



List of Revised Courses

Department : **Chemical Engineering**

Program Name : **B.Tech.**

Academic Year : **2019-20**

List of Revised Courses

Sr. No.	Course Code	Name of the Course
01.	CH03TBS06	Mathematics-III
02.	CH03TPC01	Material And Energy Balance Calculations
03.	CH03TPC02	Fluid Mechanics
04.	CH03TPC03	Thermodynamics-II
05.	CH04TPC04	Numerical Methods In Chemical Engineering
06.	CH04TPC06	Particle And Fluid Particle-Processing
07.	CH04TPC07	Process Instrumentation



Minutes of Meetings (MoM) of Board of Studies (BoS)

Academic Year : 2019-20

School : School of Studies of Engineering and Technology

Department : Chemical Engineering

Date and Time : May 13, 2019 - 11:30 AM

Venue : HoD Room

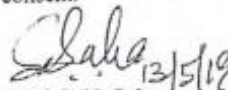
Minutes of Meetings

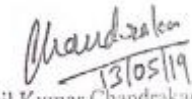
The scheduled meeting of member of Board of Studies (BOS) was held today (13th May 2019) in the office of Prof. S.N. Saha, Chemical Engineering Department to discuss the B.Tech. III and IV semester scheme and syllabi. The following members were present in the meeting:


1. Prof. S. N. Saha (Member BOS, Dept. of Chemical Engg)
2. Dr. Anil Kumar Chandrakar (HoD (I/c), Chemical Engg. -cum- Chairman, BOS)
3. Mrs. A. N. Joshi (Member BOS, Dept. of Chemical Engg)
4. Mr. Amit Jain (Invited Member, Astd. Prof., Dept. of Chemical Engg.)
5. Mr. G. P. Dewangan (Invited Member, Astd. Prof., Dept. of Chemical Engg.)
6. Dr. Sandeep Singh (Invited Member, Astd. Prof., Dept. of Mathematics)
7. Ms. Jasinta Poonam Ekka (Invited Member, Astd. Prof., Dept. of Mechanical Engg.)

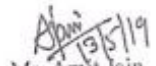
The committee discussed and resolved to approve the scheme and syllabi of B.Tech. III and IV semester.


Since external expert BOS member Prof. (Mrs.) A. B. Soni, Dept. of Chemical Engg. and external industry expert BOS member, Mr. Suprangya Mohanty could not attend this meeting due to their pre-occupation, as per discussion between members present in the meeting, this scheme and syllabus is being sent to external BOS members for their review and formal consent.

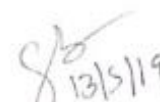

Prof. S. N. Saha
Member, BOS
Professor, Chemical Engg.



Dr. Anil Kumar Chandrakar
Chairman, BOS
HoD (I/c), Chemical Engg.


Mrs. A. N. Joshi
Member, BOS
Astd. Prof., Chemical Engg.


Mr. Amit Jain
Invited Member
Astd. Prof., Chemical Engg.


Mr. G. P. Dewangan
Invited Member
Astd. Prof., Chemical Engg.


Dr. Sandeep Singh
Invited Member
Astd. Prof., Dept. of Mathematics


Ms. Jasinta Poonam Ekka
Invited Member
Astd. Prof., Mechanical Engg.



The following courses were revised in the of B. Tech. Second year (III and IV Semesters) :

- ❖ Mathematics-III (CH03TBS06)
- ❖ Material And Energy Balance Calculations (CH03TPC01)
- ❖ Fluid Mechanics (CH03TPC02)
- ❖ Thermodynamics-II (CH03TPC03)
- ❖ Numerical Methods In Chemical Engineering (CH04TPC04)
- ❖ Particle And Fluid Particle-Processing (CH04TPC06)
- ❖ Process Instrumentation (CH04TPC07)

The following new courses were introduced in the of B. Tech. Second year (III and IV Semesters):

- ❖ Biology (CH03TBS05)
- ❖ Engineering And Solid Mechanics (CH03TES04)
- ❖ Process Instrumentation Lab (CH04PPC05)

विभागाध्यक्ष, रासायनिक अभियांत्रिकी
HoD, Chemical Engineering
प्रौद्योगिकी संस्थान/Institute of Technology
गुरु घासीदास विश्वविद्यालय, बिलासपुर (छ.ग.)
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Signature & Seal of HoD



Scheme and Syllabus

SCHOOL OF STUDIES, ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)

SCHEME FOR EXAMINATION (Effective from session 2019-20)
B. TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING

SECOND YEAR, THIRD SEMESTER

S.No.	Course No.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	Sessional Exam			
						IA	ESE	Total	
01	CH03TBS05	Biology New Course	3	1	0	30	70	100	4
02	CH03TBS06	Mathematics -III	3	1	0	30	70	100	4
03	CH03TES04	Engineering and Solid Mechanics New Course	3	1	0	30	70	100	4
04	CH03TPC01	Material and Energy Balance Calculations	3	1	0	30	70	100	4
05	CH03TPC02	Fluid Mechanics	3	1	0	30	70	100	4
06	CH03TPC03	Thermodynamics -II	3	1	0	30	70	100	4
Practical									
01	CH03PPC01	Chemical Engineering Lab-I	0	0	3	30	20	50	1.5
02	CH03PPC02	Fluid Mechanics Lab	0	0	3	30	20	50	1.5
Total			18	6	6			700	27

IA – Internal Assessment
Total Periods - 30

ESE- End Semester Examination
Total Credits – 27

Total Marks - 700

BOS held on 13th May 2019

SCHOOL OF STUDIES, ENGINEERING & TECHNOLOGY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by the Central University Ordinance 2009, No. 3 of 2009)

SCHEME FOR EXAMINATION (Effective from session 2019-20)
B. TECH. (FOUR YEAR) DEGREE COURSE, CHEMICAL ENGINEERING

SECOND YEAR, FOURTH SEMESTER

S.No.	Course No.	Subject	Periods			Evaluation Scheme			Credits
			L	T	P	Sessional Exam			
						IA	ESE	Total	
01	CH04THS02	Business Communication and Presentation Skill	3	0	0	30	70	100	3
02	CH04TPC04	Numerical Methods in Chemical Engineering	3	1	0	30	70	100	4
03	CH04TPC05	Inorganic Chemical Technology	3	0	0	30	70	100	3
04	CH04TPC06	Particle and Fluid Particle-Processing	3	0	0	30	70	100	3
05	CH04TPC07	Process Instrumentation	3	0	0	30	70	100	3
Practical									
01	CH04PPC03	Numerical Methods in Chemical Engineering Lab	0	0	3	30	20	50	1.5
02	CH04PPC04	Particle and Fluid Particle-Processing Lab	0	0	3	30	20	50	1.5
03	CH04PPC05	Process Instrumentation Lab New Course	0	0	3	30	20	50	1.5
Total			15	1	9			650	20.5

IA – Internal Assessment
Total Periods - 25
BOS held on 13th May 2019

ESE- End Semester Examination
Total Credits – 20.5

Total Marks - 650



B. Tech Syllabus

Department of Chemical Engineering

CH03TBS06 Mathematics-III

[L:3, T:1,P:0]

70% Change

Unit I : Introduction to statistics, mathematical statistics, variable, frequency distribution, exclusive and inclusive class intervals, type of series, graphical representation: histogram, frequency polygon, ogive measure of central tendency various types of averages, Mean median mode for grouped and ungrouped data, geometric mean, harmonic mean, measure of dispersion Skewness and Kurtosis.

Unit II : Curve fittings by method of least square- straight line parabola correlation-scatter diagram's Karl Pearson's coefficient of correlation. Limits for correlation coefficient, rank correction. Regression linear regression, equation to the line of regression. Regression coefficient, angle between two lines of regression.

Unit III : Theory of probability-Mathematical and statistical definition of probability sample space. Finite sample space sample point, events theorem of total probability. Sample and compound event. Conditional probability, theorem of compound probability, Baye's theorem, use of binomial theorem.

Unit IV : Theroretical distribution- Binominal distribution mean, standard deviation and Pearson's β and γ coefficient. Poisson distribution, mean, variance normal distribution.

Unit V : Random and simple sampling-mean, and standard deviation in simple sampling of attribute, test of significant for large sample test of significance based on Chi square, T, F and Z distribution degree of freedom, condition for applying.

Text Books:

1. M. Roy, "Mathematical Statistics"
2. Biswal, "Probability & Statistics", PHI.
3. A.A.AFTI, "Statistics analysis"
4. S. C. Gupta and Kapoor, "Fundamental of Mathematical Statistics"

Alain
13/5/19

13/5/19

Abandralen
13/05/19

13/05/19

Gaur
13/5/19

13/5/19
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B. Tech Syllabus

Department of Chemical Engineering

CH03TPC01 Material and Energy Balance Calculations [L:3, T:1,P:0]

Objectives

The course will serve as a basis for all further chemical engineering courses that are part of the curriculum.

50% Change

Contents :

1. Introductory concepts of units, physical quantities in chemical engineering, dimensionless groups, "basis" of calculations [3L+1T]
2. Gases, Vapours and Liquids: Equations of state, Vapour pressure, Clausius-Clapeyron equation, Cox chart, Duhring's plot, Raoult's law. [6L+2T]
3. Humidity and Saturation, humid heat, humid volume, dew point, humidity chart and its use. [6L+2T]
4. Material Balances with recycle, bypass and purge. [6L+2T]
5. Material Balance: With chemical reaction, Concept of stoichiometry and mole balances, examples, including combustion. [6L+2T]
6. Material Balance: Introduction, solving material balance problems without chemical reaction. [6L+2T]
7. Energy balance: open and closed system, heat capacity, calculation of enthalpy changes. [6L+2T]
8. Energy balances with chemical reaction: Heat of reaction, Heat of combustion. [6L+2T]

Total [45L+15T]

Suggested Text Books

1. S. N. Saha, "Chemical Process Engineering Calculation", Dhanpat Rai Publication Co. (Pvt.) Ltd., New Delhi
2. Bhatt, B. I., Vora, S. M., "Stoichiometry", Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2004.

Suggested References Books

1. Felder, R. M.; Rousseau, R. W., "Elementary Principles of Chemical Processes", Third Edition, John Wiley & Sons, 2000
2. Hougen, O. A., Watson, K. M., Ragatz, R. A., "Chemical Process Principles, Part-I Material & Energy Balances", Second Edition, CBS Publishers & Distributors, 2004
3. Himmelblau, D. M., Riggs, J. B. "Basic Principles and Calculations in Chemical Engineering", Eighth Ed., Pearson India Education Services, 2015.
4. Venkataramani, V., Anantharaman, N., Begum, K. M. Meera Sheriffa, "Process Calculations", Second Edition, Prentice Hall of India.
5. Sikdar, D. C., "Chemical Process Calculations", Prentice Hall of India.

Alavi
13/5/19

Chandrasekhar
12/5/19

Gautam
13/5/19

13/5/19

13/5/19
Sudakar
13/5/19



B. Tech Syllabus

Department of Chemical Engineering

CH03TPC02 Fluid Mechanics

[L:3, T:1,P:0]

33% Change

Objectives:

The objective of this course is to introduce the mechanics of fluids (fluid statics and fluid dynamics), relevant to Chemical Engineering operations. The course will introduce students to forces on fluids, hydrostatic forces on submerged bodies, Eulerian and Lagrangian descriptions of flow, flow visualization, integral analysis involving mass and momentum balances, Bernoulli equation, flow through pipes and ducts, flow measurement and instruments, flow transportation - pumps, blowers and compressors, conservation of mass, linear and angular momentum in differential form, Navier-Stokes equation, viscous flows, skin and form friction, potential flows and boundary layer theory. Turbulence and turbulent flows will be introduced.

Contents :

1. Introduction to fluids, Types of fluids, Concept of viscosity, Forces on fluids, Normal and shear stresses. [3L+1T]
2. Fluid statics –Hydrostatic equilibrium, pressure distribution, Manometry, Forces on submerged bodies, Buoyancy. [3L+1T]
3. Kinematics of fluid flow- Eulerian and Lagrangian descriptions, Flow visualization, Streamfunction, Vorticity and Circulation. [3L+1T]
4. System and control volume approaches, Integral balances – mass and momentum, Euler's equation of motion, Bernoulli equation and applications. [4L+2T]
5. Reynolds number, Laminar Flow for Newtonian and Non Newtonian fluid, Turbulent flow through pipes and close channels and its characteristic equations. [5L+1T]
6. Head loss in pipe flow, Friction losses due to sudden changes in velocity or direction of flow, expansion, contraction, Effect of fittings. [6L+2T]
7. Flow measurement, variable head meters, variable area meter, insertion meter. [3L+1T]
8. Transportation of fluids - pumps, blowers, compressors selection and design of pumps. [3L+1T]
9. Differential analysis: mass and momentum balances, Navier-Stokes equation, Unidirectional flow, Viscous flow, Stokes law, Skin drag and pressure drag. [6L+2T]
10. Potential flow, Potential function, Solution of Laplace equation. [3L+1T]
11. Boundary layer theory, Blasius solution, Boundary layer separation. [6L+2T]

Total [45L + 15T]

Suggested Text Books

1. M. Whit e, Fluid Mechanics, 8 th Edition, Tata-McGraw Hill, 2016.
2. V. Gupta and S. K. Gupta, Fundamentals of Fluid Mechanics, 2nd Edition, New Age International 2011.
3. W. L. McCabe, J. C. Smith and P. Harriot, Unit Operations of Chemical Engineering, 7th Edition, McGraw-Hill International Edition 2005.
4. O. Wilkes, Fluid Mechanics for Chemical Engineers, Prentice Hall of India, 2005.

BOS held on 13th May 2019

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B. Tech Syllabus

Department of Chemical Engineering

CH03TPC03 Thermodynamics –II

[L:3, T:1,P:0]

Pre-requisites: Thermodynamics-I

30% Change

Objectives:

To introduce the concepts of fugacity, activity coefficient, vapour-liquid equilibrium and reaction equilibrium. Introduction to molecular thermodynamics.

Contents

1. Review of first and second law of thermodynamics. [3L+1T]
2. Solution Thermodynamics: fundamental property relationships, free energy and chemical potential, partial properties, definition of fugacity and fugacity coefficient of pure species and species in solution, the ideal solution and excess properties. [12L+4T]
3. Liquid phase properties from VLE, Models for excess Gibbs energy, heat effects and property change on mixing. [6L+2T]
4. Vapor-liquid equilibrium: phase rule, simple models for VLE; VLE by modified Raoult's law; VLE from K-value correlations; Flash calculations. [6L+2T]
5. Ideal solutions, activity and activity coefficient, Wilson, NRTL, UNIFAC and UNIQUAC models. [6L+2T]
6. Liquid-Liquid Equilibria; Vapor-Liquid-Liquid Equilibria; Solid-Liquid Equilibria; Solid-Gas equilibria. [6L+2T]
7. Chemical reaction equilibria: equilibrium criterion, equilibrium constant, evaluation of equilibrium constant at different temperatures, equilibrium conversion of single reactions, multi reaction equilibria. [6L+2T]

Total [45L+15T]

Suggested Text Books

1. J.M. Smith, H.C. Van Ness and M.M. Abbott, "Introduction to Chemical Engineering Thermodynamics", 7th edition, McGraw-Hill International Edition, 2005.
2. Y.V.C.Rao, "Chemical Engineering Thermodynamics", University Press, Hyderabad, 1997.
3. K V Narayanan, "A Textbook of Chemical Engineering Thermodynamics", Prentice Hall Of India, New Delhi 2011

Suggested References Books

1. R.C. Srivastava, "Thermodynamics an core course", 3rd edition, PHI publication, India, 2007.



B. Tech Syllabus

Department of Chemical Engineering

CH04TPC04 Numerical Methods in Chemical Engineering

[L:3, T:1,P:0]

15% Change

UNIT - I Introduction of Errors and their Analysis, types of errors, numerical problems on error analysis, curve fitting: method of least squares, fittings of straight line and parabola and by method of moments, fitting of exponential curves $y = ae^{bx}$, fitting of the curve $y = ab^x$, fitting of the curve $y = ax^b$.

UNIT - II Numerical Solution of Algebraic and Transcendental Equations: Graphical method bisection Method, Secant Method, Regula-falsi Method, Newton Raphson Method, Solution of a system of simultaneous linear algebraic Equations Direct method: Gauss elimination Method, Gauss Jordan method, Iterative methods .Jacobi Iterative Method, Gauss Seidel Iterative method.

UNIT - III The Calculus of Finite Differences: Finite differences, Difference formula, operators and relation between operators. Inverse Operator, Interpolation with equal intervals: - Newton's forward and backward interpolation formula. Interpolation with Unequal intervals: - Lagrange's interpolation Newton's difference formula, inverse interpolation.

UNIT -IV Numerical Differentiation and Integration: - Numerical Differentiation Newton's forward and Backward difference interpolation formula. Maxima and Minima of a Tabulated function, Numerical Integration :- Trapezoidal rule, simpson is (1/3)rd and (3/8)th rule, Boole's rule, weddle rule, Difference Equations -: Definition, order and degree of a difference equation, Linear difference equations, Difference equations reducible to Linear form simultaneous difference equations with constant coefficients.

UNIT - V Numerical solution of ordinary differential equation : Taylor series method, Euler's method, Modified Euler method Runge's method Runge Kutta method, numerical method for solution of partial differential equations. General linear partial differential equation. Laplace equation and Poisson equation.

Books Recommended :

1. JAIN & IYNGAR Numerical Methods for Scientific and Engineering Computations.
2. RAO G.S. Numerical Anlysis.
3. Grewal B S Numerical Methods In Engineering and Science.
4. Das K K Advance Engineering Methods.
5. Rajaraman V Computer Oriented Numerical Methods

Handwritten signatures and dates:
Ajay 13/5/19
Chandrabh 13/5/19
Gauri 13/5/19
Sudha 13/5/19
13/5/19



CH04TPC06 Particle and Fluid Particle-Processing [L:3, T:0,P:0]

Pre-requisites :Fluid Mechanics

20% Change

Objectives

Objective of this course is to introduce students to the numerous industrial operations dealing with the particulate solids, their handling in various unit operations, and those in which particle fluid interactions are important. The course addresses fundamentals of fluid-particle mechanics, such as the notion of drag, and builds on those fundamentals to develop design concepts for various industrial processes like packed bed operation, fluidized operations, sedimentation, filtration, separation of solids and fluids, etc. Industrial applications are discussed. The course is concluded with an introduction to colloidal systems, soft materials and nanoparticles. Applications of these novel systems are discussed.

Contents :

1. Introduction: Relevance of fluid and particle mechanics, and mechanical operations, in chemical engineering processes. [1L+0T]
2. Solid particle characterization: Particle size, shape and their distribution, Screen analysis, standard screens; Relationship among shape factors and particle dimensions; Specific surface area; Measurement of surface area. [3L+1T]
3. Mixing and storage of Solids: Types of important mixers like kneaders, dispersers, masticators, roll mills, muller mixer, pug mixer, blender, screw mixer etc., mixing index; Types of storage equipments, Bin, Silo, Hoper, etc. [3L+1T]
4. Transport of fluid-solid systems: mechanical conveying, pneumatic and hydraulic conveying. [2L+1T]
5. Size reduction: Major equipment's- Crushers, grinders, ultrafine grinders, laws of comminution, Close circuit and open circuit grinding. [3L+1T]
6. Mechanical separations: Industrial screen; their capacity and effectiveness. [2L+1T]
7. Sedimentation: Elutriation, Classification and sedimentation, Free Settling, hindered settling, flow of solids through fluid, Stoke's law, Richardson-Zaki equation, design of settling tanks. [3L+1T]
8. Centrifugal separation, design of cyclones and hydrocyclones. [2L+1T]
9. Separation of solids from fluids: Introduction, filter bags, venture scrubber, electrostatic precipitator. [2L+1T]
10. Filtration: cake filtration, Concepts, plate and frame filter, leaf filter, rotary drum filter, etc. [3L+1T]
11. Fluidization: Fluidized bed, minimum fluidization velocity, pressure drop etc. Types of fluidization: Particulate fluidization, Bubbling fluidization, Applications of fluidization. [3L+1T]
12. Packed bed: Void fraction, superficial velocity, channelling, Ergun equation and its derivation, Kozeny Carman equation, Darcy's law and permeability, Blaine's apparatus. [3L+1T]
13. Introduction to nanoparticles: Properties, characterization, synthesis methods, applications. [3L+1T]

Total [33L+12T]



B. Tech Syllabus

Department of Chemical Engineering

50% Change

CH04TPC07 Process Instrumentation [L:3, T:0,P:0]

Objectives

Objective of the course is to introduce the basics of instrumentation and process control through a hands-on practical experience. Principles of operation of different measuring devices for temperature, level, pressure, flow, pH, humidity, density, and viscosity will be introduced to impart knowledge of transmitters, transducers, converters, control valves, digital and analog components related to PLC, DCS, SCADA systems.

Contents :

1. Basics of control system components, signals and standards	[3L+1T]
2. Pressure measuring instruments/sensors	[3L+1T]
3. Level measurement	[3L+1T]
4. Flow measuring instruments	[3L+1T]
5. Temperature measuring devices	[3L+1T]
6. Humidity, density, viscosity and pH measuring devices	[3L+1T]
7. Pressure controllers: regulators, safety valves	[3L+1T]
8. Flow control actuators: different types of valves	[3L+1T]
9. Electrical and pneumatic signal conditioning and transmission	[5L+2T]
10. Computer process control, PLC, DCS, SCADA	[2L+1T]
11. Instrumentation of process equipment	[2L+1T]

Total [33L+12T]

Suggested Text Books

1. William C. Dunn, Fundamentals of Industrial Instrumentation and Process Control, McGraw Hill (2005).
2. S.K. Singh, Industrial Instrumentation and Control, 3rd edition, McGraw-Hill (2008).

Suggested References Books

1. Seborg, D.E., Edgar, T.F., Mellichamp, D.A., "Process Dynamics and Control", 2nd edition, John Wiley (2003).
2. Stephanopoulos, G., "Chemical Process Control: An Introduction to Theory and Practice", Pearson Education (1984).

Handwritten signatures and dates: 13/5/19, 13/5/19, 13/5/19, 13/5/19, 13/5/19, 13/5/19, 13/5/19.