

# *Chhattisgarh Swami Vivekanand Technical University, Bhilai*

## SCHEME OF TEACHING AND EXAMINATION

### SEMESTER VII CHEMICAL ENGINEERING

S.N	Board of study	Subject Code	Subject	Period per week			Scheme of Exam			Total Marks	Credit L+(T+P)/ 2
				L	T	P	Theory/ Practical				
							ESE	CT	TA		
1	Chemical Engg	319711( 19 )	Transport Phenomena	4	1	-	80	20	20	120	5
2	Chemical Engg	319712( 19 )	Computer Aided Process Engg.	3	1	-	80	20	20	120	4
3	Chemical Engg	319713( 19 )	Separation Processes- II	4	1	-	80	20	20	120	5
4	Chemical Engg	319714( 19 )	Process Equipment Design-II	4	1	-	80	20	20	120	5
5	Refer Table -II		Professional Elective-II	4	1	-	80	20	20	120	5
6	Chemical Engg	319721( 19 )	Computer Aided Process Engg. Lab	-	-	3	40	-	20	60	2
7	Chemical Engg	319722( 19 )	Separation Processes- II Lab	-	-	3	40	-	20	60	2
8	Chemical Engg	319723( 19 )	Process Equipment Design-II Viva	-	-	3	40	-	20	60	2
9	Chemical Engg	319724( 19 )	Minor Project	-	-	4	100	-	40	140	2
10	Management	300725(36 )	Innovative and Entrepreneurial Skills	-	-	2	-	-	40	40	1
11	Chemical Engg	319726(19 )	Practical Training ** and Library	-	-	1	-	-	40	40	1
<b>Total</b>				<b>19</b>	<b>5</b>	<b>16</b>	<b>620</b>	<b>100</b>	<b>280</b>	<b>1000</b>	<b>34</b>

L- Lecture    T- Tutorial    P- Practical    ESE- End Semester Exam    TA- Teacher's Assessment  
 \*\* To be completed after VI semester and before the Commencement of VII semester

**Table – II**

<b>Professional Elective-II</b>		
<b>Board of Study</b>	<b>Subject Code</b>	<b>Subject</b>
Chemical Engg	319751 (19)	Reactor Design.
Chemical Engg	319752 (19)	Petroleum Refinery Engg.
Chemical Engg	319753 (19).	Polymer Technology
Chemical Engg	319754 (19)	Oil and Fat Technology

**Note :** (1)- 1/4<sup>th</sup> of total strength of students subject to minimum of 20 student is required to offer an elective in the college in a particular Academic session.

(2)- Choice of elective course once made for an examination can not be change in future examinations.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII  
Subject: Transport Phenomena  
Total Theory Periods: 50  
Total Marks in End Semester Exam: 80  
Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering  
Code: 319711(19)  
Total Tutorial Periods: 12

- Unit I-** Laminar Flow of Falling Film, Flow through Circular Tube, Flow through Annuls, Flow Through Rectangular Duct, Adjacent flow of flow of Immiscible Liquids between two Parallel plates, Couette Flow.
- Unit II-** Equation of Continuity, Rectangular, Cylindrical & Spherical Co-ordinates, Equation of Motion, Use of Equations of Continuity & Motion, Tangential Annular Flow, Shape of Cylindrical Surface, Vortex Depth.
- Unit III-** Introduction to heat transport – Fourier's Law of heat conduction, temperature and pressure Dependence of thermal conductivity of gases and liquids, thermal conductivity of Solid.
- Unit IV-** Heat Transport Through Composite wall, through composite Cylinder with electrical Heat Source, with Nuclear Heat Source, Due to Viscous Dissipation through Fin, Heat Convection.
- Unit V-** Introduction to mass transport, diffusivity and mechanism of mass transport, diffusion in gases at low density, diffusion in liquids, diffusion through spherical film, diffusion in liquid, mass transfer with chemical reaction.

## Name of Text Books:

1. B. R. Bird, W. Stewart and E. N. Lightfoot, Transport Phenomena, Wiley, New York, 1960
2. L. Stuart et al., Transport Phenomena, John Wiley, New York, 1982.

## Name of Reference Books:

1. C. J. Geankopolis, Transport Processes in Chemical Operations, 3<sup>rd</sup> Ed., Prentice Hall of India, New Delhi, 1996.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: B. E. Seventh  
Subject: Computer Aided Process Engineering  
Total Theory Periods: 40  
Total Marks in End Semester Exam: 80  
Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering  
Code: 319712(19)  
Total Tutorial Periods: 12

- Unit I** Introduction, Flow Charts, Elements of FORTRAN Programming, FORTRAN constant Variable, Arithmetic's Statement, Hierarchy of Operation, Input Out put Device & statement, Control Statement, If -GOTO, Do-loop ,Continue Statement
- Unit II** Programming Application of Above Statements For Programming of Common Problems. Application Programming For Simple Chemical Engg. Problems like Heat Transfer Fluid Flow, Mass Transfer, Transfer phenomena
- Unit III** Use of AI and ANN in process engineering.
- Unit IV** Introduction to Spreadsheet, Software Package like excel, lotus smart etc. and its powerful features. Introduction to Software Design Package like AutoCAD.
- Unit V** Engineering Data Base Management (EDBMS) and FoxPro, Project Management. Cost Estimation Using Software Packages

## **Name of Text Books:**

- (1) Programming in Fortran:- E. Balaguruswami.
- (2) Lotus, Autocad, Dbase.- R. K. Taxali

## **Name of Reference Books:**

- (1) Fortran IV Computer Progrmming :-N.N.Biswas.
- (2) Computer Programming in Fortran :-V.Rajaraman
- (3) Juin Browne Computer Aided engg. And Design.
- (4) Dr. Suresh ChandraFortran Programming Numerical Tech.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII

Subject: Separations Process -II

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code: 319713(19)

Total Tutorial Periods: 12

- Unit I** Molecular and eddy diffusion in fluids, Measurements and calculation of diffusivity, mass transfer coefficient and their co relations, analogies in transfer process, Theories of mass transfer in packed and fluidized beds
- Unit II** Distillation and vapor liquid equilibrium , boiling point diagram partial vaporization and condensation and relative volatility flash distillation and differential distillation for two component mixture, steam distillation, azeotropic distillation and extractive distillation
- Unit III** Continuous distillation with rectification, Calculation of number of plates Lewis Sorel methods, McCabe Theile method, Reflux ratio, economic reflux ratio multiple feed and side streams
- Unit IV** Minimum reflux ratio- Underwood and Fensky Equations, plate efficiencies, use of enthalpy - concentration method ,packed column ,height equivalent to theoretical plate, transfer unit, batch distillation
- Unit V** Principle of absorption, two film theory, over all coefficients, H.T.U. Method absorption with chemical reaction

## **Name of Text Books:**

1. McCabe and Smith, Unit Operation of Chemical Engineering
2. Treybal , Mass Transfer Operations

## **Name of Reference Books:**

1. Coulson and Richardson , Chemical Engineering, Volume - 1.
2. S.P. Pande, Principles of Distillation, Central Techno Publications.
3. H.Stephen Stoker, Introduction to Chemical Principles, Pearson Education

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI (C.G.)**

Semester: VII  
Subject: Process Equipment Design-II  
Total Theory Periods: 50  
Total Marks in End Semester Exam: 80  
Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering  
Code: 319714(19)  
Total Tutorial Periods: 12  
Duration: 4 hours

**Note : 1.** Use of relevant design data book, steam tables, and Chemical Engineer's Hand book- by J.H.Perry (expect 3<sup>rd</sup> edition) is permitted in the examination.

**Unit I** Design of - Double Pipe Heat Exchanger ,Shell and Tube Heat Exchanger

**Unit II** Design of – Condenser for Single component Vapor, Subcooler , Tunnel and Rotary Dryer

**Unit III** Design of – Single and Multiple Effect Evaporators with and without BPR.

**Name of Text Book:**

Kern D.Q.- Process Heat Transfer

**Name of Reference Books:**

- (1) Richardson & Coulson - Chemical Engineering Plant Design Vol. VI
- (2) Douglas J.M.- Conceptual Design of Chemical Process
- (3) Perry J.H.- Chemical Engineers Hand Book 3<sup>rd</sup> Edition.
- (4) Treybal R.E., Mass Transfer Operations.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII

Subject: Oil and Fat Technology

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code: 319754(19)

Total Tutorial Periods: 12

- Unit I** Lipids: Biological significance, classification occurrence and chemistry; Triglycerides and phospholipids; emulsions and emulsifiers; soaps, detergents, polishes and paints; Inter esterifications: industrial fats and oils
- Unit II** Saturated and unsaturated fatty acid and their properties. Enzymatic and chemical spoilage. Shortenings, Butter substitutes, salad oils, margarine, non-caloric fats; standard and quality control, packaging and storage of fats and fatty foods.
- Unit III** Extraction of oils and fats – rendering and trying out, mechanical expression, hydraulic pressing and expelling, solvent extraction and pre – press solvent extraction, degumming and dewaxing, alkali treatment, bleaching, deodorization etc.;
- Unit IV** Refining of oils – physical and chemical; Hydrogenation of unsaturated fats and oils, Changes during processing and storage of oils and fats, polymorphism, rancidity and reversion; processing of oil seeds and other oil bearing materials
- Unit V** Non conventional edible oils, oil seed cakes and meal utilization: By-products of oils and fats processing industries. Oleoresins and essential oils, characteristics, chemistry, extraction and application. Toxicity and safety of fats and oils.

## **Name of Text Books:**

1. D. Swarn, Bauleys, industrial Oils and Fats Products, 4<sup>th</sup> edition Vol I and II, Wiley
2. Edgar woldatt , The manufacture of Soaps Detergent and Glycerin 1<sup>st</sup> edition eclis horwod.

## **Name of Reference Books:**

1. John Murray, Fats, Oils and waxes, London
2. G. N. Pandey , Chemical Tech. Vol II.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII  
Subject: Polymer Technology  
Total Theory Periods: 50  
Total Marks in End Semester Exam: 80  
Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering  
Code : 319753(19)  
Total Tutorial Periods: 12

- Unit I** Characteristics and Analysis of Polymers: The science of large molecules. Theory of polymer solutions. Measurement of molecular weight and size. Analyzing and testing of polymers.
- Unit II** Polymer Material Structure and Properties Deformation, flow and melt characteristics. Morphology and other in crystalline polymers. Rheology and mechanical properties of polymers. Polymer structure and physical properties.
- Unit III** Polymer Synthesis and Reaction Engineering Condensation polymerization, Addition polymerization, Ionic and Coordination polymerization, copolymerisation, polymerization conditions and polymer reactions.
- Unit IV** Industrial Polymers, Manufacturing Processes and Applications Hydrocarbon plastics and elastomers, other carbon chain polymers, Heterochain thermoplastics, Thermosetting resins
- Unit V** Processing of Polymers: Plastics, Fibers and Elastomers Polymers developed for synthetic plastics, fibers and elastomer applications. Plastics technology. Fiber technology and Elastomer Technology.

## **Name of Text Books:**

1. F.W.Billmeyer, Text Book of Polymer Sciences, 3<sup>rd</sup> Ed., Wiley Inter Science, 1984.
2. Dawande S.D., Introduction to Polymer Science & Technology, Denett .Co.

## **Name of Reference Books:**

1. F. Rodriguez, Principles of polymer systems, 4<sup>th</sup> Ed., Taylor and Francis, Washington, 1996.
2. Encyclopedia of Polymers Science and Technology, John Wiley-Inter Science.

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII

Subject: Petroleum Refinery Engineering

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch Chemical Engineering.

Code: 319752(19)

Total Tut Periods : 12

- Unit I** Petroleum refining in India: - Various petroleum products, secondary processing, quality improvement, production and consumption position, world reserves of fuel. Composition of petroleum crude, Refining-Introduction, Classification - according to type, gravity. Types of refineries.
- Unit II** Distillation and Equilibrium: -Dehydration and desalting of crude Reflux ratios, types of trays, trays efficiencies, and types of distillation used in petroleum industries, various units with distillation column, various products properties and applications, treatments of important products.
- Unit III** Cracking and Coking: -Types of cracking, thermal cracking, reaction effect of operating variables, steam cracking visbreaking, catalytic cracking – reactions, various processes catalysts for catalytic cracking, fixed bed and moving bed catalytic cracking, super oil cracking technology, deep catalytic cracking.  
Coking – delayed coking, fluidized bed coking.
- Unit IV** Reforming & Isomerisation: -Thermal reforming, catalytic reforming – reactions, catalyst used, operating variables, various processes. Isomerisation reactions. IFPS New technologies for reformulated gasoline.
- Unit V** Rebuilding of Hydrocarbons & Pollution by Refineries: -Alkylation, Polymerisation, Oxidation, Hydration, Halogenation, Nitration, Depolymerisation, Hydrogenation, Dehydrogenation..  
Automation in petroleum refinery-Distributed control system.Pollution by Refineries.

## **Name of Text books:**

- 1.SarkarG.N. , Advanced Petroleum Refining.
2. SinhaN.K.,Petroleum Refinery and Petrochemicals.

## **Name of Reference books:**

- 1 . Bhaskara Rao B.K.,Modern Petroleum Refining Processes.
- 2Sharma B.K. Fuels and Petroleum processing.
- 3 Petroleum refining: Technology & Economics by Gary

# CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: VII

Subject: Reactor Design

Total Theory Periods: 50

Total Marks in End Semester Exam: 80

Minimum number of class tests to be conducted: 02

Branch: Chemical Engineering

Code : 319751(19)

Total Tutorial Periods: 12

Note: Internal Choice may be given in any three units.

**UNIT I.** Behavior of Chemical Reactors: Ideal & Non-Ideal Flow; Classification of Reactors: Isothermal, Ideal batch, CSTR, PFR, Multiple Reactors, Non-isothermal Reactors, Multiplicity, Non-ideal reactors, Fluid Solid Non-Catalytic reactions, Fluidized Beds.

**UNIT II.** Introduction to Reactor Design; Detailed Design of Batch Reactors.

**UNIT III.** Flow Reactors; Detailed Design for CSTR; CSTR Design; Single CSTR Battery; CSTR at Differential Temperature etc.

**UNIT IV** Detailed Design for Plug Flow Reactor: Single; Series And Parallel; Mixed Reactor (Combination); Reactor stability.

**UNIT V** Design aspects for Non-ideal Reactors.

## **Name of Text Books:**

1. J.M. Smith, Chemical Engineering Kinetics
2. Octave Levenspiel, Chemical Reaction Engg.

## **Name of Reference Books:**

1. H.Scott Fogler, Chemical Reaction Engg.
2. S.D.Dawande, Chemical Reaction Engg.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI (C.G.)**

Semester: B.E. Seventh  
Subject: Separation Processes II Lab  
Total Practical Periods: 40  
Total Marks in End Semester Exam: 40

Branch: Chemical Engineering  
Practical Code: 319722(19)

**Experiments to be performed:** (Minimum 10)

- To determine the crystal yield of given sample (with seeding)
- To determine the crystal yield of given sample (with out seeding)
- To prepare the ternary phase diagram (Binodal curve) for the given ternary system.
- To draw the line and hence determine the plait point for ternary system Acetic Acid-Chloroform-Water.
- To plot the drying rate curve for wet solid.
- To determine the effect of solvent ratio in % recovery in leaching and to plot the overflow and underflow curve for sand and salt water system.
- Study of Fluidized Bed Dryer.
- Study of Spray Dryer.
- Study of Batch Crystallizer.
- 10. To determine the Drying Rate by Vacuum Tray Dryer.
- 11. Study of Cooling Tower.
- 12. Study of Liquid-Liquid extraction by York-Shiebel Extraction Apparatus.
- 13. Study of Solid –Liquid Extraction Unit.

**List of Equipments/Machines Required**

- Crystallizer
- Cooling Tower
- Spray Dryer
- York-Shiebel Extraction Apparatus
- Vacuum Tray Dryer
- Fluidized Bed Dryer
- Solid –Liquid Extraction Unit
- Oven
- Weighing Balance
- Hot Plate
- Water bath
- Agitator

**Recommended Books:**

- McCabe and Smith , Unit Operation of Chemical Engg
- Coulson and Richardson, Chemical Engineering, vol 1.
- Treybal , Mass Transfer Operations.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI (C.G.)**

Semester: B.E. Seventh  
Subject: Process Equipment Design – II Viva  
Total Practical Periods: 40  
Total Marks in End Semester Exam: 40

Branch: Chemical Engineering  
Practical Code: 319723 (19)

Viva – voce examination based on syllabus for Process Equipment Design – II Theory, to be conducted.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,  
BHILAI (C.G.)**

Semester: VII  
Subject: Computer Aided Process Engg. Lab  
Total Practical Periods: 40  
Total Marks in End Semester Exam: 40

Branch: Chemical Engineering.  
Practical Code: 319721(19)

**Experiments to be performed:** (Minimum 10)

- Write a Program for sum of 2 no.
- Write a Program for sum of N real nos.
- Write a Program for Factorial of any no.
- Write a Program for prepare of any Array.
- Write a Program for sum array elements.
- Write a Program for prepare of Matrix [2][2].
- Write a Program for sum of elements of Matrix [2][2].
- Write a Program for prepare finding largest no. among 3 no.
- Write a Program for prepare finding lowest no. among 3 no.
- Write a Program for prepare finding largest no. among an Array.
- Write a Program for prepare finding largest no. among a Matrix.
- Write a Program for prepare finding Reynold no.
- Write a Program for prepare Fibonacci series.
- Write a Program for sum of 10 elements of Fibonacci series.
- Write a Program for sum of series  $s=1+1/2+1/3+1/4+-----$
- Write a Program for sum of series  $s=1+1/2!+1/3!+1/4!+-----$
- Write a Program for sum of series  $\sin(x)$  .

**List of Equipments/Machines Required**

- (i) Computer system with loaded Fortran.

**Recommended Books:**

1. E. Balagurusami, Fortran
2. Ravichandran , Fortran.

# **Chhattisgarh Swami Vivekanand Technical University, Bhilai (C.G.)**

Semester: VII  
Subject: Innovative & Entrepreneurial Skill  
Total Practical Periods: 28  
Total Marks in End Semester Exam: ---  
Minimum number of class test to be conducted: 2

Branch: Common to All Branches  
Code: 300725 (36)  
Total Tut Periods: NIL

## **Unit I**

Innovation: innovation- an abstract concept; creativity, innovation and imagination; types of innovation - classified according to products, processes or business organizations.

## **Unit II**

Entrepreneurship: who is an entrepreneur? Entrepreneurship- A state of Mind, Emergence of entrepreneur; Role of Entrepreneur; A Doer not a Dreamer- Characteristics of an entrepreneur; Factors affecting entrepreneurial growth – Social, cultural, personality factors, psychological and Social Factors. Impact of Entrepreneurship for sustainable development.

## **Unit III**

Difference between entrepreneur and entrepreneurship, Difference between entrepreneur and intra-preneur, Common Entrepreneurial competencies/Traits; Entrepreneurship stimulants, Obstacles inhibiting Entrepreneurship; Types of entrepreneurs, Functions of an entrepreneur.

## **Unit IV**

Identification of Business Opportunities: Introduction, Sources of Business of Product Ideas, Steps in Identification of Business opportunity and its SWOT Analysis.

## **UNIT-V**

Techno-Economic Feasibility of the project: Introduction, Techno- Economic feasibility of the Project, Feasibility Report, Considerations while preparing a Feasibility Report, Proforma of Feasibility Report, Role of Institutions and entrepreneurship.

## **Text and Reference Books:**

1. Competing through Innovation-Bellon & Whittington, Prentice Hall of India
2. A Guide to Entrepreneurship – David Oates- JAICO Publishing House.
3. Entrepreneurship- Rober D Hisrich, Peters, Shepherd- TMH
4. Entrepreneurship in Action- Coulter, Prentice Hall of India
5. Entrepreneurship Management and Development – Ajith Kumar, HPH
6. Fundamentals of entrepreneurship- Mohanty, PHI
7. Patterns of Entrepreneurship- Jack M Kaplan, Wiley, student Edition.