinder and then to calculate the mass transfer coefficient.
- Study of Adsorption in a packed bed for a Solid liquid system, plotting the breakthrough curve of adsorption for a given system
- To study the performance of forced draft water-cooling tower.
- To study the drying characteristics of a wet granular material using natural and forced circulation in tray dryer.
- Studies on solid-liquid extraction column.
- To study the yield of crystals of a saturated solution using open tank type agitated batch crystallizer.
- To study the yield of crystals of a saturated solution using Swenson walker crystallizer.
- To draw the tie lines and plot equilibrium curve for given ternary system.
- Liquid- Liquid extraction in a packed column for co-current and counter current flow of binary systems.
- To Study on Liquid-Liquid extraction on a spray Extraction Column.

Note: Each student should perform at least eight experiments from the above list.

Course Code	Semester	Course Title	Load	Credit
PCC-CH502	V	Computation Methods in Chemical Engineering	3L:1T:2P (06 hrs)	Credits:04

Prerequisite(s): Mathematics-III

Course Objective

The objective of subject to understand the applications of computational techniques for chemical engineering calculations numerical techniques in chemical engineering calculations.

Module 1: **8 hrs**

Treatment of engineering data: Graphical representation. Empirical equations, Interpolation, Newton's formula, Lagrange's Interpolation formula, extrapolation, Integration, Graphical Integration, and Graphical Construction of Integral curves, Numerical Integration.

Module 2: **9 hrs**

Interpretation of Engineering Data: Significant figure, Classification of Measurements, Propagation of Errors, Variation and Distribution of Random Errors, Properties of Variance, Confidence limits for small samples.

Module 3: **7 hrs**

Ordinary Differential Equations: Formulation, Application of Law of Conservation of Mass–Mixing in flow process. Classification of ordinary Differential Equations and its applications to common Chemical Engineering problem.

Module 4: **9 hrs**

Numerical Solutions of Ordinary Different Equations: Linear Second– order Equations with variable coefficients, Numerical solution by Runge Kutta Method, Euler's Method. Its application to higher–order equations

Module 5: **8 hrs**

Formulation of partial Different Equations: Finite difference, linear finite difference equations, non-linear difference equations, Optimization, types of methods, its application relating to chemical processes.

Text/Reference Book:

1. Mickley HS, Sherwood and Reed; Applied Mathematics in Chemical Engineering; TMH pub.
2. Jenson & Jeffrey's; Mathematical Methods In Chemical Engineering; Mc Graw Hill
3. Luyben WL; Process modeling, simulation and control for chemical engineer; Mc Graw Hill
4. Mark E. Davis.: Numerical methods and modeling for chemical engineers, Dover Publication

Course Outcomes:

After completion of this course, the students are able to:

CO1: Ability to solve numerical integration, Newton's formula, Lagrange's interpolation formula & extrapolation.

CO2: Ability to discuss about interpreted engineering data, propagation of error, properties of variance.

CO3: Ability to formulate ordinary differential equation, classification and its application to chemical engineering problems.

CO4: Ability to solve ordinary differential equation by Runge-Kutta method.

CO5: Ability to formulate partial differential equation, finite difference.

List of Experiment (Pl. expands it):

1. Data representation and treatment by Graphical methods, Pressure- Volume-Temperature and concentration relationships for gases and their mixtures.
2. Integrated methods of data processing. Integral functions and their graphical representation.
3. Estimation of properties from empirical correlations (Nokay)
4. Estimation of critical properties from group contribution method.
5. Redlich-Kwong equation of state and other Virial equations to estimate thermodynamic properties like compressibility factor, molar volume and P-V-T relationships.
6. To study the effect of liquid viscosity and dissolved gases on pump efficiency, reciprocating pump performance.
7. Measurement errors their propagation and minimization of random errors. Selection of confidence limits.
8. Mass balance problems using continuity equation applied to a dynamic system. Formation of differential equations (component balance) and their solution & examples – CSTR and flow through pipes.
9. Numerical Solutions of batch reactor problems. Euler Algorithm
10. Runge-Kutta algorithm and its application in chemical Engineering. Implicit and explicit calculations. Problems related to effect design, optimum liquid concentration.
11. Transient flow of fluid unsteady temperature and varying concentration problems and use of partial differential equation to solve them.

Course Code	Semester	Course Title	Load	Credit
PCC-CH503	V	Chemical Reaction Engineering-I	3L:1T:2P (06 hrs)	Credits:04

Prerequisite Course: Chemical Process Calculations

Course Objective: To provide the comprehensive knowledge of reaction engineering and chemical Reactors.

Module 1:

8 hrs

Introduction: Definition of reaction rates, variables affecting reaction rates, classification of reactions, order, molecularity. The Reaction Rate Constant, concept of kinetics, Concentration dependent term of a rate equation, temperature dependent term of a rate equation.

Module 2:

9 hrs

Introduction to Reactor Design: Ideal reactors for single reaction: Ideal batch reactor, steady state Mixed Flow Reactor, steady state PFR, Holding time and space time for flow systems. Design for single reactions: Size comparison, multiple reactor systems; recycle Reactor, auto catalytic reactions.

Module 3:

6 hrs

Interpretation of Batch Reactor Data: Differential Method of Rate Analysis, Integral Method, variable volume batch reactor, temperature and reaction rate.

Module 4:

7 hrs

Design for Multiple Reactions: Parallel and series reactions, selectivity and yield factors, reactor choice for multiple reactions, Non Isothermal Reactor Design, optimum temperature progression.

Module 5:

10 hrs

Non-ideal Flow: Residence time distribution of fluids, General characteristics, Measurement of RTD, RTD in ideal reactor, Tanks-in-series model, Dispersion model, Conversion using RTD data for first order reactions.

Course Outcomes:

After completion of this course, the students are able to:

CO1: Ability to define the classification of reaction, reaction rate and order of reaction.

CO2: Ability to know classification of reactors and to design isothermal and non-isothermal batch, CSTR, PFR reactors.

CO3: Ability to interpret integral and differential method of kinetic analysis.

CO4: Ability to describe multiple reactions in batch, CSTR, PFR reactors.

CO5: Ability to evaluate RTD characteristics, dispersion model, tank and series model.

Text/Reference Book:

1. Levenspiel, O., "Chemical Reaction Engineering" ,3rd ed.,Wiley & Sons, Singapore, 1999.
2. Fogler, H. S., "Elements of Chemical Reaction Engineering," 3rd ed., Prentice Hall of India, 2003.
3. Smith, J. M., "Chemical Engineering Kinetics", 3rd ed. McGraw Hill, 1981.
4. Richardson, J.F., and Peacock D.G., "Coulson and Richardson's Chemical Engineering," vol. 3, 3rd ed., Asian Books Pvt. Ltd., New Delhi, 1998.

List of Experiment

- 1 Determine the rate constant and order of reaction between ethyl acetate per sodium hydroxide.
- 2 To study temperature dependency of rate constant, evaluation of activation energy and verification of Arrhenius law.
- 3 To study a homogeneous reaction in a semi-batch reactor under isothermal conditions.
- 4 Study of non catalytic homogeneous saponification reaction in CSTR.
- 5 To study a non-catalytic homogeneous reaction in a plug flow reactor.
- 6 To study the residence time distribution behavior of a back mix reactor.
- 7 To study the RTD behavior of a tubular reactor.
- 8 To study the RTD behavior of a packed bed reactor.
- 9 To study the behavior of a continuous flow reactor system-three reactor in series.
- 10 To study the kinetics of thermal decomposition of calcium carbonate.
- 11 To study a homogeneous catalytic reaction in a batch reactor under adiabatic conditions.
- 12 Study of non catalytic saponification reaction in a tubular flow reactor.

Course Code	Semester	Course Title	Load	Credit
PEC-CH501(A)	V	Chemical Technology	3L:1T:0P (04 hrs)	Credits:04

Prerequisite Course: Engineering Chemistry

Course Objective: To Study of organic and inorganic process industries involving process technology, raw material availability, production pattern, Engg. Problems involving material of construction, Environment pollution, waste utilization and disposal, energy consumption and conservation Equation.

Module 1: **9 hrs**

Industrial gases: Nitrogen, Oxygen, Hydrogen, Helium and Argon, Cement industry. Sulphur Industries: Sulphur dioxide, Sulphuric acid, Oleum. Nitrogen Industries: Ammonia, Nitric acid, Ammonium sulphate, Ammonium nitrate, Urea, Calcium ammonium nitrate.

Module 2: **8 hrs**

Chlor-alkali Industries: caustic soda, chlorine, hydrochloric acid and potassium salts. Phosphorus Industries: Phosphorus, Phosphoric acid, Phosphatic fertilizers. Mixed Fertilizers: SSP, TSP, and DAP.

Module 3: **7 hrs**

Alcohol industries: formation of alcohol, alcohol derivatives like acetic acid, acetic anhydride, vinyl acetate and ethylene glycol.

Module 4: **8 hrs**

Pulp and Paper: Types of raw material for pulping, Various pulping methods, Recovery of chemicals from black liquor, Manufacture of paper, Quality improvement of paper. Soaps and Detergents: Types of soaps, Soap manufacture, recovery and purification.

Module 5: **8 hrs**

Petroleum based products: phenol, methanol, ethylene, propylene, aromatic benzene, toluene, xylene, acrylo-nitrite, styrene and butadiene. Synthetic fibers: rayon, polyester, polyamides, acrylics, cellulose and acetate. Concept of bio-refineries.

Course Outcome

- CO1: Ability to understand about various industrial gases
- CO2: Ability to understand general overview about chlor-alkali Industries
- CO3: Ability to understand general overview about alcohol industries.
- CO4: Ability to understand general overview about pulp and paper:
- CO5: Ability to describe the processing petroleum based products.

Text/Reference Book:

1. Dryden's Outline of Chemical Technology for the 21st Century, Third Edn.
2. Shreve's Chemical Process Industry, Fifth Edn.

Course Code	Semester	Course Title	Load	Credit
PEC-CH501(B)	V	Food Technology	3L:1T:0P (04 hrs)	Credits:04

Prerequisite Course:

Course objective: Acquire the knowledge about evolution of food processing technology, food chemistry, principal of food processing and its packaging. Quality assurance and waste management in food industry.

Module 1:

6 hrs

Chemistry of Carbohydrates: Nomenclature, Classification and Structure of carbohydrates. Functional properties of carbohydrate in food. Chemistry of Lipids : Definition and classification, Chemistry of Proteins: classification, structure and chemistry of amino acids, peptides and proteins. Sources and distribution of proteins isolation, Chemistry of fatty acids and glycerides, Chemistry of processing of fats and oils.

Module 2:

8 hrs

Food Chemistry: Growth of microorganisms, Nutritional requirements of microorganisms, Methods of isolation and characterization of microorganisms, Effect of temperature on growth of microorganisms, Control of microorganisms by high and low temperature, Bacteriological analysis of food and water.

Module 3:

10 hrs

Principles of Food Processing (Unit operations in food processing, Heat & Mass Transfer in food technology) & Food Preservation Techniques (Cooking, Blanching, Pasteurization and Sterilization. Thermal Processing of Foods: Thermal conductivity of foods. Rate of heat penetration. Calculation of process time. Unit operations in canning. Irradiation–Effect of irradiation on food. Preservation by ionizing radiations, ultrasonic)

Module 4:

9 hrs

Food Quality-Analysis & Assurance (Food Laws such as FSSAI, Agmark, ISO, BIS, and Codex alimentaris. Packaging of Food Products (Principles of packaging, Types and function of packaging, materials. Filling and sealing of containers like metallic, glass and plastic containers. Flexible packaging laminated packaging and retortable pouches. Testing of packaging materials, computation of shelf life and requirement for packaging)

Module 5:

8 hrs

Management of Food Industry waste, waste utilization & disposal in food industry. Aerobic treatment of wastewater. Biomethanation. By product recovery and value addition to the food industry waste

Course Outcome:

CO1: Ability to understand chemistry of Carbohydrates, lipids and proteins.

CO2: Ability to describe growth and controlling of microorganisms.

CO3: Ability to understand the principles of food processing.

CO4: Ability to analyze the food quality standards.

CO5: Ability to understand the managing and utilization of food industry wastes.

Text/Reference Book:

1. Food Processing Technology – Principles and Practice by Dr. P. Fellow. Published jointly by Ellis Horwood Limited, Chichester, England and VCH VerlagsgesellschaftmbH, Weinheim Federal Republic of Germany.
2. Fundamental of Food Engineering by Charm SE. AVI Publishing Company Inc. Westport, Connecticut, USA.
3. Food Chemistry : L H Meyer, Van Nostrand Reinhold Co New York 1960
4. Food Microbiology by W C Frazier, Tata McGraw Hill Pub.Co.Ltd., New Delhi

Course Code	Semester	Course Title	Load	Credit
PEC-CH501(C)	V	Process Piping Design	3L:1T:0P (04 hrs)	Credits:04

Prerequisite Course: Fluid mechanics.

Course Objective: The aim of this subject is to expose the students to understand the basic piping design and its application to chemical engineering.

Course Content-

Module 1: 10 hrs

IS & BS codes for pipes used in chemical process industries and utilities. Selection of various piping materials such as Ferrous, non-ferrous and non-metallic. Pipes of circular and non-circular cross section-velocity distribution, average velocity and volumetric rate of flow. Flow through curved pipes (Variable cross sections). Pressure drop for flow of Newtonian fluids through pipes. Resistance to flow and pressure drop. Effect of Reynolds and apparent Reynolds number. Recommended design methods.

Module 2: 8 hrs

Flow through Process pipes, Shear stress, Shear rates behavior, apparent viscosity and its shear dependence, Power law index, Yield stress in fluids. Recommended design methods. Time dependant behavior, Mechanical analogues, and velocity pressure relationships for fluid, line. Recommended design methods.

Module 3: 7 hrs

Flow of gas-liquid, liquid- liquid, gas-solid and liquid-solid mixtures in pipes, flow pattern, holdup, pressure gradients and empirical overall correlations, bubble flow pattern, slug flow pattern, annular mist flow pattern Recommended design methods.

Module 4: 8 hrs

Flow of gas-liquid, liquid- liquid, gas-solid and liquid-solid mixtures in pipes, flow pattern, holdup, pressure gradients and empirical overall correlations, bubble flow pattern, slug flow pattern, annular mist flow pattern, Lockhart Martinelli relations, Flow pattern regimes. Recommended design methods, Case studies.

Module 5: 7 hrs

Functions of valves and their selection, valve materials and, material of construction for the following type: Gate, globe, Needle, piston, Butterflies, plug. Diaphragm, pinch, foot and float valves, Application of various valves and their operational characteristics relevant to piping engineering.

Course Outcomes

CO1: Ability to familiarize with piping codes, standard and Newtonian fluid flow through pipes.

CO2: Ability to understand the behavior of Non Newtonian fluid flow through process pipes

CO3: Ability to understand Pipe line Design and Power Losses in vertical Flow.

CO4: Ability to understand Pipe Line Design and Power Losses in Horizontal Flow.

CO5: Ability to analyze the application of various valves and their operational characteristics relevant to piping engineering.

Text/Reference Book:

1. Govier, G.W. and Aziz K.- The Flow of Complex Fluids in Pipes- Krieger Publication, Florida, 1982.
2. McKetta. John .J ,Piping Design Handbook, Marcel Dekker
3. Mohinder L Nayyar, Piping Handbook, McGraw Hill Book Co.
4. Rip Weaver , Process Piping Design Vol. 1, Gulf Publishing Co.
5. Coulson JM and Richardson J.F. – CHEMICAL ENGINEERING – Vol I, VI Edition, Butterworth Heinemann, British Library, Publication, Oxford, 1999.

Course Code	Semester	Course Title	Load	Credit
OEC-CH501(A)	V	Professional Open Elective-I Entrepreneurship	3L:1T:0P (04 hrs)	Credits:04

Pre requisite(s): Nil

Course Objectives:

- To develop conceptual understanding of the concept of Entrepreneurship
- To learn the government's policy.
- To Learn about types of Enterprises
- To Learn about E-commerce and its Technological Aspects
- To Learn about Digital Marketing

Course Content:

Module 1 (08 Hrs)

Entrepreneurship: Definition, requirements to be an entrepreneur, entrepreneur and intrapreneur, entrepreneur and manager, growth of entrepreneurship in India, women Entrepreneurship, rural and urban entrepreneurship.

Module 2 (10 Hrs)

Entrepreneurial Motivation Motivating factors, motivation theories-Maslow's Need Hierarchy Theory, McClelland's Acquired Need Theory, government's policy actions towards entrepreneurial motivation, entrepreneurship development programmes.

Module 3 (10 Hrs)

Types of Enterprises and Ownership Structure: Small scale, medium scale and large scale enterprises, role of small enterprises in economic development; proprietorship, partnership, Ltd. companies and co-operatives: their formation, capital structure and source of finance.

Module 4 (12 Hrs)

E-commerce and its Technological Aspects: Overview of developments in Information Technology and Defining E-Commerce: The scope of E commerce, Electronic Market, Electronic Data Interchange, Internet Commerce, Benefits and limitations of E-Commerce, Produce a generic framework for E-Commerce, Architectural framework of Electronic Commerce, Web based E Commerce Architecture.

Module 5 (10 Hrs)

Introduction to Digital Marketing: Evolution of Digital Marketing from traditional to modern era, Role of Internet, Search Engine Advertising, Display marketing, Social Media Marketing.

Course outcomes:

1. To inculcate entrepreneurship skills to students.
2. To aware about industry structure and how to start up a company.
3. To aware about types of Enterprises.
4. To understand E-commerce practices.

5. To understand and practice Digital Marketing.

Text Books:

1. Koontz & O'Donnel, Essentials of Management, Tata McGraw Hill, New Delhi, 2009
2. Peter F Drucker, The Practice of Management, McGraw Hill, New York, 1960
3. Peter F. Drucker, Innovation and Development, McGraw Hill, New York, 2000.

Reference Books:

1. Mohanty SK; Fundamental of Entrepreneurship; PHI, 2005.
2. Davis & Olson; Management Information System; TMH, 1985.

Course Code	Semester	Course Title	Load	Credit
OEC-CH501	V	Professional Open Elective-I Principles of Management and Managerial Economics	3L:1T:0P (04 hrs)	Credits:04

Course Objectives:

- Explain management, organization and the roles of managers & Explain different theories of management.
- Describe the importance of planning and organization Structure.
- Discuss the control process and its elements
- Explain the term Managerial Economics & its importance.
- Explain productivity & factors that affect productivity.

Module- 1 Introduction: Definition, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Difference between Management and Administration. Significance of Values and Ethics in Management.

Evolution of Management: Thought Approaches of Management Thought, Functions of Management. Different theories of Management. (08 Hrs)

Module- 2 Planning and Organizing: Nature, Scope, Objective and Significance of Planning, Elements and Steps of Planning, Decision Making Organizing Principles, Span of Control, Line and Staff Relationship, Authority, Delegation and Decentralization. Effective Organizing, Organizational Structures, Formal and Informal Organizations, Staffing. (10 Hrs)

Module- 3 Directing: Effective Directing, Supervision, Motivation, Different Theories of Motivation, Concept of Leadership- Theories and Styles. Communication Process, Channels and Barriers, Effective Communication.

Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Effective Control Systems. Coordination Concept, Importance, Principles and Techniques of Coordination, Concept of Managerial Effectiveness. (08 Hrs)

Module- 4 Managerial Economics: Introduction, Factors Influencing Manager, Micro and Macro-economics, Theory of the Cost, Theory of the Firm, Theory of Production Function. (08 Hrs)

Module- 5 Productivity: Input-Output Analysis, Micro-economics Applied to Plants and Industrial Undertakings, Production and Production system, Productivity, Factors affecting Productivity, Increasing Productivity of Resources. (10 Hrs)

Case Studies.

Course Outcomes: After completion of the course student will be able to:

- Understanding of basic concepts, principles and practices of management
- Understanding the planning and organizing & organization Structures.
- Importance of Management Control Techniques
- Understand the term Managerial Economics• & its importance.
- Understand productivity• & factors that affect productivity.

Text Books:

1. Chhabra T.N., Principles and Practice of Management. 10th ed Year 2018.
2. Murton- Gulab, Management Today. 3th ed.1998
3. KoontzH. and O'Donnell., Essential of Management, 8th ed., McGraw-Hill, New Delhi, 2009.
4. Robbins, S.Fundamentals of Management. 5th ed., Pearson Education, Canada, 2008.

Reference Book:

1. Prasad L M, Principles and Practices of Management, S. Chand and Sons, New Delhi ,2018
2. Terry & Francklin, Principles of Management, Richard– Erwin.18th Ed. 1982

Course Code	Semester	Course Title	Load	Credit
OEC-CH501(C)	V	Professional Open Elective-I Intellectual Property Rights	3L:1T:0P (04 hrs)	Credits:04

Pre requisite(s): Nil

Course Objective:

- To be familiar with the concept of intellectual property.
- To be familiar with Purpose and function of trademarks
- To be familiar with Fundamental of copy right law
- To clear idea of the trade Secrete.
- To be familiar with latest development in the field of intellectual property.

Module 1 (08 Hrs)

Introduction to Intellectual Property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

Module 2 (08 Hrs)

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

Module 3 (10 Hrs)

Law of Copyrights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copyright registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

Module 4 (08 Hrs)

Trade-Secrets: Trade secretes law, determination of trade secretes status, and liability form is appropriations of trade secrets, protection for submission, trade secretes litigation. Unfair competition: Misappropriation right of publicity, false advertising.

Module 5 (08 Hrs)

New Development In Intellectual Property: new developments in trade mark law; copy right law, patent law, intellectual property audits. International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

Course Outcome:

After completion of the course student will be able to:

1. Understand the concept of intellectual property.
2. Understand what is trademark and its importance.
3. Understand the law of copyright.
4. Understand how trade secrete help in competitive market
5. Understand the latest trends in intellectual property.

Text Books & References:

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, Prabuddha Ganguli, Tata McGraw Hill Publishing company ltd.,

Course Code	Semester	Course Title	Load	Credit
PCC-CH504	V	Simulation Lab- I	L:T:4P (04 hrs)	Credits:02

Simulation Study of Various Chemical Process with the help of Software: AFT Fathom,

Course Code	Semester	Course Title	Load	Credit
PROJ-CH501	V	Seminar-I	L:T:2P (04 hrs)	Credits:01