IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Semester IV (Second Year)
For admitted in July 2022 (*w.e.f. July, 2023*)

S.No.	Course Type	Course Code	Course Title	Hrs./ Week			Credits
				L	T	P	
1	BSC	MA03	Statistics & Probability	3	1	-	3
2	PCC	CH05	Chemical Engineering Thermodynamics-II	3	1	-	3
3	PCC	CH06	Heat Transfer	3	1	-	3
4	PCC	CH07	Mass Transfer-I	3	1	-	3
5	PCC	CH08	Fuel Technology	3	1	-	3
6	HSMC	HS04	Entrepreneurship and Principles of Management	1	-	-	1
7	IFC	AL01	Inter-Disciplinary Foundation Course-I	2	-	-	2
8	LC	CH06(P)	Heat Transfer	-	-	2	1
9	LC	CH07(P)	Mass Transfer-I	-	-	2	1
10	LC	CH08(P)	Fuel Technology	-	-	2	1
11	SBC	CH01(P)	Computer Applications in Chemical Engineering	-	-	2	1
12	LLC	LLC02	Liberal Learning Course-II	-	-	2	1
13	MLC	MLC02	Constitution of India	1	-	-	Audit
Total Credits							23

❖ **Interdisciplinary Foundation Course-I**
Foundation of AIML (Offered by CSE department)

❖ **Liberal Learning Course-II, LLC02 (Any One Course from NSS/ NCC/NSO/NCA)**
A. NSS
B. NCC
C. NSO
➢ Any one Sports at State Level
D. NCA
(A) Music
(B) Western Dance
(C) Photography
(D) Cinematography
(E) Podcasting
(F) Theatre
(G) Madhubani Painting
(H) Kathak

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Course Code	Semester	Course Title	Load	Credit
BSC-MA03	IV	Statistics & Probability	3L:1T:0P (04 hrs)	Credits:03

Course Objective: The objective of this course is two familiarize the students with statistical techniques, develop statistical skills and increase students' thinking power. It aims to equip the students with standard concepts and tools at an intermediate to advance level that will serve them well towards tackling various problems in the discipline.

MODULE 1: **(10 Hours)**
Data Collection & Analysis : Introduction and importance of statistics, Types of data, Methods of collecting primary data, Methods of sampling, Merits and limitations of sampling, Types of classification, Formation of frequency distribution, Tabulation of data, Frequency distribution, Types of graphs and diagrams, Histogram, Bar diagram, Frequency polygon, Frequency curve, Ogive, Pie diagram, Pictogram.

MODULE 2: **(8 Hours)**
Statistical Measures: Measures of central tendency, Arithmetic mean, Median, Mode, Geometric mean, Harmonic mean, Measures of absolute dispersion, Range, Quartile deviation, Average deviation, Standard deviation, Skewness and Kurtosis.

MODULE 3: **(9 Hours)**
Correlation & Regression Analysis : Introduction, Significance, Types, Scatter diagram, Karl Pearson's correlation coefficient, Coefficient of correlation, Rank correlation coefficient, Regression lines, Regression equations, Standard error of estimate. (9 Hours)

MODULE 4: **(10 Hours)**
Probability Theory : Definition of probability, Mutually exclusive events, Additive law of probability, Compound events, Dependent and independent events, Multiplicative law of probability, Conditional probability, Total probability, Bayes' theorem, Random variables and their properties, Probability mass function, Probability density function.

MODULE 5: **(8 Hours)**
Discrete and Continuous Probability Distributions: Introduction, Discrete distribution: Binomial and Poisson's distribution, Continuous distribution: Normal distribution, Exponential distribution, Gamma & Beta distribution.

Course Objectives:

CO1: To explain concept of statistical analysis and find the distribution behind data

CO2: To explain and apply the basic ideas of statistics including measures of Central tendency.

CO3: To explain and apply the concepts of correlation and regression

CO4: To define the principal concepts about probability and apply to engineering problems.

CO5: To explain and apply the concepts of probability distribution in evaluation of engineering problems. Express the features of discrete and continuous random variables.

Textbooks/References:

1. J. Susan Milton and Jesse Arnold, Introduction to Probability and Statistics, McGraw Hills 2017
2. B.V. Ramanna, Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 2017.
3. C. Douglas Montgomery and G. C .Runger, Applied Statistic and Probability for Engineers,
4. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Probability and Statistics for engineering and Scientist, Pearson Education, 9th Edition, 2011.
5. Dr. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44 thEdition, 2020.
6. Dr. T.K.V. Iyengar, B.Krishna Gandhi, S.Ranganatham, Dr. M.V.S.S.N. Prasad,Probability and Statics S. Chand Publication,
7. A Text Book for Probability and Statistics, Morris H. Degroot, 4th Edition 2012.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
PCC-CH05	IV	Chemical Engineering Thermodynamics-II	3L:1T:0P (04 hrs)	Credit:03

Prerequisite(s): Chemical Engineering Thermodynamics-I

Course objective-The objective of this course to understand the theory and applications of Solution thermodynamics, thermodynamic properties of pure fluid, and various cycles like vapor compression cycle etc.

Course content-

MODULE 1: (10 hrs)
Thermodynamic properties of pure fluid**,** Helmholtz free energy, Gibbs free energy Relationship among thermodynamic properties, Maxwell's relationship, Clausius equation Clausius-Clapeyron equation, Gibbs-Helmholtz equation, Joule-Thomson coefficient.

MODULE 2: (12 hrs)
Thermodynamic properties of homogeneous mixtures; property relationship for systems of variable compositions, partial molar properties, fugacity & fugacity-coefficient in ideal- solution, concept of fugacity departure, Activity.

MODULE 3: (10 hrs)
Chemical potential & its physical significance, effect of pressure & temperature on heat of reaction, concept of free energy Vant-Hoffs equation, Gibbs-Duhem relationship of free energy with equilibrium constant, chemical reaction equilibria & its applications.

MODULE 4: (08 hrs)
Change of mixing activity, heat effects in mixing, activity effect in gaseous mixture, Excess properties, Residual properties.

MODULE 5: (06 hrs)
Refrigeration, ideal reversed Carnot cycle, vapor compression refrigeration, component of vapor compression plant (compressor, condenser, expansion device, and evaporator) propertiesof refrigerant

Course Outcomes:
After completion of this course, the students are able to:
1: Understand thermodynamic properties of pure fluid.
2: Ability to apply the concept of partial molar properties and its importance in heterogeneoussolutions.
3: Capable to apply the concept of chemical potential and its significance in equilibrium.4: Ability to understand the concept of heat effect in mixing and activity effect.
5: Ability to understand the concept of refrigeration and its application.

Text/Reference Book-

1. K.V Narayanan (2010). A Textbook of Chemical Engineering Thermodynamics. (1stEdition). PHI learning private limited, New Delhi
2. J. M. Smith, H.C. Ness, M. Abbott (2009). Introduction to Chemical Engineering Thermodynamics. (7th Edition). McGraw Hill Education.
3. Daubert, T. E. (Thomas E.), 1937- Chemical Engineering Thermodynamics. (1stEdition McGraw-Hill) New York.
4. Stanley I. Sandler, Thermodynamics, 5th Edition, John Wiley & Sons 2017.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
PCC-CH06	IV	Heat Transfer	3L:1T:0P (04 hrs)	Credits:03

Prerequisite(s): Chemical Process Calculation

Course objective-To understand the fundamentals of heat transfer mechanisms in fluids and solids and their applications in various heat transfer equipment in process industries.

Course content-

MODULE 1: **(07 hrs)**

Conduction- Modes of heat transfer one dimensional and two-dimensional, heat rate equations, Theory of insulation, critical radius calculations, types of insulation material, conduction through slab, cylinder and sphere.

MODULE 2: **(08 hrs)**

Convective heat transfer in boundary layer and in films, natural and forced convection, co/counter/cross current contacting for heat transfer, individual and overall heat transfer coefficient, fouling factor.

MODULE 3: **(06 hrs)**

Radioactive heat transfer- Black body radiation, concept of shape factor, methods of determination of shape factor, radiation exchange in enclosure with black surfaces.

MODULE 4: **(10 hrs)**

Heat transfer under phase change conditions-boiling and condensation of pure components, heat flux temperature diagram for boiling and condensation under vertical and horizontal surfaces, nucleate & pool boiling, effect of surface condition on condensation, correlation for heat transfer under condensation. Evaporation- Type of evaporators and their applications single and multiple effect evaporators, design and operation of forward– backward and mixed feed operations, effect of boiling point elevation and hydrostatic head, vapor recompression.

MODULE 5: **(09 hrs)**

Heat Exchange equipment- Introduction to general design of double pipe, shell and tube heat exchangers, condensers, extended surface equipment's. Heat exchanger equation– coil to fluid, jacket to fluid.

Course Outcomes:

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

1: Understand modes of heat transfer, heat rate equation, theory of insulation.

2: Solve convective heat transfer problems, individual and overall heat transfer coefficient,fouling factor.

3: Solve radiative heat transfer problems.

4: Understand heat transfer under phase change conditions, boiling & condensation and todesign forward and backward evaporators.

5:Design of double pipe shell and tube exchanger, condensers, extended surface equipment

Text/Reference Book-

1.McCabe W.L., Smith J.C. and Harriott P. (2017) Unit Operations of ChemicalEngineering", 7th Ed., McGraw Hill. Holman J.P.9th Ed, 2001, Heat Transfer, New York, McGraw Hill.

2.Incropera F.P. and Dewitt D.P. Fundamentals of Heat and Mass Transfer. Wiley; 5thEdition John Wiley. 2001

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
PCC-CH07	IV	Mass Transfer-I	3L:1T:0P (04 hrs)	Credits:03

Prerequisite(s): Chemical Process Calculation

Course Objective: The Objective of these subject diffusion phenomena, fundamentals of mass transfer and techniques involved in mass transfer operations of distillation and absorption.

Course content-

Module 1: **(09 hrs)**

Introduction: Mass transfer operation, Classification of mass transfer operations, choice of separation methods.Molecular diffusion: Fick's law of diffusion, steady state diffusion, multicomponent diffusion, measurement and prediction of diffusion coefficients, molecular diffusion in gases, liquid and solids, Knudsen diffusion, surface diffusion, eddy diffusion. Local and overall mass transfer coefficients.

Module 2: **(09 hrs)**

Fundamentals of Mass Transfer: Interphase mass transfer, two phase flow, local overall mass transfer coefficients and their inter relationships, analogies in mass, heat and momentum transfer. Mass transfer theories: film theory, penetration theory and surface renewal, material balance for co current and counter current processes, column internals: types of trays/ plates and packing, concept of ideal stage and stage efficient.

Module 3: **(08 hrs)**

Vapor liquid equilibrium, boiling point diagram, relative volatility, flash and differential distillation for two component mixture, steam distillation, azeotropic distillation, extractive distillation

Module 4 **(10 hrs)**

Continuous and Differential contact Distillation: Rectification, reflux ratio, calculation, optimum reflux ratio, open steam, partial condenser, multiple feed and multiple product calculations, enthalpy concentration diagram, Panchon-Savarit method for calculation of number of theoretical plates, Fensky and Underwood equation for minimum numbers of plate calculation, batch distillation.

Module 5: **(09 hrs)**

Absorption: Absorption and stripping of dilute mixtures: Fundamentals of absorption, equilibrium curves, choice of solvent, co-current and counter current contacting fluids, Minimum solvent flow rate, estimation of number of ideal stages – graphical and analytical methods, significance of absorption factor, design of packed column, calculation of NTU and HTU, Concept of HETP.

Course Outcomes:

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

1: Understand the knowledge of mass transfer by applying principles of diffusion, masstransfer coefficients

2: Estimate the mass transfer coefficients and their inter relationship. Understanding differenttheories of mass transfer analogies and inter-phase mass transfer.

3: Understand the vapor liquid equilibrium and different type of distillation.4: Evaluate the number of theoretical stages by different methods.
5: To determine NTU, HTU, HETP and height of packed bed used for absorption.

Text/Reference Book-

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

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
PCC-CH08	IV	Fuel Technology	3L:1T:0P (04 hrs)	Credits:03

Prerequisite(s): Applied Chemistry

Course objective-The objective of this course to understand processing and limitations of fossil fuels (coal, petroleum and natural gas) and necessity of harnessing alternate energy resources such as solar, wind, nuclear, geothermal tidal and biomass. Also understand and practice various characterization techniques for fuels.

Course content-

MODULE 1: (08 hrs)

Solid Fuels & Coal Carbonization:Coal & lignite reserves in India, classifications of coal, washing of coal, analysis of coal, proximate and ultimate analysis. Mechanism of low temperature carbonization and high temperature carbonization, byproduct recovery from coke oven, properties of coke coal, grinding, pulverization, briquetting of solid fuels.

MODULE 2: (08 hrs)

Liquid Fuels:Origin of petroleum production, distillation, thermal & catalytic cracking, coking, reforming, isomerizations, crude oil classification, reserves of hydrocarbon in India, introduction to petroleum refining and processing.

MODULE 3: (08 hrs)

Petroleum Products Properties and Its Utilization:Petroleum product and their utilization, diesel, petrol, blending of petrol for octane number boosting, AVL (aviation liquid fuel), kerosene, fuel & furnace oil, testing of petroleum product: flash point, pore point, fire point, octane number, cetane number, viscosity and viscosity index, API.

MODULE 4: (08 hrs)

Gaseous fuels:Natural gas, synthesis gas, producer gas, water gas, coal gas, LPG, CNG and hydrogen as a fuel, composition properties and uses.

MODULE 5: (08 hrs)

Renewable Energy Sources and Fuel cell:Types of solar cell and fabrication, wind energy, principles of tidal energy. Principle and working of fuel cell, various types, construction and itsapplication

Course Outcomes:

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

1: Recall coal reserves in India & explain washing of coal & Discuss coal classification2: Interpret mechanism of low and high temp carbonization

3: Illustrate the knowledge of petroleum processing like cracking, reforming, distillation and isomerization

4: Estimate properties of petroleum product and understand composition and properties ofgaseous fuel

5: Discuss principle, working & construction of fuel cell and support renewable energy sources.

Text/Reference Book-

1. Sarkar S; Fuel and Combustion; Orient Long men Ltd.
2. Gupta OP; Fuel and Combustion; Khanna Publication.
3. Gary; Refining of Petroleum Technology.
4. D.P. Kothari, K. C. Signal, R. Rajan, Renewable Energy Sources and Emergingtechnology, PHI Learning pvt. Ltd.
5. G.D. Roy, Non-Conventional Energy Source, Khanna Publisher.
6. J. Twidel, T Weir, Renewable Energy Sources, Taylor and Francis.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
HSMC-HS04	IV	Entrepreneurship & Principles of Management	1L:0T:0P (02 hrs)	Credits:01

Pre requisite(s): Nil

Course Objectives:
- Explain Entrepreneurship and its importance
- Describe the importance E-commerce
- Explain the importance Digital Marketing in current scenario.
- Describe the importance of planning and organization Structure.
- Discuss the control process and its elements

Course Content:

MODULE 1 **(08 Hrs)**

Entrepreneurship: Definition, requirements to be an entrepreneur, entrepreneur and intrapreneur, entrepreneur and manager, growth of entrepreneurship in India, Types of Enterprises and Ownership Structure**.**

MODULE 2 **(10 Hrs)**

E-commerce and its Technological Aspects: Overview of developments in Information Technology and Defining E-Commerce: The scope of E commerce, Benefits and limitations of E-Commerce.

MODULE 3 **(08 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

MODULE 4 **(08 Hrs)**

Business Management: Definition, Functions, Process, Scope and Significance of Management. Nature of Management, Managerial Roles, Managerial Skills and Activities, Propritership, Ltd., Pvt. Ltd., Company act registration, Startup India, DPIIT, Yukti Portal, Gumasta Lisences, Indian startup policy, MP startup policy, Closing a company, Leadership aspects.

MODULE 5 **(10 Hrs)**

Management Functions: Nature, Scope, Objective and Significance, Elements and Steps of Planning & organizing, Delegation and Decentralization. Formal and Informal Organizations.
Directing: Effective Directing, Supervision, Different Theories of Motivation,
Controlling and Coordinating: Elements of Managerial Control, Control Systems, Management Control Techniques, Coordination Concept, Importance, Principles and Techniques of Coordination.

Course Outcomes:

After completion of the course student will be able to:
1. Understanding of basic concepts, principles and practices entrepreneurship.
2. Understanding of basic concepts & Importance of e-commerce.
3. Understanding of basic concepts of digital marketing
4. Understanding the planning and organizing & organization Structures.
5. Importance of Management Control Techniques

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‟DonnelH., Essential of Management, 8th ed., McGraw-Hill, New Delhi, 2009.
4. Robbins, S. Fundamentals of Management. 5th ed., Pearson Education, Canada, 2008.
5. Mohanty SK; Fundamental of Entrepreneurship; PHI, 2005.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
IFC-AL01	IV	Foundation of AIML	2L:0T:0P (02 hrs)	Credits:02

Course Objective:
The objective of this course is to understand fundamental of AI & ML with Block Chain Technology.

Course Contents: (22 hrs.)

MODULE 1: **(04 HRS.)**
Introduction to Artificial Intelligence, Need of AI, Goals of AI, Applications of AI, Types of AI, Basic Problem Solving: Informed & Uninformed Search algorithms, Hill CLimbing Algorithm.

MODULE 2 : **(05 HRS.)**
Working of machine learning, Machine Learning Life Cycle, Datasets & Data preprocessing, Types of learning methods: Supervised Learning, Unsupervised Learning, Reinforcement Learning, Some basic supervised learning algorithms: Linear Regression & K Nearest Neighbors.

MODULE 3: **(05 HRS.)**
Blockchain Technology: Introduction, Need of blockchain (solving double spending), Public Key Cryptography, Hashing, Blockchain vs Database, Blockchain Data Management, Limitations of Blockchain,

MODULE 4: **(04 HRS.)**
Bitcoin: An application of Blockchain Technology, Basic Components of Bitcoin, Bitcoin mining & role of miners, Chaining of blocks & Distributed ledger, Privacy in Bitcoin system.

MODULE 5: **(04 hrs.)**
Introduction to various online tools & python libraries, Demonstration of Case studies using Kaggle online tool: Predicting House Prices using Boston Housing Dataset & Performing K-NN algorithm on Iris Dataset.

Course Outcome:
1. Identifying Needs & Uses of AI & ML in the modern world.
2. Getting Acquinted with Blockchain Technology & Understanding its working
3. Studying an application of Blockchain i.e. Bitcoin.
4. Understanding Practical implementation of Machine Learning
5. Working with a few popular case studies pertaining to Machine Learning

List of Text / Reference Books
1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-GrawHill.
2. Introduction to AI & Expert System: Dan W.Patterson, PHI.
3. The Hundred-Page Machine Learning Book: Andriy Burkov
4. BASICS OF BITCOINS & BLOCKCHAINS: An Introduction to Cryptocurrencies and the Technology that Powers Them: Anthony Lewis
5. Blockchain Basics: A Non-Technical Introduction in 25 Steps.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
LC-CH06(P)	IV	Heat Transfer	0L:0T:2P (04 hrs)	Credits:01

List of experiments-To ascertain the…

1. Thermal conductivity of metal rod.
2. Equivalent thermal conductivity of composite wall.
3. Heat transfer coefficient in force convection.
4. Heat transfer coefficient in Natural convection.
5. Heat transfer coefficient with the help of Stefan Boltzmann Apparatus.
6. Emissivity of the test plate by emissivity measurement apparatus.
7. Heat transfer coefficient in double pipe heat exchanger.
8. Heat transfer characteristics of a shell and tube heat exchanger (heating/cooling) ofwater.
9. Heat transfer coefficient in parallel and counter flow heat exchanger.
10. Rate of evaporation using an open pan evaporator.
11. Rate of condensation of pure water vapor and to determine the heat transfer coefficient.
12. Demonstrate the film-wise drop-wise condensation and determination of the heattransfer coefficient.
13. Study the single effect evaporator and find out the heat transfer coefficient.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
LC-CH07(P)	IV	Mass Transfer	0L:0T:2P (04 hrs)	Credits:01

List of Experiment-Determination of….

1. Diffusion coefficient, or diffusivity, of given liquid in air.
2. Mass transfer coefficient in gas liquid system by evaporation.
3. Study the rates and phenomena of diffusion into gases flowing through the pipe.
4. Study different types of plates and packing.
5. Study the rates and phenomena of diffusion into gases flowing through the pipe andalso to verify the Sherwood & Gilliland correlations.
6. Vapor-liquid equilibrium and boiling point diagram for a binary liquid mixture.
7. Validate Rayleigh equation for differential distillation of binary system.
8. Rate of distillation by steam distillation.
9. Studies on packed tower distillation unit.
10. Studies on the sieve plate distillation unit.
11. Studies on bubble cap distillation column.
12. Mass transfer coefficient for absorption of CO_2 in NaOH solution in packedcolumn.packed column.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Subject Code	Semester	Course Title	Load	Credit
LC-CH08(P)	IV	Fuel Technology	0L:0T:2P (04 hrs)	Credits:01

List of experiments-

1. Proximate analysis of the given coal sample.
2. Determine the viscosity of the given oil sample by Redwood Viscometer. No. 1 and No.2
3. Calculate the viscosity of a given oil sample by Saybolt viscometer.
4. Estimate the viscosity of a given coal tar with the help of tar viscometer.
5. Evaluate the flash and fire points of the given oil sample by Penskey Martin'sapparatus.
6. Find the flash and fire points of the given oil sample by Abel's apparatus.
7. Determine the flash and fire points of the given oil sample by Cleveland apparatus.
8. Investigate the carbon residue of the given oil by Conradson method.
9. Calculatethe cloud and pour point of given oil sample by cloud and pour pointapparatus.
10. Find the composition of given gas by Orsat apparatus.
11. Study the method of determination of calorific value by Bomb-Calorimeter.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Course Code	Semester	Course Title	Load	Credit
SBC-CH01	**IV**	**Computer Applications in Chemical Engineering**	**0L:0T:2P (02 hrs)**	**Credits:01**

Course objective: The objective of the course to understand the application Microsoft (MS) excel to solve chemical engineering numerical

List of experiments-

1. Introduction to MS excel and discuss basic operations
2. Explain the diverse function in MS excel
3. Unit conversions of chemical process.
4. Ability to solve material balance solution using MS excel
5. Discuss energy balance solution using MS excel.

IPS Academy
Institute of Engineering & Science
(*A UGC Autonomous Institute, Affiliated to RGPV, Bhopal*)
Scheme & Syllabus Based on AICTE Flexible Curricula
B. Tech, Chemical Engineering Department

Course Code	Semester	Course Title	Load	Credit
MLC-MLC02	IV	Constitution of India	2L:0T:0P (02 hrs)	Credits:00

Course Objective: The objective of this course is to familiarize the students with the feature ofthe Indian constitution, laws, democracy etc.

Course content-

MODULE 1: **(08 hrs)**

Historical background: Formation and working of constituent assembly, formation and working of drafting committee, commencement of Indian constitution, Dr. Ambedkar's ideasof reservation in constitution.

MODULE 2: **(08 hrs)**

Important feature of the constitution: Preamble, fundamental rights, directive principles of state policy, fundamental duties, centerstate relation.

MODULE 3: **(08 hrs)**

Parliamentary democracy: Loksabha, Rajyasabha, central exclusive president, prime minister, and central ministry, Vidhansabha, Vidhanparishad and state executive (Governor, Chief minister, Minister of state).

MODULE 4: **(08 hrs)**

Special provisions in Indian constitution: finance commission contingency fund, consolidated fund, public service commissions, election commission, safeguards for SC, ST and backward classes, provisions for emergency and constitutional amendments, Indian judiciary supreme court and high court.

Course Outcomes:

After completion of this course, the students are able to:
1: Commencement of Indian Constitution2: Features of Indian constitution
3: Working and functions of Parliamentary house4: Provisions in Indian Constitution

Text/Reference Book-

1. Austin, G. (1999), The Indian Constitution, Oxford, Oxford University Press
2. Pylee, M. V. (2016), India's Constitution (16 Edition), New, Delhi, S. ChandPublication
3. Kumar, R.(2011), Ambedkar and Constitution (1st Edition), New Delhi,Commonwealth Publication Pvt. Ltd.

----------**----------**----------