

## ERODE SENGUNTHAR ENGINEERING COLLEGE (Autonomous)



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(Approved by AICTE, New Delhi, Permanently Affiliated to Anna University – Chennai& Accredited by NAAC & National Board of Accreditation (NBA), New Delhi.) **PERUNDURAI, ERODE 638 057** 

## DEPARTMENT OF CHEMICAL ENGINEERING

# **Curriculum and Syllabus**

# **B.TECH.**

# CHEMICAL ENGINEERING

# **REGULATION - 2019**

# Choice Based Credit System (CBCS)

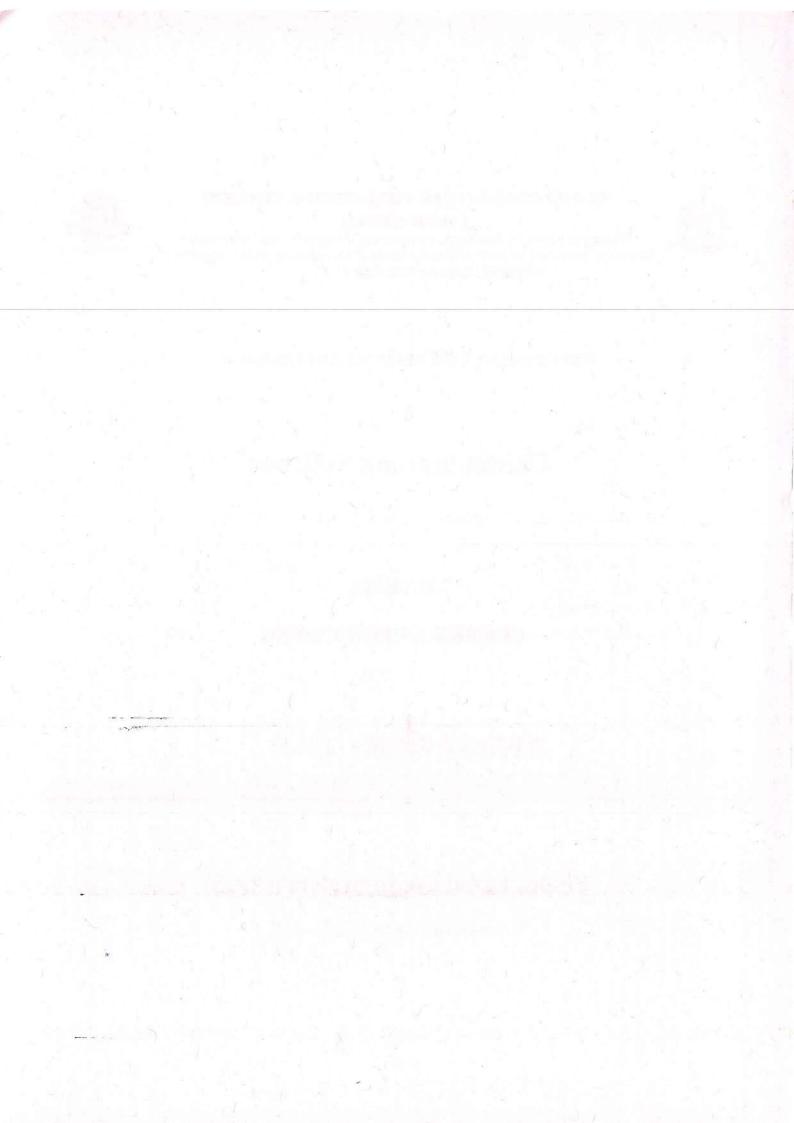
(Academic year 2020 - 21)

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#### **INSTITUTION VISION & MISSION**

#### VISION

Erode Sengunthar Engineering College strives with determination and commitment to provide and promote world-class Technical Education, in particular to the students of backward rural areas, transforming them into holistic personalities embedded with discipline, skill and responsibility that make them patriotic, successful, and self-developed professionals ready to accomplish any job in their career and life.

#### MISSION

- Provide an idyllic study atmosphere, fine infrastructure, qualified and dedicated faculty and standardized systems for a strong career foundation.
- Aid and motivate the students and faculty alike for maximum utilization of facilities, making them innovative and creative in thinking and research, in order to provide technical service to industry and society.
- Develop multi-skilled personalities to make ESEC, a world leader in Technical Education.

#### VISION

#### DEPARTMENT OF CHEMICAL ENGINEERING

To inculcate continuously and relentlessly to produce top notch Chemical Engineers for the industrial requirement.

#### MISSION

- To impart knowledge the students at all levels through vibrant, dynamic and state -of the -art intellectual exercise.
- To synergize the efforts of the students and faculty to evolve the innovative practices and teaching methodologies.
- To generate in atmosphere of continuous learning and research promoting environmentconscious Chemical Engineers.



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#### Program Educational Objectives (PEOs)

- I. Preparing the students with strong fundamental knowledge in Mathematics, Science, English and Engineering Sciences so as to enable them to analyze the Chemical Engineering related problems. (Preparation)
- II. To prepare the students to design Chemical Engineering equipment, process design by executing and evaluating the performance including socio-economic impacts to the region. (Core Competence and Professionalism)
- III. To provide problem solving computational skills for process simulation, design and analysis by using appropriate software and also to give the students an exposure in word processing, spread sheet, ppt., and to make them use information on the world wide web.(Breadth)
- IV. To train the students in communication techniques and to make them aware of job-related skills, emerging technologies in global issues. Giving information on safety aspects, professional ethics and to maintain harmony with society. (Learning Environment)

#### PROGRAM OUTCOMES (POs)

The work

**PO1:Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

**PO2:Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

**PO3:Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

**PO4:Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

**PO5:Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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**PO6:The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

**PO7:Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO8:Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

**PO9:Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

**PO10:Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

**PO11:Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

**PO12:Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

#### PROGRAM SPECIFIC OUTCOMES (PSOs)

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**PSO1: Process Modeling & Simulation** – Developing applied knowledge through Process Modeling & Simulation in Chemical Process Industries.

PSO2: Contemporary Skills – An ability to update knowledge on recent developments in Chemical Industries.

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## ERODE SENGUNTHAR ENGINEERING COLLEGE, ERODE DEPARTMENT OF CHEMICAL ENGINEERING

## **REGULATION - 2019**

### CHOICE BASED CREDIT SYSTEM

### I TO VIII SEMESTERS CURRICULAM

Induction Program (Mandatory)	3 weeks duration
	Physical activity
Induction program for students to be offered right at the start of the first year	<ul> <li>Creative Arts</li> <li>Universal Human Values</li> <li>Literary</li> <li>Proficiency Modules</li> <li>Lecturer by Eminent People</li> <li>Visits to local Areas</li> <li>Familiarization to Dept. / Branch &amp;Innovations</li> </ul>

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THEORY												
Code No	Course	Objec	ctives & Out	comes	L	T	Р	с	Max	imum	Marks	Catego
Code No	Course	PEOs	POs	PSOs	L	1	Р	C	CA	ES	Total	У
19BS101	Calculus and its Applications	I, II	1,2,3,4,12	-	3	1	0	4	40	60	100	BS
19BS102	Engineering Physics	1, 11	1,2,4,5,6,8, 9	1,2	2	0	2	3	40	60	100	BS
19BS103	Engineering Chemistry	1, 11	1,2,3,4,5,7, 12	-	3	0	0	3	40	60	100	BS
19HS101	Communicative English	. III	2,3,6,9,10, 12	3	3	0	0	3	40	60	100	HS
19ES101	Python Programming	I, IV	1,2,3,4,12	2	3	0	0	3	40	60	100	ES
19TPS01	Soft Skill - I	Ш	8,9,10,12	3	1	0	1	1.5	40	60	100	EEC
PRACTICA	L					NA PORO					1	
19ES104	Python Programming Laboratory	II., Second particular	1,2,3,4,5,1 2	2	0	0	2	1	60	40	100	ES
19ES106	Engineering Graphics	I, II	1,2,3,5,10, 12	2	0	0	4	2	60	40	100	ES

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19ES107	Workshop Practices	Ш	1,3,9,12	-	0	0	2	1	60	40	100	ES
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			SEM	ESTER					1			
THEORY								1		•	_	
		Objec	tives & Outco	omes	-	_	_		Max	imum	Marks	Catego
Code No	Course	PEOs	POs	PSOs	L	T	P	С	CA	ES	Total	У
19BS201	Vector Calculus and Complex Variables	1,11	1,2,3,4,12	-	3	1	0	4	40	60	100	BS
19BS207	Physics of Materials	I, II	1,2,4,5,7	2	3	0	0	3	40	60	100	BS
19MC202	Environmental Science and Ecology	1,11	1,2,3,4,5,6, 7, 8,12	-	3	0	0	0	40	60	100	MC
	Language Elective	III.,	- F		3	0	0	3	40	60	100	HS
19ES204	Principles of Electrical and Electronics Engineering	III	1,2,3,4	1,2	3	0	0	3	40	60	100	ES
19ES211	Introduction to Chemical Engineering	I, II	1,2,3,4	2	3	0	0	3	40	60	100	ES
19TPS02	Soft Skill - II	ш	8,9,10,12	2	1	0	1	1.5	40	60	100	EEC
PRACTICA	L				- in contra		المريد مرا					
19BS208	Engineering Chemistry Laboratory	1, 11, 111	1,2,3,4,5,12	1, 2	0	0	4	2	60	40	100	BS
19ES222	Chemical Analysis Laboratory	I, II	1,2,3,4,8,9	2	0	0	2	1	60	40	100	ES
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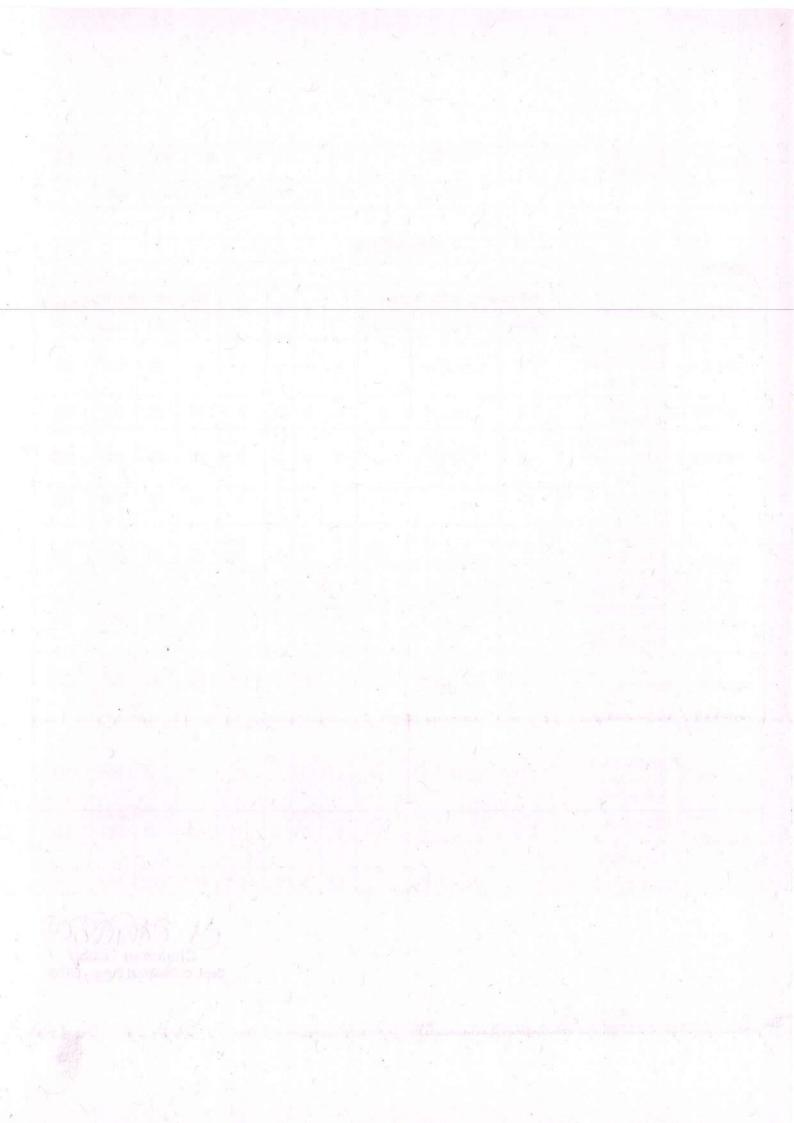
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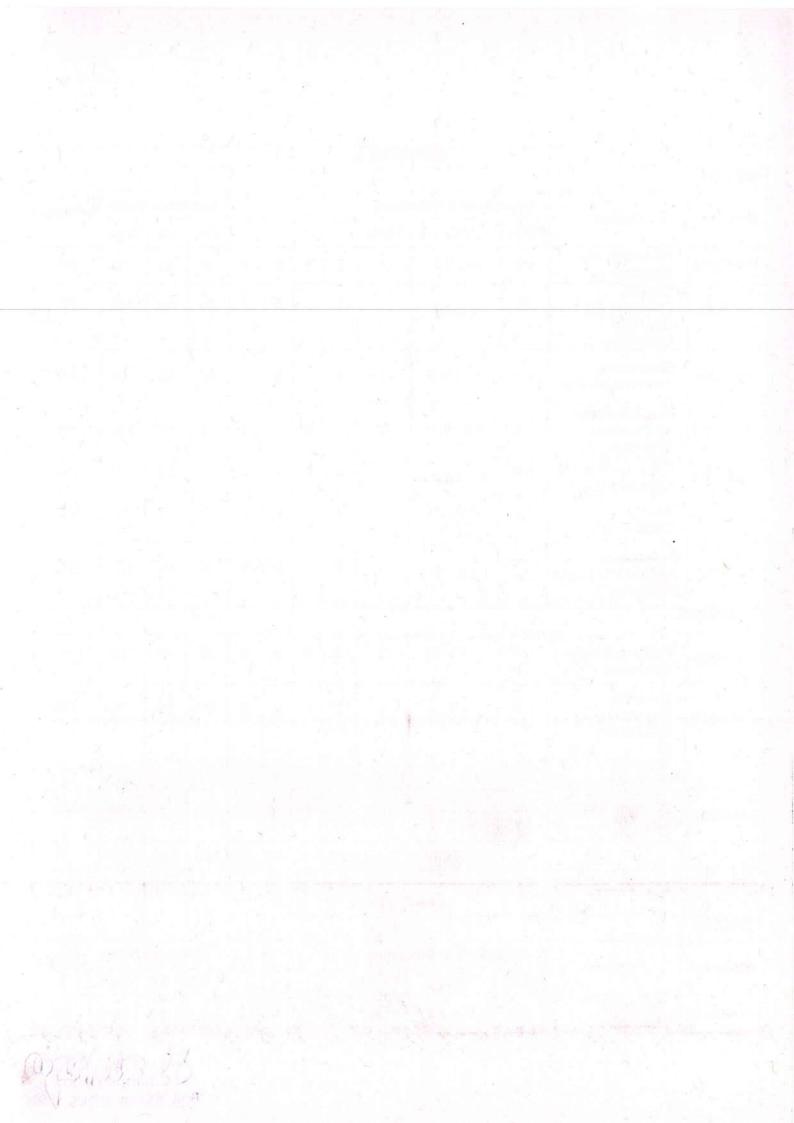
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THEORY												
4		Obje	ctives & Outo	comes					Max	imum	Marks	Categor
Code No	Course	PEOs	POs	PSOs	L	Т	Р	C	CA	ES	Total	outogor
19BS302	Probability and Statistics	I, II	1,2,3,4	2	3	1	0	4	40	60	100	BS
19CH301	Organic Chemistry for Chemical Engineers		1,2,3,4	2	3	0	0	3	40	60	100	PC
19ES303	Engineering Thermodynamics	1, 11	1,2,3,4,5	2	3	0	0	3	40	60	100	ES
19CH302	Fluid Mechanics for Chemical Engineers	I, II	1,2,3,4,5	2	3	0	0	3	40	60	100	PC
19CH303	Chemical Process Calculations	I, II	1,2,3,4,5,8	2	3	0	0	3	40	60	100	PC
19MC301	Indian Constitution	IV	1,2,6,8,10, 11,12	-	2	0	0	0	40	60	100	MC
19TPS03	Quantitative Aptitude and Logical Reasoning - I	III, IV	1,2,9,10,12	3	2	0	0	0	40	60	100	EEC
PRACTICA	NL					1	I					
19CH304	Fluid Mechanics	1, 11	1,2,3,4,5	2	0	0	4	2	60	40	100	PC
19ES306	Electrical Engineering Laboratory for Chemical Engineers	<b>I, II</b>	1,2,3,4,9	2	0	0	4	2 	60	40	100	ES
19HS301	Communication Skills	- 111 -	1,2,3,6,8, 9,10,12	2	0	0	4	2	100		100	EEC
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	THEORY								1			1	
	Code No	Course	Objectives & Outcomes						Marks	Catego			
	Code No	Course	PEOs	POs	PSOs	L		F	C	CA	ES	Total	У
-	19BS402	Numerical Methods	I, II	1,2,3,4	2	સ્	1	0	4	40	60	100	BS

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19CH401	Physical Chemistry	I, II	1,2,3,4	2	3	0	0	3	40	60	100	PC
19CH402	Chemical Engineering Thermodynamics	1, 11	1,2,3,4,5,7	2	3	0	0	3	40	60	100	PC
19CH403	Mechanical Operations	1, 11	1,2,3,4,7	2	3	0	0	3	40	60	100	PC
19CH404	Internet of Things for Chemical Engineers	-1, 11	1,2,3,4,5,10	2	2	0	2	3	40	60	100	PC
19HS402	Universal Human Values 2 : Understandi ng Harmony	1, 11	6,7,8,9,10,12	2	2	1	0	3	40	60	100	MC
19TPS04	Quantitative Aptitude and Logical Reasoning - II	IV	1,2,9,10,12	3	2	0	0	о	40	60	100	EEC
PRACTICA	<b>\L</b>					-		1.1				
19CH406	Organic Chemistry Laboratory	1, 11	1,2,3,4	2	0	0	4	2	60	40	100	PC
19CH407	Mechanical Operations Laboratory	I, II	1,2,3,4,7	2	0	0	4	2	60	40	100	PC
	1.74° 1.7828		TOTAL	-	18	2	10	23	400	500	900	/-

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THEORY		- 1		1.1.1.1								
Orde No.	0	Object	tives & Out	comes		-	-		Max	imum	Marks	Catego
Code No	Course	PEOs	POs	PSOs	L	14	P	C	CA	ES	Total	y
19CH501	Chemical Reaction Engineering - I	I, II	1,2,3,4, 5,8	2	3	0	0	3	40	60	100	PC
19CH502	Material Science and Technology	I, II	1,2,3,4, 7,11	2	3	0	0	3	40	60	100	PC
19CH503	Mass Transfer Operations – I	1, 11	1,2,3,4, 5,8,9	2	3	0	0	3	40	60	100	PC
19CH504	Heat Transfer Operations	-1, 11	1,2,3,4, 5,8,9	2	3	0	0	3	40	60	100	PC
19CH505	Instrument	S. H.J.	1,2,3,4,5,	2	3	0	0	3	J 40	60	100	PC



	Methods of Analysis		8,9				2					
	Professional Elective – I	1100			3	0	0	3	40	60	100	PE
19TPS05	Quantitative Aptitude and Logical Reasoning - III	II, IV	1,2,9, 10,12	3	2	0	0	0	40	60	100	EEC
PRACTIC	AL D								-	V H		
19CH505	Heat Transfer Laboratory	I, II	1,2,3,4,5, 8,9	2	0	0	4	2	60	40	100	PC
19CH506	Computational Engineering Practices Laboratory	1, 11, 111	1,2,3,4, 5,6,9	1, 2	1	0	2	2	60	40	100	PC
19HS501	Career Skills		1,2,3,6, 8,9,10, 12	2	0	0	2	0	100	-	100	EEC
19CH507	Internship/ Industrial visit	1, 11, 111, IV	1,2,3,4, 5,6,7,8,9, 10,11,12	1, 2	0	0	2	1	100	- - -	100	EEC
			Total	- 7	21	0	10	23	500	500	1000	

		· · · · ·	SEM	ESTER V	/1	10						
THEORY												
Oude No.	0	Objec	tives & Outc	omes		-		-	Max	imum	Marks	Category
Code No	Course	PEOs	POs	PSOs	L	Т	P	С	CA	ES	Total	
19CH601	Mass Transfer Operations – II	I, II	1,2,3,4,5, 8,9	2	3	0	0	3	40	60	100	PC
19CH602	Chemical Reaction Engineering – II	l, II	1,2,3,4,5, 8,9	2	3	0	0	3	40	60	100	PC
19CH603	Process Dynamics and Control	I, II	1,2,3,4,5, 6,10	2	3	0	0	3	40	60	100	PC
19CH604	Chemical Process Industries		1,2,3,4,5,7,8, 9,11,12	2	3	0	0	3	40	60	100	PC
	Professional Elective –II	1	A 12	f.	3	0	0	3	40	60	100	PE
	Professional Elective – III	.н. 1 Л		-	3	0	0	3	40	60	100	PE

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19TPS06	Quantitative Aptitude and Logical Reasoning - IV	III, IV	1,2,9,10,12	3	2	0	0	0	40	60	100	EEC
PRACTICA	AL.				1							
19CH605	Process Control Laboratory	. I, II	1,2,3,4,5,6, 10	2	0	0	4	2	60	40	100	PC
19CH606	Mass Transfer Laboratory	I, II	1,2,3,4,5,8, 9	2	0	0	4	2	60	40	100	PC
19CH607	Chemical Reaction Engineering and Iron Sponge Laboratory	I, II	1,2,3,4,5,8, 9	2	0	0	4	2	60	40	100	PC
			TOTAL	-	20	0	12	24	460	540	1000	-

		SEMI	ESTER V	11							
				-							
0	Objec	tives & Outc	omes		-	-	-	Max	imum	Marks	Categor
Course	PEOs	POs	PSOs	L	1	Р	C	CA	ES	Total	Ū
Transport Phenomena	1, 11	1,2,3,4,5, 7,12	2	3	0	0	3	40	60	100	PC
Chemical Process Equipment Design and Drawing	, I, II	1,2,3,4,5, 8,12	2	3	0	0	3	40	60	100	PC
Process Engineering Economics	I, II, IV	1,2,3,4,9, 11	2	3	0	0	3	40	60	100	PC
Professional Elective – IV			and the second	3	0	0	3	40	60	100	PE
Open Elective – I	alia satista -	n e glaten an	and provident	3	0	0	3	40	60	100	OE
Research Methodology	I, II, III, IV	1,2,3,4,5, 6,7,8,9,10, 11,12	2	3	0	0	3	40	60	100	HS
	Phenomena Chemical Process Equipment Design and Drawing Process Engineering Economics Professional Elective – IV Open Elective – I Research	CoursePEOsTransport PhenomenaI, IIChemical Process Equipment DrawingI, IIProcess Engineering EconomicsI, IIProcess Engineering EconomicsI, II, IVProfessional Elective – IVIOpen Elective – IIResearchI, II, III, III, III, III, III, III, I	Objectives & OutoCourseObjectives & OutoPEOsPOsTransport PhenomenaI, II1,2,3,4,5, 7,12Chemical Process Equipment DrawingI, II1,2,3,4,5, 8,12Process Engineering EconomicsI, II1,2,3,4,5, 8,12Process Engineering EconomicsI, II, IV1,2,3,4,9, 11Professional Elective – IVI, II, IV1,2,3,4,9, 11Professional Elective – IVII, II, III, IVResearchI, II, III, III, III, IZ, 3,4,5, 6,7,8,9,101,2,3,4,5, 6,7,8,9,10	Objectives & OutcomesCoursePEOsPOsPSOsTransport PhenomenaI, II $1,2,3,4,5,$ $7,12$ 2Chemical Process Equipment DrawingI, II $1,2,3,4,5,$ $8,12$ 2Process Engineering EconomicsI, II, IV $1,2,3,4,5,$ $8,12$ 2Process 	CoursePEOsPOsPSOsLTransport PhenomenaI, II $1,2,3,4,5,$ $7,12$ 23Chemical Process Equipment DrawingI, II $1,2,3,4,5,$ $8,12$ 23Process Engineering EconomicsI, II, IV $1,2,3,4,5,$ $8,12$ 23Process Engineering EconomicsI, II, IV $1,2,3,4,9,$ $11$ 23Professional Elective – IVII, II, IV $3$ Research MethodologyI, II, III, IV $1,2,3,4,5,$ $6,7,8,9,10,$ 23	Objectives & Outcomes PEOsLTTransport PhenomenaI, II1,2,3,4,5, 7,12230Chemical Process Equipment DrawingI, II1,2,3,4,5, 8,12230Process Equipment DrawingI, II1,2,3,4,5, 8,12230Process Engineering EconomicsI, II, IV1,2,3,4,9, 11230Professional Elective – IVI, II, IV1,2,3,4,9, 11230Research MethodologyI, II, III, IV, II1,2,3,4,5, 6,7,8,9,10,230	Objectives & OutcomesLTPTransport PhenomenaI, II $1,2,3,4,5,$ $7,12$ 2300Chemical Process Equipment DrawingI, II $1,2,3,4,5,$ $7,12$ 2300Chemical Process Equipment DrawingI, II $1,2,3,4,5,$ $8,12$ 2300Process Engineering EconomicsI, II, IV $1,2,3,4,9,$ $11$ 2300Professional Elective – IVI, II, IV $1,2,3,4,9,$ $11$ 2300Research MethodologyI, II, III, III, III, II, II, III, II,	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

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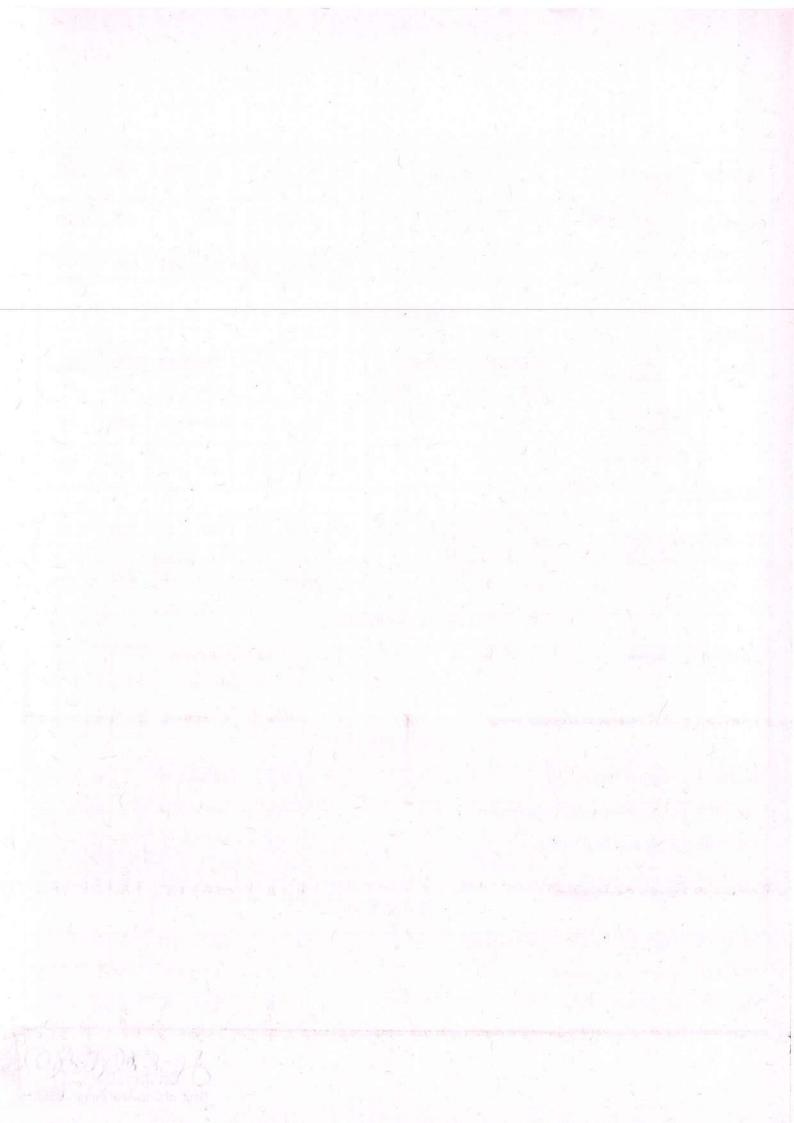
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19CH704	Project Work Phase – I	I, II, III, IV	1,2,3,4,5, 6,7,8,9,10, 11,12	1, 2	0	0	2	1	60	40	100	EEC
19CH705	Comprehensive Review	II, IV	1,2,3,4,5,6, 7,8,9,10,11, 12	1,2	0	0	2	0	100	-	100	EEC
			TOTAL	1.4	18	0	4	19	400	400	800	-

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THEORY									1.			
Code	Cauraa	Objectives & Outcomes				-	-		Max	Catego		
No	Course	PEOs	POs	PSOs	L	1	P	С	CA	ES	Total	У
	Professional Elective – V				3	0	0	3	40	60	100	PE
	Open Elective – II				3	0	0	3	40	60	100	OE
PRACTIC	AL					-						1
19CH801	Project Work Phase – II	I, II, III, IV	1,2,3,4,5, 6,7,8,9,10, 11,12	1, 2	0	0	12	6	60	40	100	EEC
1.0		X	TOTAL	1.1	6	0	12	12	140	160	300	-

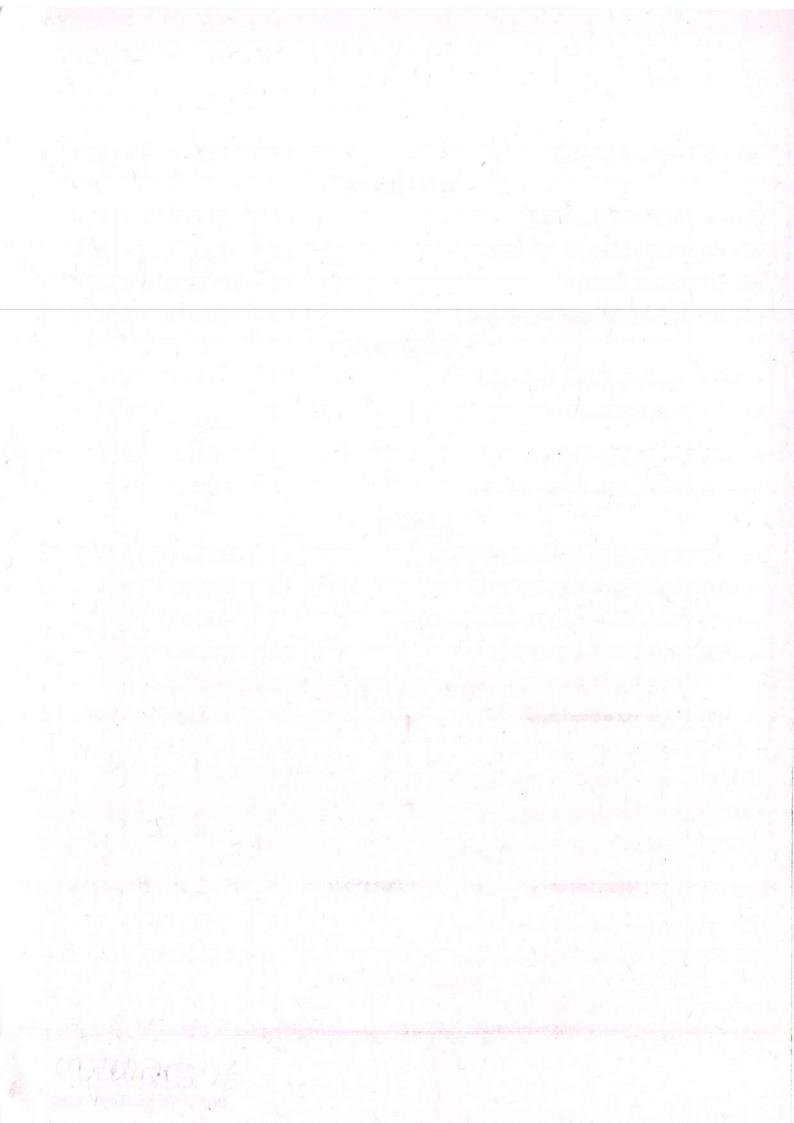
	Professional Electives	Sec. 2.1			6	3	
Code No.	Course	Objectives and Outcomes					c
	and the second of the second	PEOs	POs	in she	d.	Vieta	n No saos
	ELECTIVES – I			-			-
19CHX01	Polymer Technology	1, 11	1,2,3,4,7,11	3	0	0	3
19CHX02	Chemical Process Optimization	1, 11	1,2,3,4,7,11	3	0	0	3
19CHX03	Corrosion Engineering	<u> </u>	1,2,3,4,7	3	0	0	3
19CHX04	Energy Engineering	1, 11	1,2,3,4,7,8	3	0	0	3
	ELECTIVES – II				- 7.1		_
19CHX05	Chemical Process Flow Sheeting	I, II	1,2,3,4,7,11	3	0	0	3
19CHX06	Enzyme Engineering	1, 11	1,2,3,4,7	3	0	0	3
19CHX07	Food Technology	-1, 11	1,2,3,4,7	3	0	0	3
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19CHX08	Plastics Engineering	1, 11	1,2,3,4,7	3	0	0	3
		.,	1,2,0,1,7				
	ELECTIVES – III						
19CHX09	Fluidization Engineering	1, 11	1,2,3,4,5	3	0	0	3
19CHX10	Modern Separation Techniques	1, 11	1,2,3,4,5,7, 8,12	3	0	0	3
19CHX11	Industrial Safety	1, 11	1,2,3,4,8,9,10,12	3	0	0	3
19CHX12	Renewable Energy Technologies	I, II	1,2,3,4,7,8	3	0	0	3
	ELECTIVES – IV				<u> </u>		I
19CHX13	Petroleum Refinery Engineering	1, 11	1,2,3,4,8	3	0	0	3
19CHX14	Plant wide control	1, 11	1,2,3,4,5,6, 10	3	0	0	3
19CHX15	Heterogeneous Catalysis	1, 11	1,2,3,4	3	0	0	3
19CHX16	Process Modelling and simulation	1, 11	1,2,3,4,5,7, 8,12	3	0	0	3
	ELECTIVES – V						
19CHX17	Drugs and Pharmaceutical Technology	1, 11	1,2,3,4,6,7,8	3	0	0	3
19CHX18	Biochemical Engineering		1,2,3,4,6,7,8	3	0	0	3
19CHX19	Professional Ethics for Chemical Engineers	1, 11	1,2,3,4,6,7,8	3	0	0	3
19CHX20	Programming using MATLAB	1, 11	1,2,3,4,5,7, 8,12	3	0	0	3
	OPEN ELECTIVES OFFERED BY CHEMICAL ENG	GINEERIN	G DEPARTMENT				1
19CHY01	Electro Chemical Engineering		1,2,3,4,7,8	3	0	.0	3
19CHY02	Advances in Pollution Control	I, II	1,2,3,4,6,7,8	3	0	0	3
19CHY03	Industrial Wastewater Treatment	I, II	1,2,3,4,6,7,8	3	0	0	3
I9CHY04	Total Quality Management	-1, 11	1,2,3,4,5,6,8, 9,10,12	3	0	0	3
19CHY05	Nano science and Nano technology	I, II	1,2,3,4,7,8,	3	0	0	3
9CHY06	Piping Engineering	I, II	1,2,3,4,5	3	0	0	3
9CHY07	Non - conventional Energy sources	1, 11	1,2,3,4,6,7,8	3	0	0	3
9CHY08	Fuel and Combustion Technologies	I, II	1,2,3,4,6,7,8	3	0	0	3
1	MANDATORY COURSES	S					
9MC202	Environmental Science and Ecology	1,11	1,2,5,6, 7, 、 8,12	3	0	0	0
	1 - 43 1 - 43		1 - 17 3		1.1.1.1.1.1.1.1	1 . 50	14

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19MC301	Indian Constitution	IV	1,2,3,4,6, 7,8	2	0	0	0
19HS402	Universal Human Values 2 : Understanding Harmony	IV	6,7,8,9,10,12	2	1	0	3

	5	LANGUA	GE ELECTIVE					U
Code No.	Cours	0	bjectives & O	utcomes		т	Р	C
	e	PEO s	Pos	PSOs				
19HX201	English for Engineers	Ш	2,3,6, 9,10,12	3	3	0	0	3
19HX202	Hindi	. 111	2,3,6, 9,10,12	3	3	0	0	3
19HX203	Japanese	ш	2,3,6, 9,10,12	3	3	0	0	3
19HX204	French	ш	2,3,6, 9,10,12	3	3	0	0	3

	NPTEL	- VALU	IE ADDED COU	JRSES				
Code No.	Course	C	bjectives & Ou	utcomes		-		
Code No.	Course	PEO s	Pos	PSO s	L	Т	Р	С
19CHZ01	Particle Characterization	I, II,	1,2,3,4,7	3	3	0	0	3
19CHZ02	Introduction to Polymer Science	I, II,	1,2,3,4,7,11	<b>3</b> Paleston and the	3	0	0	3
19CHZ03	Electro- chemical Engineering	I, II,	1,2,3,4,7,8	3	3	0	0	3
19CHZ04	Nanoscience and Technology	I, II,	1,2,3,4,7,8, 12	3	3	0	0	3
19CHZ05	Chemical Process Intensification	I, II,	1,2,3,4,5,7, 8,9,11,12	3	3	0	0	3
19CHZ06	Process Control Design, Analysis and Assessment	I, II,	1,2,3,4,5,6, 10	3	3	0	0	3
19CHZ07	Thermodynamics of Fluid Phase Equilibria	I, II,	1,2,3,4,5,7	3	3	0	0	3
19CHZ08	Infrared Spectroscopy for Pollution Monitoring	I, I <u>I</u> ,	1,2,3,4,5,8,9	<b>3</b>	3	0	0	3
19CHZ09	Multiphase flows	I, IÌ,	1,2,3,4,5	3	3	0'	0	3



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19CHZ10	Flow through Porous Media	I, II,	1,2,3,4,5	3	3	0	0	3
19CHZ11	Continuum Mechanics and Transport Phenomena	I, II,	1,2,3,4,5,7, 12	3	3	0	0	3
19CHZ12	Introduction to Process Modelling in Membrane Separation Process	1, 11,	1,2,3,4,5,7, 8,12	3	3	0	0	3
19CHZ13	Waste to Energy Conversion	I, II,	1,2,3,4,5,7,8	3	3	0	0	3

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CATEGORY			CREDIT	<b>IS FOR</b>	SEM	ESTER			TOTAL CREDIT
CATEGORY	1	II	III	IV	V	VI	VII	VIII	
BS	10	09	04	04	2	-	-		27
ES	07	07	05	-	_		-	-	19
HS	03	03	-	-	-	-	03	-	09
MC	- 1	-	-	03	-	-	-		03
PC	-	-	11	16	18	18	09	-	72
PE	-	-	-	-	03	06	03	03	15
OE	-	-		-	-	-	03	03	06
EEC	1.5	1.5	02	-3	02	- 7	01	06	14
Total	21.5	20.5	22	23	23	24	19	11	165

BS – Basic Sciences

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- HS Humanities & Social Sciences
- PE Professional Elective Course
- EEC Employability Enhancement course

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EA - End Semester Assessment

- ES Engineering Sciences
- PC Professional Core
- OE Open Elective Course
- CA Continuous Assessment

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## TOTAL CREDIT = 165

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# **SEMESTER I**

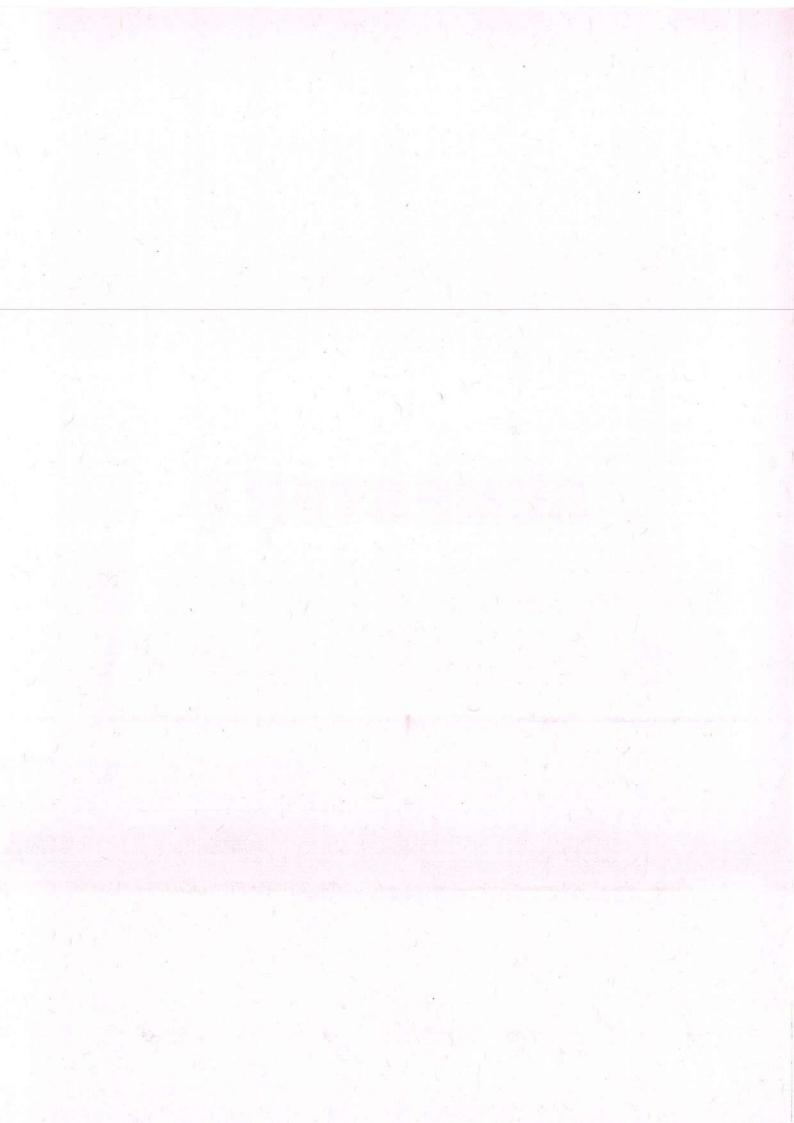
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	CHEMICAL ENGINEER	CINC			-	R 2019	Semester	I B
Course Code	Course Name		lour Wee		Credit	Total	Maximum	Mar
19BS101		L	Т	Ρ	С	Hours		mai
141223	CALCULUS AND ITS APPLICATIONS	3	1	0	4	60	100	9
Course Object	tive (s): The purpose of learning this cou	rse	is to					
phenom Summar several v Develop Find Eige arising in Course Outcor Apply diff of different Identify a and solve Character Integrate Analyze th INIT I	the introductory concepts of Limit and co the introductory concepts of calculus, thi ena involving continuous change of varial ize and apply the methodologies involv variables. enough confidence to identify surface and en values and Eigen vectors which is one the field of engineering. <b>mes:</b> At the end of this course, learners we ferentiation to solve maxima and minima natiation to differentiate functions ind model the real time problems using fir the higher order ordinary differential equi- tize the functions of several variables and the functions for evaluating the surface are characteristics of a linear system with 1 <b>S AND CONTINUITY</b>	s will bles red d are of th rill bo prol st of ation get ea a Eige	I ena in so ea th ne po e ab blem rder ns. the and v n va	ere l ower le to: s us linea solut volun	g probler by solving ful tools t e both th ar differer tions of th ne. and Eige	ns related g using int to handle e limit de ntial equat ne same. en vectors	d to function egration practical pro finition and r ions. Recog	ns c blen rules nize
presentation of	functions - Limit of a function	i - d	eriv	ativo	Difforon	tistis D		12
NIT II ORDI	ction of one variable		CITVE	auve	Dillelen	luation Ru	leMaxima	
ear differentiel	NARY DIFFERENTIAL EQUATIONS							12
uations of highe	equations of second and higher order with	h co	nsta	nt co	pefficients	s. Linear c	lifferential	12
	er order with variable coefficients: Cauchy eters for second order differential equation	's lir	near	diffe	rential ec	uation - N	lethod of	
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NIT III MULT	Variables and their solutions. Total Difference	ontia		oriver	1		the second se	
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NIT III MULT nctions of Two V cobian's, Uncon	Variables and their solutions- Total Different strained maxima and minima.			1			-	2
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- B.S. Grewal, Higher Engineering Mathematics, Forty Third Edition, Khanna Publications, New Delhi 2014
- 5. Glyn James, Advanced Engineering Mathematics, Third Edition, Wiley India, 2014.

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Department	nt CHEMICAL ENGINEERING					R 2019	Semester I	BS
Course Code	Course Name	Hour	s/We	ek	Credit	Total	Maximu Marks	
		L	Т	Ρ	С			
19BS102	ENGINEERING PHYSICS         2         0         2         3         60         1           (Laboratory Embedded)         2         0         2         3         60         1					100	1.2	
	ive (s): The purpose of learning							
Enhance     Engineer	the fundamental knowledge in F	Physics a	nd its	appl	lications r	elevant to	o various stre	ams (
and the second se	ing and Technology		201.1	1		1000-10		
	nes: At the end of this course, le							
Acquire kn	ledge on the basics of propertie owledge on the concepts of Ultr	s or matt	er and	a its a	application	IS		
Get knowle	uate knowledge on the concept	s of fiber	& Las	ser al	nd their a	oplication		
tunneling	edge on advanced Physics con microscopes and	cepts of	quan	tum	theory an	d its app	plications in	
	d knowledge on the concepts of	thormal	arana	rtion	ofmatoria	la and th		
expansion	of joints and heat exchangers	inemai	stope	rues	or materia	als and tr	ieir applicatio	ns in
	PERTIES OF MATTER		1	-		Start and	2009 3009	6+6
	ess-strain diagram and its uses	- torsion	al str	888 2	and defor	mations	- twisting co	
torsion pendulu	m: theory and experiment - be	ndina of	beam	s - h	ending m	nations	- cantilever: t	heory
and experiment	- uniform and non-uniform bend	dina: the	orv an	dex	periment -	I-shane	d airders	neory
	ASONICS	ang. and	, y an	u ov	Seriment	1 Shape	d girders.	6+6
	assification of Sound- Ultrasor	ics Proc	luctio	n - 1	Magnetos	triction	nenerator -	
electric generate	or-cavitations-ultrasonic cleaning	a-Non De	estruc	tive	Testina- F	Pulse ect	o system thr	ough
ransmission an	d reflection modes- A, B and C -	- scan di	splays	s- En	aineerina	Applicat	ions-Cutting	ougn
welding and drill	ing.				g	, ibbuggi	ionio o datang,	
JNIT III LASE	R AND FIBRE OPTICS	the second	E		Renter St.		1	6+6
asers: populati	on of energy levels, Einstein's A	and B	coeffic	cients	derivatio	n – Sem	iconductor la	sers:
	nd heterojunction - Industrial a							
aperture and acc	ceptance angle - types of optical	fibres (n	nateria	al, re	fractive in	dex, mo	de) – fibre opt	tic
ensors: pressu	e and displacement.							
NIT IV QUAN	ITUM PHYSICS							
	TUM PHIBICS	and and	3		11 I.			6+6
		n) – Com	pton	effec	t: theory a	and expe	rimental	6+6
Black body radia erification – wa	tion – Planck's theory (derivatio ve particle duality – electron diffi	raction -	conce	ept of	wave fur	iction an	d its physical	6+6
Black body radia erification – wa ignificance – So	tion – Planck's theory (derivatio ve particle duality – electron diffi chrödinger's wave equation – tim	raction -	conce	ept of	wave fur	iction an	d its physical	6+6
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<ol> <li>Halliday, D., Resnick, R. &amp; Walker, J. "Principles of Physics". Wiley, 2015</li> <li>Serway, R.A. &amp; Jewett, J.W. "Physics for Scientists of Landscience of Physics".</li> </ol>	
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists - 15	
<ol> <li>Serway, R.A. &amp; Jewett, J.W. "Physics for Scientists and Engineers". Cengage Lea</li> <li>Tipler, P.A. &amp; Mosca.G, "Physics for Scientists and Engineers with ModernPhysics".W.H.Freeman,2007.</li> </ol>	rning, 2010

## LIST OF EXPERIMENTS (ANY FIVE)

30 Hours

- 1. Determination of rigidity modulus Torsion pendulum
- 2. Determination of Young's modulus by non-uniform bending method
- 3. Determination of Young's modulus by uniform bending method
- 4. Determination of wavelength, and particle size using Laser
- 5. Determination of acceptance angle in an optical fiber.
- 6. Determination of thermal conductivity of a bad conductor Lee's Disc method.
- 7. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer.
- 8. Determination of wavelength of mercury spectrum spectrometer grating
- 9. Determination of band gap of a semiconductor
- 10. Determination of thickness of a thin wire Air wedge method.

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Department	CHEMICAL ENGIN					R 2019	Semester I	BS
Course Code	Course Name	Hour	's / V	leek	Credit	Total Hours	Maximum Marks	1
oouloc oouc		L	Т	Р	С	nours	Warks	
19BS103	ENGINEERING CHEMISTRY	3	0	0	3	45	100	
	ve (s): The purpose of learning this on and the basic concepts of water characteristics of water characteristics of the second s			and	treatmer	nt method	S.	
	fundamental concepts of Electroch						1	*
	nd the principles and generation of e	energy	in Ba	tterie	es, Solar	cells & N	luclear reacto	ors.
	wledge on nanomaterials.							
	e types of fuels and the manufacture	and the second se			adapt of the second	ous fuels.		_
	nes: At the end of this course, learne							
	students conversant with water treat					ada		
	reaction involved in corrosion and co owledge on renewable energy sourc						to import	
	ge on energy storage devices	es like	nucle	ai, a		wind and		
	owledge on various preparation met	hods of	nano	o par	ticles an	d know th	ne application	IS.
	owledge on different types of fuels (s							
	it combustion			,, ,	·······		<b>,</b>	,
INITI WATE	ER CHEMISTRY	1.2			1971	4	· North	9
lardness of war	ter – types – Estimation of hardnes	s of wa	ater	by E	DTA – p	oroblems	- Domestic	wat
	troubles (scales, sludge, Primir							
	rbonate, phosphate, sodium alumina			on co	onditionir	ng) extern	al treatment	-
	process – Desalination - Reverse C		5.				1.	
JNIT II ELEC	TROCHEMISTRYAND CORROSIO	N				I Comercia		9
	cell - redox reaction, electrode pote							
	en electrode-Calomel Electrode- Co							ica
	nic, differential aeration)-factors influence	encing	corro	sion	-corrosic	on control	- sacrificial	
	essed current cathodic method.	-	- 17					9
		fueien		laar	aboin roe	actiona li	abt water rea	-
reeder reactor-	clear energy- nuclear fission- nuclear solar energy conversion- solar cells-	wind e	nerg	y. Ba	atteries a	and fuel c	ells: Types	CIO
	e battery- lead storage battery- lithiu DCHEMISTRY		aller	y- Tu				9
and the second se		uba (Cl		m d m	anauira	Cunthoo		100
	ticles: nano cluster, nano rod, nanot othermal,solvothermal,electrodeposi							Jn,
Properties and a		tion, che	ennica	aivap	ourdept	Sillon,ias	erablation,	
	SANDCOMBUSTION			-		- International States		9
	n- classification of fuels- solid fuels-	coal- n	ovim	ate	and ultin	nate anal	veis- manufa	
	coke (Otto Hoffmann method) – Liqu							
	cesses- knocking- octane number- ce							
	ter gas- bio diesel. Combustion- flue						and a position	
EXT BOOK(S):		<u> </u>	-				1 S. P. 1	
	nd Monica Jain, "Engineering Cher	nietny	Dha	nnat	Doi Dul	aliching (	Company (D)	1 +
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<ol> <li>Kannan P., Ltd. Chenna</li> </ol>	Ravikrishnan A., "Engineering Chem ii,2009	nistry",	Sri K	rishr	a Hi-tec	h Publish	ing Company	/ P
	States and All Press					As	PAR	A
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## **REFERENCE(S):**

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1.	Dara S.S, U	mare	e S.S, "Enginee	ering Chemis	try", S.	Chand & Cor	npany Ltd., I	New Delhi 2	010	
2.	Sivasankar Delhi,2008.	В.,	"Engineering	Chemistry",	Tata	McGraw-Hill	Publishing	Company,	Ltd.,	New

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	CHEMICAL ENG	NEER	NG		1	R 2019	Semester I	HS
Course	Course Name	Hou	rs/W	leek	Credit	Total Hours	Maximun Marks	n
Code		L	т	Р	С	nours	inditto	
19HS101	COMMUNICATIVE ENGLISH	3	0	0	3	45	100	
Course Object Acquire Develo texts. Enhance Improve Help le Course Outco Improve Develop Acquire Enhance Commu UNIT I LAN Parts of speciations UNIT II LIST Listening for conversation lyrics - Clean UNIT III REA Prediction -	tive (s):The purpose of learning this of e usage of grammar in English languag p listening skills which will enable to list ce the reading skill to comprehend tech e writing skills to express thoughts free arners develop their speaking skills ar omes: At the end of this course, learned their language usage in LSRW skills. to listening skills to comprehend genera the ability to understand different writ the ability to understand different writ the ability to understand different writ the writing skills to express the idea unicate fluently in real time context. <b>IGUAGE FOCUS</b> eech - Word formation - Sentence type (b) - Tense forms - Subject - Verb agree (FENING) or specific information: Short conversions - Note-taking - Listening for gist / in r individual sounds - Word stress - Tel <b>DING</b> Skimming for gist - Scanning for specific ructure	sourse ge. sten lev hnical v ely. ad spea ers will al / tecl ten tex s of the s (decl ement sations terview ephon	is to cture writin ak flu be al hnica ts. e lean aratin - Ver / m vs - I e etic	is and ings. iently ble to al talk rners ve, ir rbs - onolo Lister quett	d compre	hend diff ontexts. - Adjectiv Gap fillir ongs and	erent types atory & ves - Framin g - Teleph completing ext and	9 9 one the 9
Dialogue wr UNIT V SPE Self-introdu past experie - Agreemen TEXT BOOK(S		ormatio tion - E Tongu	n - T Expre e twi	sters	g about p g opinion	present c s and jus	ircumstance stifying opinio	<b>9</b> s,
UNIT IV WRI Paragraph v Dialogue wr UNIT V SPE Self-introdu past experie - Agreemen TEXT BOOK(S 1. Communic University 2	iting - E-mail – Instructions AKING ction - Giving personal and factual info ences and future plans - Mini-presenta t / disagreement - Likes and dislikes - S): ative English by KN Shoba, Lourdes J 2017.	ormatio tion - E Tongu	n - T Expre e twi	sters	g about p g opinion	present c s and jus	ircumstance stifying opinio	<b>9</b> s,
UNIT IV WRI Paragraph v Dialogue wr UNIT V SPE Self-introdu past experie - Agreemen TEXT BOOK(S 1. Communic University 2 REFERENCE(	iting - E-mail – Instructions AKING ction - Giving personal and factual info ences and future plans - Mini-presenta t / disagreement - Likes and dislikes - S): ative English by KN Shoba, Lourdes J 2017. S):	ormatio tion - E Tongu oavani	n - T xpre e twi Ray	sters en P	g about p g opinion ublished	oresent c s and jus by Camb	ircumstance stifying opinio pridge	<b>9</b> s,
UNIT IV WRI Paragraph v Dialogue wr UNIT V SPE Self-introdu past experie - Agreemen TEXT BOOK(S 1. Communic University 2 REFERENCE( 1 Murphy, Ra Interm learn	iting - E-mail – Instructions <b>AKING</b> ction - Giving personal and factual info ences and future plans - Mini-presenta t / disagreement - Likes and dislikes - <b>S):</b> ative English by KN Shoba, Lourdes J 2017. <b>S):</b> aymond. "English Grammar in Use – A hers of English". IV edition. United King	ormatio tion - E Tongu oavani Self-S gdom:	n - T xpre e twi Ray tudy Cam	en P Refe	g about p g opinion ublished erence ar ge Univer	by Camb by Camb d Practic sity Pres	ircumstance stifying opinio pridge ce Book for s. 2012.	<b>9</b> s,
UNIT IV WRI Paragraph v Dialogue wr UNIT V SPE Self-introdu past experie - Agreemen TEXT BOOK(S 1. Communic University 2 REFERENCE( 1 Murphy, Ra Interm learn 2 Seely, Johr Oxford Univ	iting - E-mail – Instructions <b>AKING</b> ction - Giving personal and factual info ences and future plans - Mini-presenta t / disagreement - Likes and dislikes - <b>5):</b> ative English by KN Shoba, Lourdes J 2017. <b>S):</b> aymond. "English Grammar in Use – A	ormatio tion - E Tongu oavani Self-S gdom: nd Spe	n - T xpre e twi Ray tudy Cam aking	essing sters en P Refe bridg g <sup>*</sup> . In	g about p g opinion ublished erence ar ge Univer dian ed.	by Camb by Camb d Practic sity Pres New Del	ircumstance stifying opinio pridge ce Book for is. 2012. hi:	<b>9</b> s,

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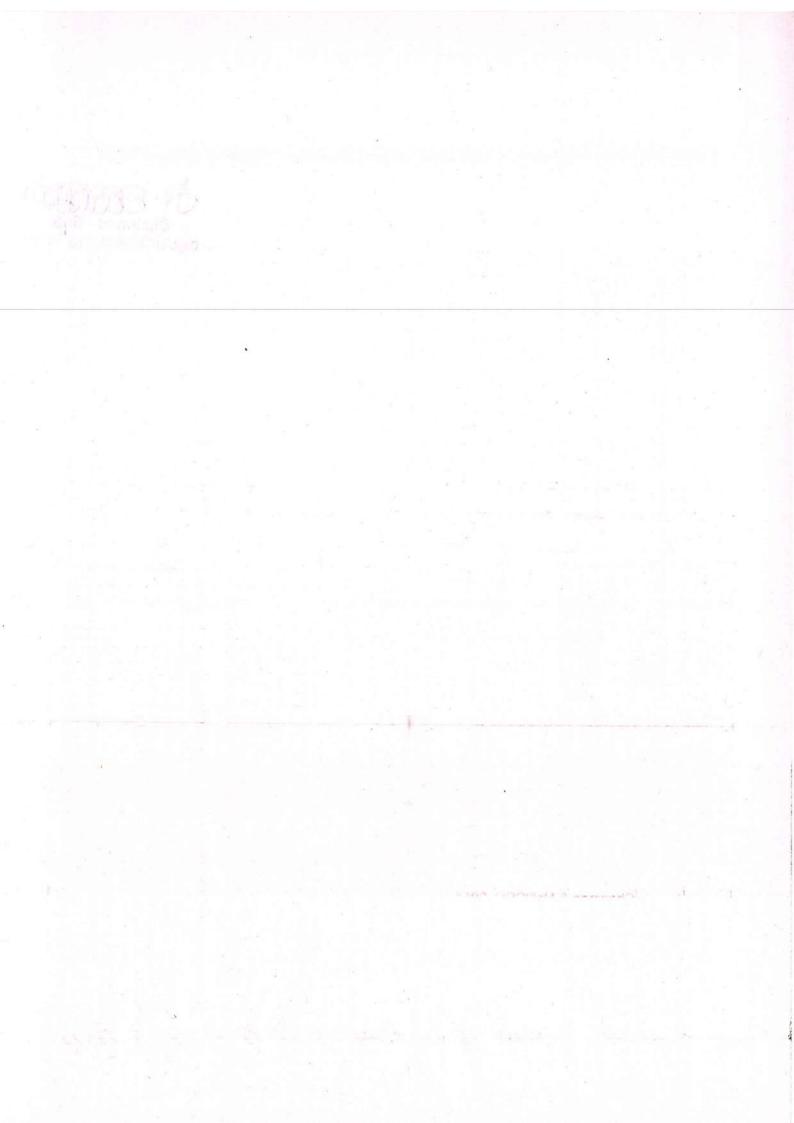
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Departmen	t	CHEMICAL ENGI	NEER	ING	3		R 2019	Semester I	ES
Course Co	ode Course Name		CONTRACTOR INCOMES	urs eel	(CS-22)	Credit	Total	Maximur Marks	n
			L	т	Ρ	С	Hours	Warks	
19ES101	25	PYTHON PROGRAMMING	3	0	0	3	45	100	
Understa     Understa     Python p     Develop     Use Pyth Course Outcor     Apply pro     Recogniz     Design, c     Write coc     Read and INIT I     Read and INIT I     Introduction to Computer-Inform Computer-Inf	and pro- and whi- rogram Pythor on dat mes: A oblems ze and code, a de usin d write COMP Comp mation eneral equent aptor a <b>STRIN</b> – Acco Access peratio <b>DICTIC</b> naries ningafu octions <b>MODU</b> orting n singfile Except	a structures — lists, tuples, dicti- ta structures — lists, tuples, dicti- ta the end of this course, learner is solving techniques to real work construct common programming and test Python programs using g dictionaries and functions data from/to files in Python Prog <b>UTATIONAL THINKING</b> utational Thinking —From abac and data - Converting inform Problem-Solving concepts-: Algo ial Logic Structure - Problem So and Scratch Tools. <b>DUCTION TO PYTHON</b> es - Setting up path - Working w al Statements — Looping — Cont <b>IG MANIPULATION, LIST AND</b> essing Strings- Basic Op- sing list - Operations on List - W ns — Functions and Methods <b>DNARIES AND FUNCTIONS</b> - Accessing values in dictionaries inction-Callingafunction-Typesof - Global and local variables <b>LES, FILES AND EXCEPTION</b> nodule - Math module - Random e-FileOpeningModes-Readingan ion Handling - Except clause - T Riley and Kenny Hunt, "Comput-	d loops onarie s will t d probl g idion List, T grams us to nation orithm olving ith Pyt rol Sta <b>TUPL</b> beratio /orking es - N functio <b>HANE</b> modu dwritir ry, fina	e for s. pe a emination int Ps with horn ter Ps with horn ter ps y with horn ter pons- pons- pgfil ally Th	chine s. varia es an chine chine a -Ba eudo h De n -Ba eudo h De n -Ba seudo h De r seudo h De n -Ba seudo h De seudo h De h H De seudo h De h H De h De h H H	o bles, loop, d Strings e – The finata -Data o-code and cisions - F sic Syntax ing slices ts - Functi with did ctionArgun cages- unctionsEs se User De g for the M	branch, a rst Softwa Capacity Flowcha Problem S - Variable - Functio on and M ctionaries nents- Comp xceptionH efined Exc Modern Pro	and input / out are –First Mo Problem Sol rt Problem Sol olving with Lo e and Data Ty e and Data Ty on and Metho lethods – Crea - Propertie osition Files andling ceptions.	put. 9 derr lving 000p 9 pes 9 gds - ating s - 9 s
۷,	Educa	rankle, "Problem Solving and Pr tion, New Delhi, 2011.	ogram	mır	ng Co	oncepts", 9	ith Edition	i, Pearson	
EFERENCE(								landa Historia	
1.	Brian	Heinold," Introduction to Program	nming	Us	ing F	ython", M	ount St. M	lary's Univers	ity,
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	2013.
2.	Michael Dawson, "Python Programming for the Absolute Beginner", 3rd Edition, 2010.
3.	Allen Downey, Green Tea Press Needham, "Think Python, How to Think Like a Computer Scientist", Massachusetts.
4.	Cunningham, sams teach yourself python in 24 hours, Second edition Pearson, 2014

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Department	Common to al		laure	~	,	R 2019	Semester I EE
ourse Code	Course Name		lour: Weel	k	Credit	Total	Maximum
			Т	Ρ	С	Hours	Marks
19TPS01	SOFT SKILL -I	1	0	1	1.5	30	100
Course Obj	ective (s): The purpose of learnin	g this course	e is				
<ul> <li>To enf</li> <li>To imp</li> <li>To dev</li> <li>To dev</li> </ul>	elop basic grammar knowledge in ance Speaking Skills in English rove Verbal and Non-verbal Comm elop Confidence and Emotional In elop Inter Personal Skills.	nunication S Itelligence					
<ul><li>Have</li><li>Spea</li><li>Have</li><li>Hand</li></ul>	comes: At the end of this course, competent knowledge of grammar fluent English by enriching Vocal good Presentation Skills through any Situation with confidence by in a team by having team coheren	r bulary Know verbal and no y being emot	ledge on-ve ional	e. erbal ly st	l commur able.	nication.	
	fective English – Written Englisl	h		_			6
	Grammar - Parts of Speech – Ten		Sent	enc	e Constru	uction.Diale	275
onversations	- Writing. Exercises to practice a	nd improve t	hese	skil	ls.		
UNIT 2 Ef	fective English – Spoken Englis	h		-			6
ocabulary -	Idioms & Phrases - Synonyms		ms.D	ialog	gues a	nd Conve	rsations -Writing
xercises to p	ractice and improve these skills.						
	t of Communication & The Hidd			1001			6
erbal Comn	unication - Effective Communicat	tion - Active	listen	ing	–Paraphi	rasing – Fe	eedback.
	ommunication - Body Language						
nportance of	feelings in communication - dealin	g with feelin	gs in	con	nmunicati	ion.	
UNIT 4 W	ORLD OF TEAMS - PART -01		en en		17.5755 B		6
elf Enhance motional inte	ment - importance of developing lligence.	assertive sk	cills-	deve	eloping s	elf-confide	nce – developin
UNIT 5 W	ORLD OF TEAMS - PART -02		2000	6.6	RE 10 2.10		6
	Team work – Team vs. Group - A Dealing with People- Group Decis		a suc	cess	sful team	– Barriers	involved Workin
	TOTAL : 30(15 Th	ieory + 15 P	racti	cal)	Hours		1
(	RE	EFERENCES	S:				
1. The Se	ven Habits of Highly Effective Peo	ple - Steph	en R	. Co	ovey.		
2. All the	books in the "Chicken Soup for the	e Soul" serie	s.				
and the second	search for meaning – Viktor Frankl		-			Š.	X
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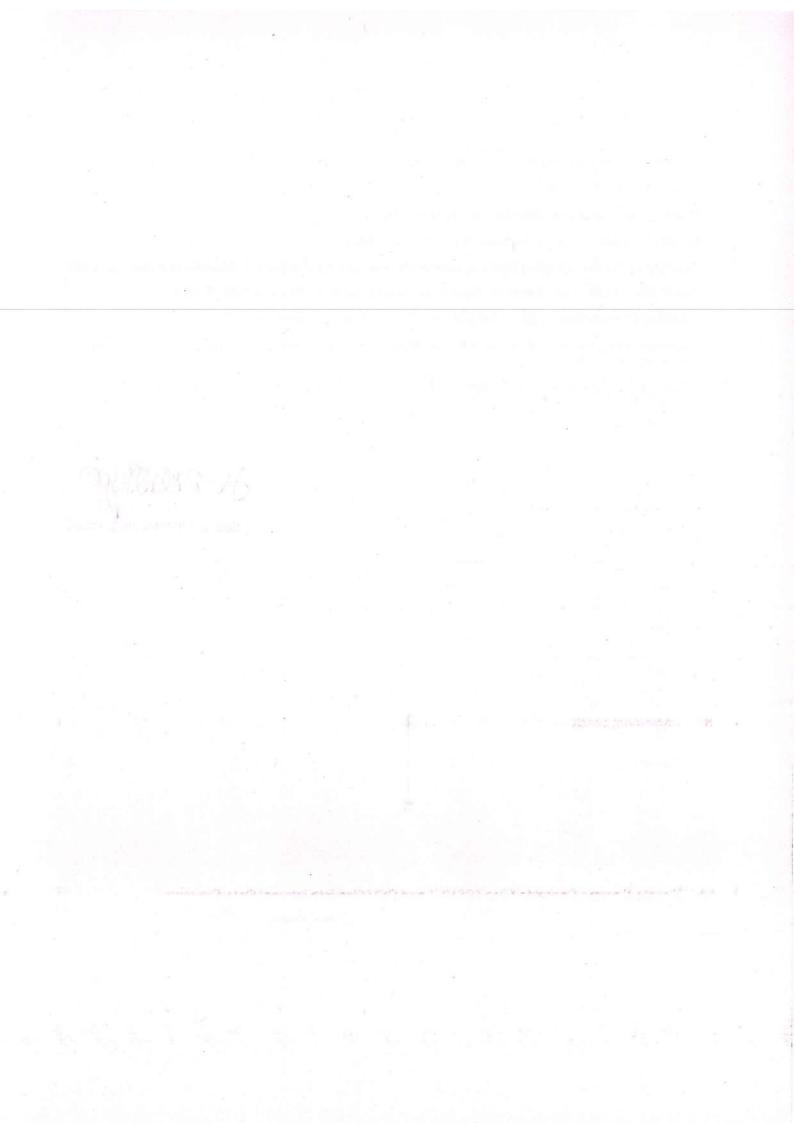
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- 4. The greatest miracle in the world OgMandino
- 5. Goal Eliyahu Goldratt.

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- 6. Working with Emotional Intelligence David Goleman.
- 7. Excel in English Sundra Samuel, Samuel Publications
- 8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
- 9. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
- 10. Effective Presentation Skills (A Fifty-Minute Series Book) by Steve Mandel
- "Strategic interviewing" byRichaurd Camp, Mary E. Vielhaber and Jack L. Simonetti Published by Wiley India Pvt. Ltd
- 12. "Effective Group Discussion: Theory and Practice" by Gloria J. Galanes, Katherine Adams , John K. Brilhart

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Department	CHEMICAL ENG	INEER	ING			R 2019	Semester I ES
Course Code	Course Name Hours / Week Cred				Credit	Total	Maximum
19ES104	PYTHON PROGRAMMING LABORATORY	L	T	Р	С	Hours	Marks
1923104		0	0 2		1	30	100
<ul> <li>Use function</li> </ul>	ons for structuring Python progran	ne					

• Read and write data from/to files in Python.

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Exp No.	Name of Experiments
1	Find the Greatest among three numbers without using third variable
2	Sum of the Digits of a Number
3	Generation of Prime Numbers
4	Implement a sequential search
5	Create a calculator program
6	Explore string functions
7	Implement Selection Sort
8	Implement Stack
9	Read and write into a file
10	Demonstrate usage of basic regular expression
11	Demonstrate use of advanced regular expressions for data validation.
12	Demonstrate use of List
13	Demonstrate use of Dictionaries
14	Create Comma Separate Files (CSV), Load CSV files into internal Data Structure

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Department	CHEMICAL ENGIN	NEERIN	G			R 2019	Semeste	r I Es
Course Code	Course Name	Hou	rs / W	Veek	Credit	Total	Maximu	m
19ES106	ENGINEERING GRAPHICS	L	Т	Р	с	Hours	Marks	
1320100	ENGINEERING GRAPHICS	0	0	4	2	60	100	
	es: The purpose of learning this cou							
	ntions and use of drawing tools in r		engin	eerir	ng drawir	ngs.		
	raphic projection of points and lines							
	pjection of planes and simple solids							
	ction of solids and obtain the develo		of su	rface	es of give	en solids.		
	metric projection of the given solids		a ahl					
	es: At the end of this course, learne				ile drefti		abiaata	
	he conventions and apply dimensio hographic projection of points and l		icepi	s wh	lie draitii	ng simple	Jujecis.	
	bjection of planes and simple solids ction of solid drawings and develop		ounfo		of airror	aalida		
	metric projection of the given object		Suna	aces	or given	solius.		
	CONVENTIONS (Not for Examin			<u></u>				1
the second se	Charles and the second s		du a fti i		-		nuantiana	
	phics in engineering applications – ize, layout and folding of drawing sh						nvenuons	and
	CURVES	ieets –	Lelle	ning a		ensioning.		12
	I constructions, Curves used in eng	ainoorin	a pro	otion	c: Conio	c Const	nuction of c	1
	erbola by eccentricity method – C							
	nd circle – Drawing of tangents and							les c
	CTION OF POINTS AND LINES	nonnai	10 11	c ab				11
and the second		5	1		munation att		an of no	
	ojection- Principles-Principal Plan htlines(onlyFirstangleprojections)inc						on of po	ints.
	rue lengths and true inclinations by					1165-		
	CTION OF PLANES & SOLIDS	Totating		meu	iou.			12
	es (polygonal and circular surfaces)	inclino	to h	oth t	ho princi	nal planas	Projection	
	orisms, pyramids, cylinder, cone an							
	ines by rotating object method.	u trunce	aleu a	Solida		10 4/13 13 11		ine .
	CTION OF SECTIONED SOLIDS A	AND DE	VELO	OPM	ENT OF	SURFAC	ES	12
	e solids in simple vertical position							
orincipal planes ar	nd perpendicular to the other – obta	ining tru	le sh	ane	of section	n Develor	ment of lat	eral
surfaces of simple	and sectioned solids – Prisms, pyr	amids o	vlind	ers a	ind cone	S.	mont of lat	orui
	TRIC PROJECTIONS			e same	Contraction of the local division of the loc			12
and the second se	etric projection – isometric scale –ls	sometric	proie	ectio	ns of sim	ple solids	- Prisms	Contraction of the
	s, cones- combination of two solid							
TEXT BOOK(S):								
	., "A text book of Engineering Grap	hics" D	hana	laks	nmi Publi	ishers Ch	ennai 2011	2
and the second se	. and Prabhu Raja V., "Engineering	In the second						
2008.		Graphi	<b>0</b> 3 , 1	10.00	nge mie	mational (	, cirnico,	
REFERENCE(S)		A STREET		11/21/2014	alema har a			

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	Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3.	Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4.	N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.

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Department	CHEMICAL ENG	GINEE	RING	6		R 2019	Semester I	
Course Code	Course Name	Hours / Week Credit			Credit	Total	Maximum Marks	
19ES107	WORKSHOP PRACTICES	L	Т	Р	с	Hours	rs	
1323107	WORRSHOP FRACTICES	0	0	2	1	30	100	

Course Objective (s): The purpose of learning this course is to

- Provide hands on training for fabrication of components using carpentry, sheet metal and welding equipment /tools.
- Gain the skills for making fitting joints and household pipe line connections using suitable tools.
- Develop the skills for preparing the green sand mould and to make simple household electrical connection
- Provide hands on training for dismantling and assembling of petrol engines, gear box and pumps.
- Develop the skills for making wood/sheet metal models using suitable tools.

Course Outcomes: At the end of this course, learners will be able to:

- · Fabricate simple components using carpentry, sheet metal and welding equipment/tools
- Make fitting joints and household pipe line connections using suitable tools.
- Prepare green sand mould and make simple household electrical connections using suitable tools
- Dismantle and assemble petrol engines, gear box and pumps.
- Make simple models using wood and sheet metal.

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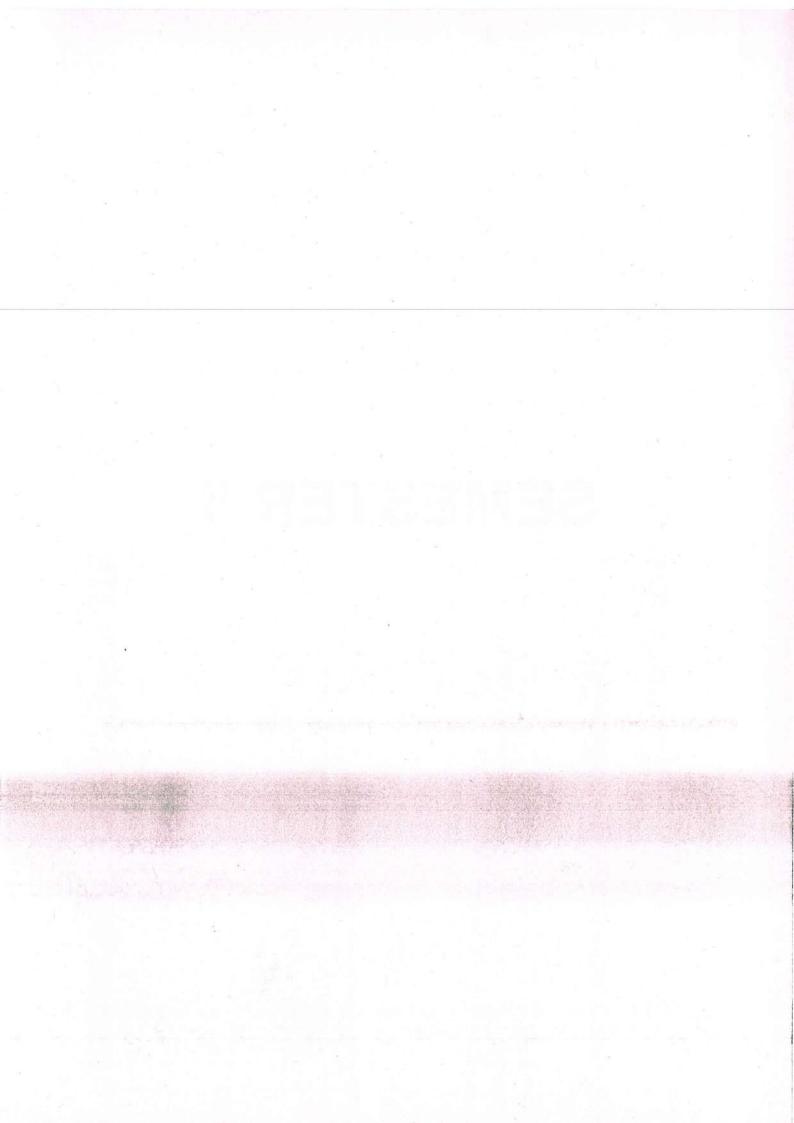
Exp No.	Name of Experiments
1	Forming of simple object in sheet metal using suitable tools (Example: Dust Pan / Soap Box
2	Fabrication of a simple component using thin and thick plates. (Example: Book rack)
3	Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box.
4	Prepare a "V" (or) Half round (or) Square joint from the given mild Steel flat.
	Construct a household pipe line connections using pipes, Tee joint, Four way joint, elbow, union, bend,Gate way and Taps (or) Construct a pipe connections of house application centrifugal pump using pipes,bend, gate valve, flanges and foot valve.
6	Prepare a green sand mould using solid pattern/split pattern.
	Construct a domestic electrical wire connections using indicator, one way switch with calling bell, two way switch with lamp, one way switch with fan regulator and one way switch with socket.
8	Dismantling and assembly of Centrifugal Monoblock / Gear Pump / Gear box.
9	Dismantling and assembly of two stroke and four stroke petrol engine.
10	Mini Project (Fabrication of Small Components).

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Department	CHEMICAL ENG	R 2019	Semester II	B				
Course Code	Course Name	Hours / Week			Credit	Total	Maximur	n
Code		LTP		С	Hours	Marks		
19BS201	VECTOR CALCULUS AND COMPLEX VARIABLES	3	1	0	4	60	100	
Course Obie	ctive (s): The purpose of learning this	course	is to	/			1.00	_
<ul><li> principli</li><li> Implem and ele</li><li> Develop</li></ul>	arize and apply the methodologies invo es of Calculus viz: Vector, Vector Diffe ent the Complex Analysis, an elegant i ctrostatics. o enough confidence to identify and me	rentiation method	on ar in th athen	nd Vo ne str natic	ector Inte udy of he al patterr	gration. at flow, flu ns in real v	uid dynamics world and off	er
	riate solutions, using the skills learned g a complex function and solving throu					pporting e	environment.	
the second se	omes: At the end of this course, learned					1		
Charac	terize the calculus of vectors.				21			
<ul> <li>Apply the</li> </ul>	ne theoretical aspects of vector integra	calculu	us in	their	core are	as.	1.11	
<ul> <li>Recogn</li> </ul>	ize the differentiation properties of con	nplex fu	Inctic	ons.			1917) 1924:	
<ul> <li>Identify</li> </ul>	the complex functions and their mappi	ng in ce	ertair	n cor	nplex pla	nes.		
<ul> <li>Use the</li> </ul>	concepts of integration to complex fur	nctions i	in ce	rtain	regions.			
JNIT I D	IFFERENTIATION OF VECTORS	3.00				•	<	12
	nction- Directional derivative - Gradien Scalar potential	t -Diver	geno	ce -C	url - Sole	noidal – I	rrotational	
	ITEGRATION OF VECTORS				-			12
	ine Integral - Surface integral- Green's	theore	m in	a nl	ane- Stok	e's Theor	em- Gauss	12
vergence the	prem- Applications involving cubes and	l naralle	eleni	ned			ciii- Gauss	
	NALYTIC FUNCTIONS	parane	siopi	JUU.				12
	ons- Necessary and Sufficient conditio	ns of A	nalvt	ic Fr	Inction- F	roperties	of Analytic	
	rmination of Analytic Function using Mi							
nction - Dete					. Howard and		Section of the last	and the second
							CONTRACTOR OF THE REAL PROPERTY OF THE PARTY	12
roblems of Po			in and a	C. L. State				CONTRACTOR OF
roblems of Po JNIT IV M	APPING OF COMPLEX FUNCTIONS	nslatior	n, rot	atior	n, magnif	cation an	And the second	CONSTRUCTION OF
roblems of Po JNIT IV M onformal map	tential Flow. APPING OF COMPLEX FUNCTIONS pping- Application of transformation: tra						And the second	CONSTRUCTION OF
roblems of Pc JNIT IV M onformal map ulti valued fur	APPING OF COMPLEX FUNCTIONS						d inversion o	CONSTRUCTION OF
roblems of Po JNIT IV M onformal map ulti valued fur JNIT V C	APPING OF COMPLEX FUNCTIONS pping- Application of transformation: transformation transformation and transformation transformation and transformati	on (Bilir	near	trans	sformatio	n).	d inversion o	nf.
roblems of Po JNIT IV M onformal map nulti valued fur JNIT V C auchy's Fund	APPING OF COMPLEX FUNCTIONS pping- Application of transformation: transformation notions - Linear fractional Transformation OMPLEXINTEGRATION	on (Bilir ormula	near	trans	sformatio	n).	d inversion o	nf.
roblems of Pc JNIT IV M onformal map nulti valued fur JNIT V C auchy's Fund lassification o	APPING OF COMPLEX FUNCTIONS oping- Application of transformation: transformations - Linear fractional Transformation OMPLEXINTEGRATION amental Theorem - Cauchy's Integral F f Singularities - Cauchy's Residue The	on (Bilir ormula	near	trans	sformatio	n).	d inversion o	nf.
roblems of Po JNIT IV M onformal map nulti valued fur JNIT V C auchy's Fund lassification o	APPING OF COMPLEX FUNCTIONS apping- Application of transformation: transformations - Linear fractional Transformation OMPLEXINTEGRATION amental Theorem - Cauchy's Integral F f Singularities - Cauchy's Residue The S):	on (Bilir ormula orem	near 1 - Ta	trans aylor'	sformations and La	n). urent'sser	d Inversion o	л <sup>я</sup> 12
roblems of Pc         UNIT IV       M         conformal map         nulti valued fur         UNIT V       C         auchy's Fund         lassification o         REFERENCE(	APPING OF COMPLEX FUNCTIONS pping- Application of transformation: transformations - Linear fractional Transformation OMPLEXINTEGRATION amental Theorem - Cauchy's Integral F f Singularities - Cauchy's Residue The S): yszig, Advanced Engineering Mathema	on (Bilir ormula orem	near 1 - Ta	trans aylor'	sformations and La	n). urent'sser	d Inversion o	л 12

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	Publishing Company Ltd, 2003
3.	J. A. Brown and R. V. Churchill, Complex Variables and Applications , Sixth Edition, McGraw Hill,New Delhi, 1996
4.	Peter V. O. Neil, Advanced Engineering Mathematics, Seventh Edition ,Cengage Learning India Private Limited, 2012
5.	Glyn James, Advanced Engineering Mathematics, Third Edition, Wiley India, 2007

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Departme	nt CHEMICAL EN	GINEER	NG	7		R 2019	Semester II	BS
Course Code	Course Name		lour Wee		Credit	Total Hours	Maxim Mark	
	States and a state of the Oak	L	Т	Ρ	С		1.1.1.1.1.1	
19BS207	PHYSICS OF MATERIALS	3	0	0	3	45	100	
<ul> <li>To in</li> <li>Course Ou</li> <li>To ga</li> <li>To ac</li> <li>To ga</li> <li>To ga</li> <li>To ga</li> <li>To ga</li> <li>To ga</li> <li>To ac</li> <li>To ac<th>jective (s): The purpose of learning this troduce the physics of various materials tcomes: At the end of this course, learn ain knowledge on conducting materials, cquire knowledge on basics of semicond et knowledge on the magnetic materials aderstand the basic concepts of synthes ave the necessary understanding on var ONDUCTING MATERIALS ee electron theory - expression for</th><th>s relevan ners will ducting n and thei sis of nar rious adv</th><th>t to c be a nater r app noma ance</th><th>ble : blicat olicat ateria ed m</th><th>and its ap tions, als and its aterials</th><th>oplication:</th><th>S</th><th>9</th></li></ul>	jective (s): The purpose of learning this troduce the physics of various materials tcomes: At the end of this course, learn ain knowledge on conducting materials, cquire knowledge on basics of semicond et knowledge on the magnetic materials aderstand the basic concepts of synthes ave the necessary understanding on var ONDUCTING MATERIALS ee electron theory - expression for	s relevan ners will ducting n and thei sis of nar rious adv	t to c be a nater r app noma ance	ble : blicat olicat ateria ed m	and its ap tions, als and its aterials	oplication:	S	9
UNIT II S	Franz law – Lorentz number- Success unction – density of energy states-Effect SEMICONDUCTING MATERIALS emiconductors - Compound semicond	ct of temp	perat	ure o	on Fermi	function		9
emiconduct ffect -Hall ef	n (derivation) – Extrinsic semiconc ors (derivation) – variation of Fermi lev ffect in n-type and p-type semiconducto IAGNETIC MATERIALS	el with te	mpe	eratu	re and im	purity col	ncentration -	- Ha
naterials-Doi erromagnetio ndustries	gnetic moment-Bohr magneton-Introduc main theory of ferromagnetism-Hyste c materials-Ferrites and its applicatio ANO MATERIALS	eresis- S	oft a	and	Hard ma	agnetic m	naterials -	Ant
vapour dep method, pro nanotubes:	als: preparation (bottom up and top o position method, PVD method -Sol o ecipitation method and sono chemica types and applications – Photocatalytic als and carbon nanotubes	Gel meth al metho	od, d-pr	solv oper	othermal ties and	method applicat	, hydrotherr	mal
UNIT V N	EW ENGINEERING MATERIALS							9
pplications-F	es – Preparation, properties and application iber reinforced plastics and fiber reinfor nded ceramics.	ations-SI rced met	nape als-0	mer Cera	mory allo mics-Clas	ysprope ssification	erties and n-crystalline-	
<ul><li>Balası</li><li>Wahal</li></ul>	<b>((S):</b> , S.O. —Principles of Electronic Materia ubramaniam, R. "Callister's Materials So o, M.A. —Solid State Physics: Structure e, 2009.	cience ar	nd Er	ngine	ering". V	Viley India	a Pvt. Ltd. 20	014.

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## REFERENCE BOOK(S):

- .
- Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010. .
- Raghavan, V. "Materials Science and Engineering: A First course". PHI Learning, 2015. .

Smith, W.F., Hashemi, J. & Prakash. R. "Materials Science and Engineering". Tata Mc Graw Hill

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	CHEMICAL ENGINE	R 2019	Semester II	MC				
Course	Course Name	Hours / Week C			Credit	Total	Maximum	
Code		LTP		С	Hours	Marks		
19MC202	ENVIRONMENTAL SCIENCE AND ECOLOGY	3	0	0	. 0	45	100	
<ul> <li>Realize for quest for quest for Recognit</li> <li>Recognit</li> <li>Course Outco</li> <li>Assess the natural resident of the course th</li></ul>	tive (s): The purpose of learning this cou the interdisciplinary and holistic nature of and how natural resources and environm r sustainable development ze the socio-economic, political and ethic mes: At the end of this course, learners ne importance of interdisciplinary nature of sources. he different types of ecosystems and bio ing the environment from degradation.	f the nent a cal is: will b of en	envir affect sues be ab viron	in e in e le to	quality o environmo o nt studies	ental scier , uses an	nce d exploitatior	n of
<ul><li>Select su</li><li>Correlate</li></ul>	e existing environmental challenges rela itable strategies for sustainable manager the impacts of population and human ac	ment	of co	mp	onents of	fenvironn		
	URAL RESOURCES							
tilization of su	es: Use - over exploitation - deforestation rface and ground water - conflicts over effects of extracting and using mineral re	r wa	ter. N	Mine	eral reso	urces: Us	e - exploitat	tion -
atilization of su environmental e of modern ag nagnification)-v Geo-thermal an	rface and ground water - conflicts over	r wat esour s (e resou	ter. N rces - utrop urces	Mine - ca hica :ren	eral resolutionse studie ation, blue ewable(s	urces: Us s. Food r ue baby	e - exploitat esources: Ef syndrome,	over tion - ffects bio-
atilization of su environmental e of modern ag nagnification)-v Beo-thermal an UNIT II ECO concept of an omposers - for haracteristic fe fbiodiversity-the n-situ and ex-sit	rface and ground water - conflicts over effects of extracting and using mineral re- riculture - fertilizer-pesticide problems vaterlogging-salinity-casestudies.Energyr d hydroelectric power) - non - renewable	r wat esour s (e resou e ener an o pyra stem	ter. M rces - utrop urces rgy s ecos amids - eco	Vine - ca hica :ren ourc yste	eral resolutions ation, blue ewable(s ces. m - pro Types of ical succ	urces: Us es. Food r ue baby solar,wind ducers- c ecosyste ession. B	e - exploitat esources: Ef syndrome, ,tidal, consumers - em: Introduc Biodiversity -	over tion - ffects bio- <b>9</b> de tion
Atilization of su environmental environmental environmental en of modern agen agnification)-v Geo-thermal an UNIT II ECO concept of an omposers - for haracteristic fea fbiodiversity-the n-situ and ex-sit UNIT III ENVI Pollution: Defini- reatment by ac	rface and ground water - conflicts over effects of extracting and using mineral re- riculture - fertilizer-pesticide problems vaterlogging-salinity-casestudies.Energy d hydroelectric power) - non - renewable <b>SYSTEMS AND BIODIVERSITY</b> ecosystem: Structure and function of od chains - food webs and ecological atures: forest ecosystem - desert ecosys reatstobiodiversity-endangeredandenden tu conservation of biodiversity - field stud	r wat esour s (e resou e ener an o pyra stem nicsp hy. s of a ss) -	ter. N rces - utrop urces rgy so ecosy amids - eco pecies air po marii	Mine - ca hica :ren ourc yste s - co olog s-Cc Illuti ne p	eral resolution se studie ation, blu ewable(s ces. m - pro- Types of jical succ onservation on - wate pollution	urces: Us es. Food r ue baby solar, wind ducers- of ecosyste ession. B onofbiodiv er pollution - thermal	e - exploitat esources: Ef syndrome, ,tidal, consumers - em: Introduc Biodiversity - versity: n: (Sewage v pollution - r	over tion - ffects bio- 9 de tion value 9 vater noise
atilization of su environmental e of modern ag magnification)-v Seo-thermal an UNIT II ECO concept of an omposers - for haracteristic fea fbiodiversity-thr -situ and ex-sit UNIT III ENVI Pollution: Defini- reatment by ac ollution. Disast andslides	rface and ground water - conflicts over effects of extracting and using mineral re- riculture - fertilizer-pesticide problems waterlogging-salinity-casestudies.Energy d hydroelectric power) - non - renewable <b>SYSTEMS AND BIODIVERSITY</b> ecosystem: Structure and function of od chains - food webs and ecological atures: forest ecosystem - desert ecosys reatstobiodiversity-endangeredandenden tu conservation of biodiversity - field stud <b>RONMENTAL POLLUTION</b> tion - causes - effects - control measures stivated sludge and trickling filter proces	r wat esour s (e resou e ener an o pyra stem nicsp hy. s of a ss) -	ter. N rces - utrop urces rgy so ecosy amids - eco pecies air po marii	Mine - ca hica :ren ourc yste s - co olog s-Cc Illuti ne p	eral resolution se studie ation, blu ewable(s ces. m - pro- Types of jical succ onservation on - wate pollution	urces: Us es. Food r ue baby solar, wind ducers- of ecosyste ession. B onofbiodiv er pollution - thermal	e - exploitat esources: Ef syndrome, ,tidal, consumers - em: Introduc Biodiversity - versity: n: (Sewage v pollution - r	over tion - ffects bio- 9 de tion value 9 vater noise
atilization of sum         environmental envital envital environmental environmental envital envita	rface and ground water - conflicts over effects of extracting and using mineral re- riculture - fertilizer-pesticide problems vaterlogging-salinity-casestudies.Energyn d hydroelectric power) - non - renewable <b>SYSTEMS AND BIODIVERSITY</b> ecosystem: Structure and function of od chains - food webs and ecological atures: forest ecosystem - desert ecosys reatstobiodiversity-endangeredandenden tu conservation of biodiversity - field stud <b>RONMENTAL POLLUTION</b> tion - causes - effects - control measures stivated sludge and trickling filter process er management, causes - effects - control	r wat esour s (e resou e ener an o pyra stem nicsp by s of a ss) - ol me to su sible	ter. N rces - utrop urces rgy se ecosy amids - eco pecies air po marii easur ustair solut	Mine - ca hica ::ren ourco yste 5 - olog s-Cc illuti ne p es c	eral resolution se studie ation, blu ewable(s ces. m - pro- Types of jical succ onservation on - wate pollution of floods - e develo s - solid v	urces: Us s. Food r ue baby solar, wind ducers- of ecosyste ession. B onofbiodia er pollution - thermal earthqua	e - exploitate esources: Ef syndrome, ,tidal, consumers - em: Introduct Biodiversity - versity: n: (Sewage v pollution - r ake - cyclone urban proble nagement -	over tion - ffects bio- 9 de tion value 9 vater noise 9

harve	esting -watershed management. Climate change- global warming - acid rain - ozone layer	
deple	etion. Environment protection act: Air (Prevention and control of pollution) act - wildlife protectio	n act.
UNI	T V HUMAN POPULATION AND ENVIRONMENT	9
Hum	an population: Population growth - characteristics- variation among nations - population explosi	on -
Nom	en and child welfare programmes- value education - HIV / AIDS. Role of information technology	in
	conment and human health - occupational safety and health administration (OSHA).	
	T BOOK(S):	0.00
1.	Anubha Kaushik, C.P. Kaushik, Environmental Science and Engineering, 4th Multi ColourEdtic New Age International Publishers, New Delhi, 2014	on,
2.	A. Ravikrishnan, Environmental Science and Engineering, 5th revised Edition, Sri Krishna Hite Publishing company (P) Ltd, Chennai, 2010	ch
REF	ERENCE(S):	1
1.	T. G. Jr. Miller,S.Spoolman, New Environmental Science, 14th Edition, Wads Publishing Co, New Delhi,2014.	worth
2.	E. Bharucha, Textbook of Environmental studies, second Edition, Universities Press Pvt. Ltd., I Delhi, 2013.	New
3.	A. K. De, Environmental Chemistry, 7th Edition, New age international publishers, New Delhi, 2	2014.

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	CHEMICAL ENGI	NEER	ING			R 2019	ES		
Course Code	Course Name	1 2 6 2	Hours / Week Credit		Total				
- 11 m	PRINCIPLES OF ELECTRICAL	L	Т	Ρ	С	Hours	Mark	Marks	
19ES204	AND ELECTRONICS ENGINEERING	3	0	0	3	45	100		
	e (s): The purpose of learning this co					1.1.1	and the second		
	he basic concepts of electric circuits a		-						
	construction and operation of various								
	construction and operation of various construction and operation of various								
	es: At the end of this course, learners					5.			
	undamental laws to electric circuits an					t alternatir	na quantities		
	aws of magnetism for the operation of					t alternation	ig quantities.		
	e construction and working principle of					S			
	rive for different application and spee						motors.		
	e performance characteristics and app								
	RIC CIRCUITS						-	9	
efinition of Vol	tage, Current, Electromotive force,	Resi	star	ice.	Power	& Energy	Ohms law	/ a	
efinition of real, NIT II DC MA	eration of alternating emf - RMS value reactive and apparent power. ACHINES		_	×.				9	
lachines – FMF	ignetic circuits - Law of Electromagne equation – Torque equation - Applicat	tic ind	uctio	on –	- Principle	es and ope	ration of DC		
and the second se	CHINES	.10115.	-				Land Street	9	
	Three Phase Transformer - Single Ph	nase a	and .	Thre	e nhase	induction	motor -	3	
Iternator - Cons	tructions - Working Principle - Applica	tions.			o priace	maaotion			
	RICAL DRIVES							9	
	Types of Electric Drives - factors influ							J	
	s - Loading conditions and classes of	duty	Sp	eed	control n	iethods of	DC and AC		
otors	e Louding conditions and classes of	CONTRACTOR OF TAXABLE PARTY.	and the second	COLUMN 1	and the second second second		A D Transferrence of the Party Street and the second secon		
ALLER MALE MALE AND A				Contraction of the second	and a strength of the strength of the				
	RONIC DEVICES AND COMMUNIC	ATIO	-	1.0.1.0.0				9	
haracteristics of	RONIC DEVICES AND COMMUNIC. PN Junction diode and Zener diode -	<b>ATIOI</b> Half v	vave				rs – Bipolar		
haracteristics of unction Transisto	RONIC DEVICES AND COMMUNIC	<b>ATIOI</b> Half v	vave				rs – Bipolar		
haracteristics of unction Transistc ystems.	RONIC DEVICES AND COMMUNIC. PN Junction diode and Zener diode -	<b>ATIOI</b> Half v	vave				rs – Bipolar		
haracteristics of	RONIC DEVICES AND COMMUNIC. PN Junction diode and Zener diode -	<b>ATIOI</b> Half v	vave				rs – Bipolar		
haracteristics of unction Transistc /stems. XT BOOK(S):	RONIC DEVICES AND COMMUNIC PN Junction diode and Zener diode - or - Operation of NPN and PNP transis	ATION Half w	vave Log	lic g	ates - Inti	roduction I	rs – Bipolar ocommunica	tion	
haracteristics of unction Transistc /stems. XT BOOK(S):	RONIC DEVICES AND COMMUNIC. PN Junction diode and Zener diode -	ATION Half w	vave Log	lic g	ates - Inti	roduction I	rs – Bipolar ocommunica	tior	
haracteristics of unction Transistc /stems. XT BOOK(S):	RONIC DEVICES AND COMMUNIC PN Junction diode and Zener diode - or - Operation of NPN and PNP transis	ATION Half w	vave Log	lic g	ates - Inti	roduction I	rs – Bipolar ocommunica	tior	

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2.	Smarjith Ghosh, Fundamentals of Electrical and Electronics Engineering, Prentice Hall (India) Pvt.
1.5	Ltd., 2010
REFE	RENCE(S):
1.	A.Sudhakar,ShyammohanSPalli,CircuitsandNetworksAnalysisandSynthesis,TataMcGraw Hill, 2010
2.	R. S. Sedha, A Textbook of Applied Electronics, S.Chand& Company Ltd, 2013
3.	Muthusubramanian&Salivahanan, Basic Electrical and Electronics Engineeringand
	Communication Engineering, Seventh Edition, Tata Mc. Graw Hill Education Private Limited, 2011

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Department	CHEMICAL ENGINE	ERING	3			R 2019	Semester II	ES
Course Code	Course Name	Ηοι	irs/M	/eek	Credit	Total	Maximum M	ark
		L	Т	Р	С	Hours	indxiniani in	ain
19ES211	INTRODUCTION TO CHEMICAL ENGINEERING	3	0	0	3	45	100	n a
Course Objecti	ve (s): The purpose of learning this co	ourse i	s to	6.5.6	1.1	The Rost		
Introduce h	istory, importance and components of	chor		onair	ooring			
	ncepts of unit operations and unit proc			· · · ·	-	nario of che	mical and allic	d
process inc		63363	, and	Curi	ent scei	Iano or che		u
	sic principles and calculations of chem	nical e	naine	erin	n mater	ial halances	s and their	
applications		nour c	igin	Ser in i	g, mater		s and then	
	sic principles of momentum, heat and	mass	trans	fer a	nd equi	oment.		
	foundation for Chemical reaction eng						cal Engineerir	na
courses.	9							.9
Course Outco	omes: At the end of this course, learne	ers wil	l be a	able t	0			
	of career options, potential job functio					orofessional	issues.	
	what Chemical Engineering is and wh							al
Engineering								
Acquire bas	sic principles of momentum and heat tr	ransfe	r&h	eat ti	ransfer o	equipment.		
	sic principles of mass transfer and equ						4	
	the reaction kinetics and various type	El		rial re	eactors.			
and the second se	RODUCTION							9
Definition of Ch	emical Engineering, Role of Chemic	cal Er	naine	er ir	evervo	dav life. Hi	story of Cher	10.00
	d Chemical Technology; Scope of							
	w diagram, Flow sheet, with simple e							
	atch to continuous processing. Role							
	processes and Unit operations.							
						100		
	CIPLES OF STOICHIOMETRY AND N							9
	Stoichiometry: Stoichiometric relatio				calculati	ons, metho	ods of expres	sing
	mixtures and solutions, density and sp						and the second second second	
	nsfer: Nature of a Fluid, viscosity, vel							
	ow, conservation mass. Conservation			NUMBER OF	and the second second second	and the second process of the second s	and the second se	flow
	gy balance for study flow: Bernoulli's th							-
	gen-Poiseuille equation, Friction losses	s in tu	rbule	ent flo	w: Fanr	ning equatio	n.	
and the second second to be specific to an a state	TTRANSFER	3.0		di tra si bati				9
	irier's law, mean area of heat tran							
	ton's law of cooling, individual heat tra							
	ents, overall heat transfer coefficier							
	n-Boltzmann law (Black body Radiatio					sun. Heat tr	anster equipm	ent
Jouble pipe, she	II & tube heat exchangers (description	with c	lagra	ams).				

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#### UNIT IV MASS TRANSFER

Diffusion, Diffusion in different phases, diffusivity, role of concentration difference in diffusion, resistance to diffusion, diffusion in liquids, Relative volatility, Boiling point diagram. Distillation: Flash distillation, differential distillation, steam distillation, Fractional distillation McCabe-Thiele method. Mass Transfer Equipment: Equipment for Gas-Liquid operations plate and packed columns: description with diagrams.

#### UNIT V MECHANICAL OPERATIONS AND CHEMICAL KINETICS

Introduction to Mechanical Operations: Size reduction, filtration, basic differences between agitation and mixing.

**Chemical kinetics:** Rate and order of the reaction, types of reactions, thermodynamic review, and determinationoftherateequation.Effectoftemperatureonreactionrate,catalysis,reactors(description with diagrams).

#### Text Books:

- 1. Introduction to Chemical Engineering, S. Pushpavanam, PHI Learning Private Limited, New Delhi (2012).
- Introduction to Chemical Engineering, S. K. Ghosal, S. K. Sanyal & S. Datta, Tata McGraw-Hill, New Delhi (2006).

## **REFERENCES:**

- 1. Unit Operations of Chemical Engineering, Warren L. McCabe, Julian C. Smith, Peter Harriot, 7th edition, McGraw Hill, NewDelhi.
- 2. ChemicalprocessPrinciplesPart–1,MaterialandEnergyBalancesbyO.A.Hougen,K.M.Watson, and R.A.Ragatz, 2nd Edition, John Wiley & Sons(2004).

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Department	Common to all Br	1988 S.		2		R 2019	Semester II E
Course Code	Course Name		Hour Wee		Credit	Total	Maximum
		L	Т	Ρ	C	Hours	Marks
19TPS02	SOFT SKILL -II	1	0	1	1.5	30	100
Course Objective	(s): The purpose of learning the	is course	e is				
	tudents on Group Discussion D	o's and	Don	ts.			
	students on Interview Skills.					-7/	
	resentation Skills. usiness Etiquette.						
<ul> <li>To teach implication</li> </ul>	ortance of Ethics and Values.		a de la				* 2.
Course Outcomes	: At the end of this course, learn	ners will	be a	ble t	0:	5	6. s <sup>a</sup> 1
Participate C	Group Discussion with Confiden	ce by kn	owir	g the	e tips and	Tricks.	
<ul> <li>Attend the in</li> <li>Present the</li> </ul>	nterview with positive attitude by n very well by enhancing their F	having	Moc	k Inte	erviews.		
	well in official gathering and Me					e.	
<ul> <li>Have good e</li> </ul>	thics and values in their Person						
the second se	DISCUSSION						(
oles in a GD – Do's	standing the objective and sl & Don'ts – Mock GD & Feedba	kills tes ick	ted	in a	GD –	General	types of GDs
	er. ,						
UNIT 2 INTERVI	EW SKILLS	0		1			el internior el
edback.	kills – Self preparation checklist	– Groon	ning	tips:	do's & do	on ts – moo	CK Interview &
UNIT 3 PRESEN	TATION SKILLS	- <u>-</u>	1	1			6
resentation Skills -	Stages involved in an effective	oresenta	ation	– se	lection of	topic, con	tent, aids –
ngaging the audien	ce – Time management – Mock	Present	ation	ıs &	Feedbacl	<b>K</b> .	
	s Etiquette						6
rooming etiquette – ow to impress.	Telephone & E-mail etiquette -	- Dining	etiqu	lette	– do's &	Don'ts in a	a formal setting
UNIT 5 Ethics					_		6
adlines.	of Ethics and Values - Choice	es and	Diler	nma	s faced	<ul> <li>Discuss</li> </ul>	ions from new
			and the				
The second second second	TOTAL : 30(15 Theor	y +15 P	racti	cal)	Hours		
EFERENCES:			- Contraction				
	abits of Highly Effective People	A CONTRACTOR OF THE OWNER	Contraction of the local	. Co	vey.		
	n the "Chicken Soup for the Sou	ul" series	S.				
	for meaning – Viktor Frankl						
4. The greatest r	niracle in the world – OgMandin	0					
5. Goal - Eliyahu	u Goldratt.						
6. Working with I	Emotional Intelligence - David G	oleman.		-	-		and the second
. 7 <sup>↓</sup> Excel in Englis	sh – Sundra Samuel, Samuel Pu	ublication	ns	1	. wh		S. est
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- 8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi.
- 9. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
- 10. Effective Presentation Skills (A Fifty-Minute Series Book) by Steve Mandel

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- "Strategic interviewing" byRichaurd Camp, Mary E. Vielhaber and Jack L. Simonetti Published by Wiley India Pvt. Ltd
- 12. "Effective Group Discussion: Theory and Practice" by Gloria J. Galanes, Katherine Adams , John K. Brilhart

Dept. of Chemical Engg. - EGEC

Department	CHEMICAL E	NGI	NEEF	RING		R 2019	Semester II	BS
Course Code	Course Name		ours Veek		Credit	Total	Maximun	
	ENGINEERING CHEMISTRY	L	Т	Ρ	С	Hours	Marks	
19BS208	LABORATORY	0	0	4	2	60	100	

Course Objective (s): The purpose of learning this course is to

- Introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.
- Determine of total, temporary & permanent hardness of water by EDTA method.
- Determine of chloride content of water sample by argentometric method & iron content of the given solution using potentiometer.
- Determine of strength of given hydrochloric acid using pH meter & Conductometric titration of strong acid vs strong base.

Course Outcomes: At the end of this course, learners will be able to

- Apply principles of elasticity, optics and thermal properties for engineering applications.
- Make the student to acquire practical skills in the determination of water quality parameters
- through volumetric analysis.
- Acquire the knowledge about chloride content in water sample.
- Make the student to acquire practical skills about strength of iron using potentiometric titrations.
- Understand the how to estimate hydrochloric acid in water sample using pH meter & conductance of ions.

### LIST OF EXPERIMENTS

- 1. Determination of total, temporary & permanent hardness of water by EDTA method.
- 2. Determination of chloride content of water sample by argentometric method.
- 3. Determination of strength of given hydrochloric acid using pH meter.
- 4. Determination of strength of acids in a mixture of acids using conductivity meter.
- 5. Estimation of iron content of the given solution using potentiometer.
- 6. Conductometric titration of strong acid vs strong base.
- 7. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer
- 8. Estimation of iron content of the water sample using spectrophotometer

### LIST OF EQUIPMENT FOR BATCH OF 30STUDENTS

- 1. Potentiometer 10 Nos.
- 2. pH meter 10 Nos.
- 3. Conductivity meter 10 Nos.
- 4. Spectrophotometer 2 Nos.
- 5. Oswald viscometer 30Nos.



Department	CHEMICAL E	ENGIN	NEEF	RING		R 2019	Semester II	ES
Course Code	Course Name	Hou	rs / \	Neek	Credit	Total	Maximum	
4056222	CHEMICAL ANALYSIS	L	T	Р	С	Hours	Marks	
19ES222	LABORATORY	0	0	2	1	30	100	
Make the st quantitative	e (s): The purpose of learning tudent acquire practical skills in estimation of nitrite in water, o	n the v cemen	vet c it, oil	hemic coal	and Pher		methods for	
<ul><li>Familiarize</li><li>Familiarize</li></ul>	es: At the end of this course, le with equipment like viscomete the methods for determining C a few simple synthetic techniq	rs, fla: OD	sh ar	nd fire		paratus etc		
LIST OF EXPERIN	IENTS			- 442				
<ol> <li>Determination of</li> <li>Determination of</li> <li>Cement Analys</li> <li>Estimation of calcius</li> <li>Coal Analysis a</li> <li>analysis of coal.</li> <li>Soap Analysis a</li> <li>Flue gas analysis</li> <li>Estimation of pl</li> <li>Determination of</li> <li>Determination of</li> </ol>	of calorific value using bomb ca of nitrite in water.	of oils nt b. E of cal t in co b. Est alorime	estim cium al b. imat	ation oxide Ultim	of mixed o by rapid ate analys	method. sis of coal c.	. Proximate	
	ENT FOR BATCH OF 30STUD	DENTS	;	61.5			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
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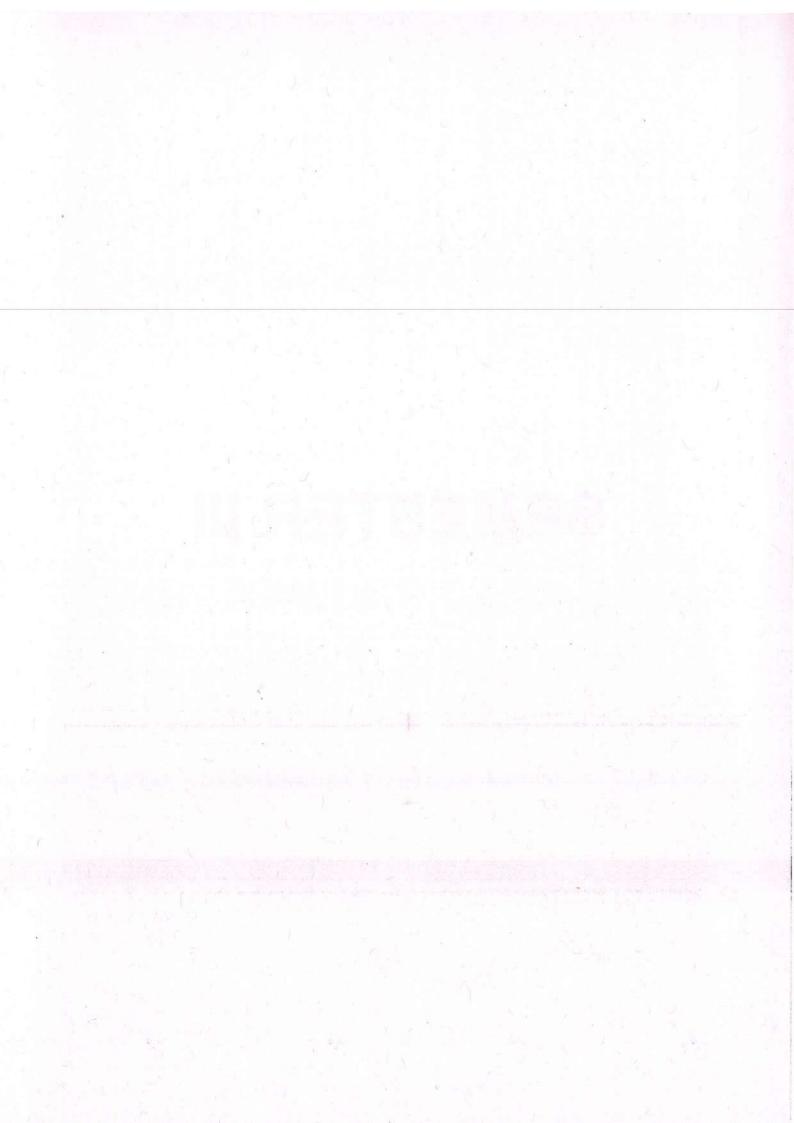
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Department	CHEMICAL ENG	GINEEF	RING			R 2019	Semester III BS		
Course Code	Course Name	Но	urs/V	Veek	Credit	Total	Maximum Ma	1.19	
Course Coue		L	Т	Ρ	С	Hours	Maximum Ma	arks	
19BS302	PROBABILITY AND STATISTICS	3	1	0	4	60	100		

Course Objective (s): The purpose of learning this course is to

- To understand the basic concepts of probability and the distributions with characteristics
- To summarize and apply the methodologies for the data analysis using statistical notions.
- To develop enough confidence to identify and model mathematical patterns in real world and offerappropriatesolutions, using thes kills learned in their interactive and supporting environment.

Course Outcomes: At the end of this course, learners will be able to:

- Demonstrate and apply the basic probability axioms and concepts in their core areas.
- Apply the concepts of probability distributions in an appropriate place of science and Engineering.
- Apply basic statistical inference techniques, including confidence intervals, hypothesis testing to science/engineering problems.
- Design an experiment for an appropriate situation using ANOVA technique.
- Correlate and predict the valid outcome of a real time problem

# UNIT I PROBABILITY AND RANDOM VARIABLE

Probability - Axioms of probability - Conditional probability - Total probability - Baye's theorem -Random variable-Probabilitymassfunction-Probabilitydensityfunction-Properties–Momentgenerating functions.

UNIT II PROBABILITY DISTRIBUTIONS

Moment generating functions of probability distributions- Concept and applications of standard probability distributions: Binomial- Poisson- Uniform -Exponential –Normal- Weibull distributions.

#### UNIT III TESTING OF HYPOTHESIS

Sampling distributions – Estimation of parameters – Statistical hypothesis – Large sample test based on Normal distribution for single mean and difference of means -Tests based on t, Chisquare and F distributions for mean, variance and proportion – Contingency table (test for independent) – Goodness of fit.

### UNIT IV DESIGN OF EXPERIMENTS

One way and Two way classifications – Completely randomized design – Randomized block design – latin square design

# UNIT V CORRELATION AND REGRESSION

Correlation – Multiple correlation-Regression-Multiple regression-Linear fit-Quadratic fit.

#### **REFERENCE(S):**

- 1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2012.
- 2. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th Edition, 2007.



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3.	Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier,2004.
4.	Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition,2004.

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Course         Course Name         Hours/week         Credit         Total         Maximum Marks           19CH301         ORGANIC CHEMISTRY         1         0         0         3         45         100           FOR CHEMICAL ENGINEERS         ENGINEERS         0         0         3         45         100           Course Objective (s): The purpose of learning this course is to         -         To study the reaction mechanism of electrophilic and nucleo philic reactions.         -         To understand the preparation, important reactions and applications of carbohydrates.           To gain the knowledge about classification and synthesis of proteins and amino acids.         -         To learn the synthesis, properties and classifications of drugs and dyes.           Course Outcomes: At the end of this course, learners will be able to:         -         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.           S tudents acquire the knowledge on various types of drugs and dyes.         -         -         -           UNIT 1         ORGANIC REACTION MECHANISM         9         9           Electrophilic reactions-Friedel crafts reaction, perion mechanism of alkene in presence of peroxide; allyli halogenation - using N-Bromo Succinamide (NBS), thermal halogenation of alkene CH <sub>2</sub> - CH = CH <sub>2</sub> .         9           UNIT 1         ORGANIC REACTION MECHANISM         9         9			GINE	ERIN	G		R 2019	SEMESTER III	PC
19CH301       ORGANIC CHEMISTRY       3       0       0       3       45       100         FOR CHEMICAL ENGINEERS         Course Objective (a): The purpose of learning this course is to         To study the reaction mechanism of electrophilic and nucleo philic reactions.         To understand the preparation, important reactions and applications of carbohydrates.       To know preparation, property and uses of polynuclear aromatic and hetero cyclic compounds.         To loan the knowledge about classification and synthesis of proteins and amino acids.       To learn the synthesis, properties and uses of polynuclear heterocyclic compounds.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic and nucleophilic reactions.         Students able to write the reaction mechanism of electrophilic reactins.									

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1.	B.S.Bhal and Arun Bhal, "A Text Book of Organic Chemistry", 17th Ed.,
	S Chand & Co. New Delhi, 2005.
2.	R.T. Morrison and R.N. Boyd "Organic Chemistry", 7 <sup>th</sup> Ed., Prentice Hall Inc. USA, 2010.
Reference	Books:
1.	Jonathan Clayden, Nick Greeves, Staurt Warren and Peter Wothers, "Organic
	Chemistry", Oxford University Press, 2 <sup>nd</sup> Ed., New Delhi, 2013.
2.	K.S. Tiwari, N.K. Vishnoi, S.N. Mehrotra, "A Text Book of Organic Chemistry", Vikas
	Publishing House, 2 <sup>nd</sup> Ed., New Delhi, 2006.

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Course	CHEMICAL EN	and the second second	d successings		One dia	R 2019	SEMESTER III E Maximum Marks	
Code	Course Name	L	rs/w	P	Credit C	Total Hours	7779 SEMINORES 1995	
19ES303	ENGINEERING THERMODYNAMICS	3	0	0	3	45	100	
ourse Ohie	ctives: The purpose of learni	na this i	COURS	e is	to		- 199 M	
<ul> <li>Provide t reversibi understa</li> </ul>	the students with the termino ity, equilibrium, phases, co nding the significance of the f w to estimate the thermal and	logy of ompone first law	thern nts; of th	nody the ermc	namics li relationsl odynamics	nip betwe s.		
<ul> <li>Understand</li> <li>heat to we understand</li> <li>understand</li> <li>of temper</li> </ul>	and the limitations imposed b vork. and the applications of first a nd the concept of adiabatic a rature on the enthalpy change	by the s and sec and the e of a ch	econ ond l oretic nemic	d lav aw c al fla cal re	v of therr of thermo ame temp action.	nodynamie dynamics	to specific proc	ess. To
<ul> <li>Under be abl</li> <li>State</li> <li>Apply</li> <li>Perce</li> </ul>	ome: At the end of this cours stand the scope and relevance to estimate the volumetric p the second law of thermodyna the concepts of first and second ve the principles of heat effect	ce of Ch propertie amics a pnd law	emic es of nd to of the	al Er pure estir ermo	ngineering fluids. mate the dynamics	efficiency of to analyz	of heat engines. e the specific pro	ocess.
heat o	f reaction. THE FIRST LAW AND OTH		SIC	CON	CEPTS			9
quilibrium, th nthalpy, hea	ics, energy balance for clo ne phase rule, the reversible p t capacity, mass and energy b	orocess palance	, con s for	stant oper	volume a	and consta		cesses,
	PVT BEHAVIOR OF PURE		and a second second				<u>ly diatant an</u>	. 9
nechanically	diagram, the ideal gas, equination of the ideal gas, equination of the system process, and polytrophetic process, and polytrophet	process nic proc iction to	): is cess. cub	other Idea ic ec	mal proc al gas ec quations o	cess, isob juation. Vi of state: V	aric process, is rial equations o ′ander Waals e	ochoric of state, quation,
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pplication of edlich/Kwon ases and liqu NIT III tatements of emperature a econd law, th	uids. THE SECOND LAW OF TH f the second law, heat engi and the ideal gas scale. Entro the third law of thermodynamic	nes, the	ermo nges	dyna of ai	nic temp nideal ga	peratures as, mather	natical statemer	9 lynamic t of the
pplication of addich/Kwon ases and lique <b>NIT III</b> tatements of emperature a econd law, the f ideal work a	uids. THE SECOND LAW OF TH f the second law, heat engi and the ideal gas scale. Entro the third law of thermodynamic and lost work.	nes, the opy chai cs, and o	ermo nges entro	dyna of ai py fro	mic temp n ideal ga om the m	peratures as, mather icroscopic	natical statemer view point, calc	9 lynamic at of the ulation
pplication of edlich/Kwon ases and liqu NIT III tatements of emperature a econd law, the f ideal work a NIT IV	uids. THE SECOND LAW OF TH f the second law, heat engi and the ideal gas scale. Entro he third law of thermodynamic and lost work. APPLICATIONS OF THERM	nes, the opy chai cs, and o MODYN	ermo nges entro	dyna of ai py fro	n ideal ga om the m O FLOW	peratures as, mather icroscopic <b>PROCES</b>	natical statemer view point, calc SES	9 lynamic t of the
Application of Redlich/Kwon ases and lique INIT III Statements of emperature a econd law, the f ideal work a INIT IV Principles of corrocesses; tur	uids. THE SECOND LAW OF TH f the second law, heat engi and the ideal gas scale. Entro the third law of thermodynamic and lost work.	nes, the ppy chain os, and o MODYN and en proces	ermo nges entro AMIO ergy sses	dyna of ar py fro CS T for fl –com	n ideal ga om the m O FLOW ow system opressors	peratures as, mather icroscopic <b>PROCES</b> ms, analys	natical statemer view point, calc SES sis ofexpansion os. Refrigeration	9 lynamic at of the ulation 9

pump, lique	efaction processes: Linde liquefaction process, Claude liquefaction process.	
UNIT V	HEAT EFFECTS	9
changes. T	eat effects, temperature dependence of heat capacity, heat effects accompanying the phati he standard heat of reaction, formation and combustion, temperature dependence of heat heat effects of industrial reactions.	
Text Book	S:	-
1.	"Introduction to Chemical Engineering Thermodynamics", Smith, J.M., Van Ness,H.C and Abbott, M.M., 8 <sup>th</sup> Edition, McGraw Hill. 2018.	i.,
Reference	Books:	
1.	K.V. Narayana, "A textbook of Chemical Engineering Thermodynamics," 2 <sup>nd</sup> edition, F 2004.	PHI
2.	Daubert, "Chemical Engineering Thermodynamics", McGraw Hill. 1985.	
3.	Y.V.C.Rao, "Chemical Engineering Thermodynamics", Universities press. 1997.	

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Department	CHEMICAL E	NGIN	IEER	ING		R 2019	SEMESTER III	PC
Course	Course Name	Hou	rs/we	ek	Credit	Total	Maximum M	arks
Code	and plant was	L	Т	Ρ	С	Hours		i.
19CH302	FLUID MECHANICS FOR CHEMICAL ENGINEERS	3	0	0	3	45	100	
Course Obje	ctives: The purpose of le	arnin	g this	cours	se is to			
the second s	basis and models for flu	-concercing				ormulating	conservative princ	iples.
	in understanding about c							
and the second se	ethods for transporting an equation of fluid flow.	d mea	asurin	g of f	flow in va	rious conc	luits. To study Quar	ititative
Course Outc	ome: At the end of this co	ourse	, learr	ners v	will be abl	e to		1
in the second	the concept of hydrostation	c equi	libriur	n and	d to have	a knowled	lge on fluid flow	
	mena.			• 194				
	nine engineering design o						flows. To work with	
	essible fluids, packed bec with variety of pumps and						various flow moasu	ring
Appara	The second s	to es	umate	e pre	ssure ios	ses que lo	various now measu	unig
	e important engineering ta	asks o	of mov	vina f	luids thro	uah proce	ss equipment and	
	ring and controlling inflov			ing i		ugii piece	oo oquipinoni unu	
INIT I	INTRODUCTION				1.2.3			9
Aethods of an	alysis and description - fl	uid a	s a co	ntinu	um – Vel	ocity and s	stress field - Newtor	ian and
	n fluids – Classification o							
INIT II	FLUID STATICS							9
luid statics -	basic equation - equilibri	um of	fluid	elem	ent - pres	ssure varia	ation in a static fluid	-
	manometer- Differential							
Bernoulli equa	tion and Navier- Stokes	equat	ion.					
JNIT III	DIMENSIONAL ANAL	/SIS		1.	- 10 M 10			9
heorem - non	of dimensional homogene -dimensional action of the nalysis and similitude - us	e basi	c equ	ation	s - similit	ude - relat	ionship between	i-
JNIT IV	FLOW THROUGH IN P	IPES	·	. ji 1		5 - A - A		9
Reynolds nun	ber regimes, internal fl	ow -	flow	throu	igh pipes	- pressu	ire drop under lam	inar an
	conditions - major and			11.		A PART OF A		and the second second second
23 W	ndary layer thickness unc						tions- Flow over a s	phere -
riction and pre	essure drag - flow through		d and	fluidi	zed beds	î în		
INIT V	FLOW MEASUREMEN	T	And and	AND FOR		T	anter a serie dan ta transmala	9
low measure	ment - Constant and varia	able h	nead r	neter	s; Velocit	y measure	ement techniques; T	ypes,
haracteristics ompressors a	and sizing of valves; Cla and fans	ssific	ation,	perfo	ormance	characteri	stics and sizing of p	umps,
ext Books:	1월 - 38 H. N. H.		÷	$\sim 2$	s na th		- 15 State - 1, 20	$q_1 (q - q)$
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Reference	Books:
1.	Unit Operations, Brown et al. – Asia Publishing House.
2.	Perry's Chemical Engineers Hand Book, Robert H. Perry, 7thedition, McGraw Hill
3.	Coulson & Richardson's Chemical Engineering, Volume-1, J.F. Richardson, J. H. Harker and J. R. Backhurst, 4 <sup>th</sup> edition, Elsevier.

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Department	CHEMICAL E					R2019	SEMESTER III	PO
Course	Course Name		1		Credit	Total	Maximum Ma	irks
Code			L       T       P       C       Hours         3       0       0       3       45       100         ng this course is to	-				
19CH303	CHEMICAL PROCESS CALCULATIONS	3	0	0	3	45	100	
Course Object	tives: The purpose of learn	ning th	his co	ourse	s to	ALC: NO		1
the second se	d the stoichiometric approa							
						It's Law a	nd Humidity charts	
								-
balances i	n a simple flow sheet invol	ving c	hem	ical re	actions.'			
<ul> <li>Solve the</li> </ul>	energy balance in simple n	nixing	and	with r	eactions.			
Course Outco	me: At the end of this cour	rse, le	arne	rs will	be able to	)		
Trouble	shoot problems in material	l flow	rate	handli	ng in chen	nical Iprod	uction.	
					-	22		
	air flow rates in drying and			A STATE OF A STATE OF A				
Calculation	te the yield in chemical pro	ductio	on pr	ocess	es.			
Calculation	te energy requirement.		•					
		100.00						
	INTRODUCTION			_			1	9
	c and composition rela		1.2					mass
toichiometric	relations, Basis of calculat	ions,	meth	nods o	f expressi	ng the cor	mposition of mixtur	es an
olutions, dens	ity and specific gravity. Be	havio	or of	ideal	gases: Int	troduction,	Applications of the	
olutions, dens as law, gaseo		havio	or of	ideal	gases: Int	troduction,	Applications of the	
olutions, dens as law, gaseo eactions.	ity and specific gravity. <b>Be</b> us mixtures, volume chang	<b>havic</b> ges wi	o <b>r of</b> ith ch	<b>ideal</b> anges	gases: Int	troduction,	Applications of the	e Idea
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olutions, dens as law, gaseo eactions. INIT II apor Pressur	ity and specific gravity. <b>Be</b> us mixtures, volume chang <b>VAPOUR PRESSURE A</b> res: Introduction, Effect of t	havio ges wi ND H tempe	or of ith ch UMII	ideal hanges DITY re on v	gases: Int in compo vapor pres	sition, Ga	Applications of the ses in Chemical or pressure plots, v	e Idea 9 apor
olutions, dens as law, gaseo eactions. INIT II apor Pressur ressure of imn	ity and specific gravity. <b>Be</b> us mixtures, volume chang <b>VAPOUR PRESSURE A</b> res: Introduction, Effect of t niscible liquids, solution. <b>H</b>	havio ges wi ND H tempe umid	or of ith ch UMII eratur ity a	ideal hanges DITY re on v nd Sa	gases: Int in compo vapor pres turation: I	ssure, vapo	Applications of the ses in Chemical or pressure plots, v	e Idea 9 apor
olutions, dens as law, gaseo eactions. INIT II apor Pressur ressure of imm ondensation, v	ity and specific gravity. <b>Be</b> us mixtures, volume chang <b>VAPOUR PRESSURE A</b> <b>res:</b> Introduction, Effect of t niscible liquids, solution. <b>H</b> wet-bulb and dry bulb therm	havio ges wi ND H tempe umid	or of ith ch UMII eratur ity a	ideal hanges DITY re on v nd Sa	gases: Int in compo vapor pres turation: I	ssure, vapo	Applications of the ses in Chemical or pressure plots, v	e Idea 9 apor cess,
olutions, dens as law, gaseo eactions. INIT II <b>'apor Pressur</b> ressure of imm ondensation, v	ity and specific gravity. <b>Be</b> us mixtures, volume chang <b>VAPOUR PRESSURE A</b> res: Introduction, Effect of t niscible liquids, solution. <b>H</b> wet-bulb and dry bulb therm <b>MATERIAL BALANCES</b>	havio ges wi ND H tempe umid nome	UMII UMII eratur ity an	ideal hanges DITY re on v nd Sa hosycho	gases: Int in compo vapor pres turation: I metric cha	ssure, vapo Introduction arts.	Applications of the ses in Chemical or pressure plots, v on, vaporization pro	e Idea 9 rapor cess, 9
olutions, dens as law, gaseo eactions. INIT II Yapor Pressur ressure of imm ondensation, w INIT III Interial Balan	ity and specific gravity. Be us mixtures, volume chang VAPOUR PRESSURE A res: Introduction, Effect of f niscible liquids, solution. H wet-bulb and dry bulb therr MATERIAL BALANCES rces: Introduction, Material	havio ges wi ND H tempe umid nome balar	UMII UMII eratu ity an ity, p	ideal hanges DITY re on v nd Sa osycho withou	gases: Int s in compo- vapor pres turation: I metric cha ut chemica	sure, vapo ntroduction ntroduction arts.	Applications of the ses in Chemical or pressure plots, v on, vaporization pro	e Idea 9 vapor cess, 9 with
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<b>Text Books</b>	
1.	Process Calculations, V.Venkataramani, N.Anantharaman, 2 <sup>nd</sup> Edition, Kindle Edition.
2.	Chemical process Principles Part–1, Material and Energy Balances by O.A.Hougen,K.M. Watson, and R.A.Ragatz, 2nd Edition, John Wiley & Sons(2004).
3.	Basic Principles and Calculations in Chemical Engineering by David M.Himmelblau and James B.Riggs,7th edition, Prentice Hall India(2003).
Reference	Books:
1.	Stoichiometry by B. Bhatt and S.Vora, 4th edition, Tata McGraw Hill(2004).
2.	Stoichiometry and Process Calculations by K. V. Narayanan and B. Lakshmikutty, Prentice-Hall of India Private Limited, New Delhi.

Chairman - Bos Dept. of Chemical Engg. - ESEC

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Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies forthe welfare of SC/ST/OBC and women

# TEXT BOOK(S):

1. "The Constitution of India", 1950 (Bare Act), Government Publication

2. Dr. S. N. Busy, "Dr. B. R. Ambedkar Framing of Indian Constitution", 1st Edition, 2016. Ava Publishers

3. M. P. Jain, "Indian Constitution Law", 7th Edn., Lexis Nexis, 2014.

### **REFERENCE** (s)

1. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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5. ENGLAND English

	COMMON TO ALL BRAI	NCH	ES			R 2019	SemesterIII E
Course Code	Course Name		Hour Wee		Credit	Total	Maximum
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UNIT 2 SIM SIMPLIFICATIO mixed fraction PROBLEMS OF UNIT 3 RAT RATIO AND P	PLIFICATIONS & PROBLEMS ON NUI ONS: BODMAS rule – Application of alge – Continued fraction and its simplification NUMBERS: Set of numbers – Assume TIO & PROPORTION , ALLIGATIONS& I ROPORTION: Ratio between two or mo	MBE ebrai on – e the MIXT re pe	er th RS c for Recu unkr URE	mula urrin nowr s – f	e –Simpli g decima n numbers Miscelland	ification of ls. s and form eous probl	decimal fraction equations
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UNIT 2 SIM SIMPLIFICATIO mixed fraction PROBLEMS OF UNIT 3 RAT RATIO AND PI ALLIGATIONS Six golden rules	PLIFICATIONS & PROBLEMS ON NUI ONS: BODMAS rule – Application of alge a – Continued fraction and its simplification NUMBERS: Set of numbers – Assume TIO & PROPORTION , ALLIGATIONS& I ROPORTION: Ratio between two or more ANS MIXTURES: Definition – Allegation to solve problems on mixture – Remove	MBE on – e the MIXT re pe	er th RS C for Recu URE TSON	mula urrin nowr s – I lean	e –Simpl g decima n numbers Viscelland value (or	ification of ls. s and form eous probl cost price	decimal fraction equations ems. ) of the mixture n two.
UNIT 2 SIM SIMPLIFICATIO ROBLEMS OF UNIT 3 RAT RATIO AND PE SIX golden rules UNIT 4 AVE	PLIFICATIONS & PROBLEMS ON NUI ONS: BODMAS rule – Application of alge a – Continued fraction and its simplification NUMBERS: Set of numbers – Assume TIO & PROPORTION , ALLIGATIONS& I ROPORTION: Ratio between two or mod ANS MIXTURES: Definition – Allegation to solve problems on mixture – Remova RAGES & PROBLEM ON AGES	MBE on – e the MIXT re pe n rule al am	er th RS C form Recu unkr URE rson a – M hong	mula urrin howr s – I lean the	ne –Simpli g decima n numbers Miscelland value (or quantities	ification of ls. s and form eous probl cost price more than	decimal fraction equations ems. ) of the mixture
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measurement - Quantity and unit - Animals and young ones - Male and female.

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MIRROR IMAGES AN	D WATER IMAGES:	: Letter inverted – Object inverted.

#### TOTAL: 30 HOURS

## **REFERENCES:**

- 1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
- 2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
- 3. R.V.Praveen,"Quantitative Aptitude and Reasoning" Third Edition, PHI Learning ,2016.
- 4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
- 5. Arun Sharma "How to Prepare for Quantitative Aptitude" Eight Edition, McGraw Hill Education, 2018.
- 6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

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Department	CHEMICAL ENG	BINEER	ING			R201 9	SEMESTER III	PC
Course Code	Course Name	Ηοι	urs/w	eek	Credi t	Total Hour	Maximum Ma	arks
		L	Т	Ρ	С	S	A State of the	
19CH304	FLUID MECHANICS LABORATORY	0	0	4	2	60	100	
<b>Course Objecti</b>	ves: The purpose of learning	this cou	rse is	to	y he sys-			
Learn expe characteris	rimentally to calibrate flow me tics.	ters, find	d pre	ssure	e loss for	fluid flow	s and determine p	ump
<b>Course Outcon</b>	ne: At the end of this course, I	earners	will k	e ab	le to		States and States	
	e area flow meters and variab							
<ul> <li>Analyze the</li> </ul>	flow of fluids through closed	conduits	s, ope	en ch	annels a	nd flow p	ast immersedbodie	es
	ps for the transportation of flui							
properties				•				
LIST OF EXPER	RIMENTS	2.4				ACC - LEV	Serie Auson	100
<ul> <li>Viscosity</li> </ul>	measurement of non-Newton	ian fluid	Is	-		I BAR		
	on of constant and variable he							
	on of weirs and notches	au mote						
	um orifice and draining time						En strategi	
	ough straight pipe						2.1	
	bugh annular pipe							
	ough helical coil and spiral coil						in the second second	
	n pipe fittings and valves							
	eristic curves of pumps (Centri	fugal / G	Gear	Reci	procatin	a)		
	drop studies in packed colum					57		
	namics of fluidized bed							
	efficient of solid particle							
A market market and a second sec	MENT FOR BATCH OF 30ST	UDENT	S					1
Viscome								
	neter 1No.						CONFIGURATION	
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Department	CHEMICAL ENG	NEE	RINC	3	1. Call	R2019	SEMESTER III	ES
Course	Course Name	Ho	urs/w	veek	Credit	Total	Maximum Marks	3
Code	and the second second	L	T	P	С	Hours		
19ES306	ELECTRICALENGINEERING LABORATORY FOR CHEMICAL ENGINEERS	0	0	4	2	60	100	
Course Obje	ctives: The purpose of learning	this	cours	se is t	to		ign	
Gain kno	wledge on characteristics of Ele	ectric	al ma	achine	es and El	ectronic D	evices	
Course Outo	ome: At the end of this course,	learr	ners v	will be	able to		N	
<ul> <li>Analy;</li> </ul>	ze the characteristics of DC gen	erato	ors					
<ul> <li>Analy;</li> </ul>	ze and test different DC motors							
<ul> <li>Test a</li> </ul>	and analyze the different AC mot	tors &	Stran	sform	iers			
LIST OF EXF	PERIMENTS	- 1			A			
• Oh	m's law and Kirchoff's law	91	11.1	No.	10.00		endylasin i precisi	
• Dic	de characteristics				(12)			
• Op	en circuit characteristics of a dc	shur	nt ger	nerato	ors			
• Loa	ad characteristics of a dc shunt g	gene	rators	S				
• Loa	ad test of D.C. shunt motor						AC DECEMBER	
• Loa	ad test on single phase induction	n mot	tor					
• Eq	uivalent circuit of a transformer		+				2 2 6 4	
the second se	inburn's test							
• Loa	ad test on 3- phase squirrel cage	e indu	uction	n mot	or			
	ad test on 1 -phase transformer				Ŧ			
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· Characteristics of half and full wave rectifiers

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Department	CHEMICAL ENG	NEERII	NG			R 2019	Semester III	EEC
	and the second of the second	Hou	rs / V	/eek	Credit	Total	Maximum Ma	rks
CourseCode	Course Name	L	Т	Ρ	·C	Hours	in the second	
19HS301	COMMUNICATION SKILLS	0	0	2	0	30	100	1
<ul> <li>To invo</li> <li>To implify</li> <li>To focu</li> <li>To enhation</li> <li>To enhation</li> <li>To integration</li> <li>Course Outco</li> <li>Underse</li> <li>Compression</li> <li>Write the Integration</li> <li>Integration</li> <li< td=""><td>tive (s): The purpose of learning the live the students in effective listening to be the oral communication skills is the effective reading of general and ance and comprehend the written to grate LSRW skills. mes: At the end of this course, least and the technical talks. unicate to his peer group properly. the reports and job application in cleast technical tec</td><td>ng activi in prope and tech ext. ext. ear man</td><td>ties. r mar nical ill be a ner.</td><td>able to</td><td>ss inform</td><td></td><td></td><td>ectu</td></li<></ul>	tive (s): The purpose of learning the live the students in effective listening to be the oral communication skills is the effective reading of general and ance and comprehend the written to grate LSRW skills. mes: At the end of this course, least and the technical talks. unicate to his peer group properly. the reports and job application in cleast technical tec	ng activi in prope and tech ext. ext. ear man	ties. r mar nical ill be a ner.	able to	ss inform			ectu
ive personal i onunciation b	AKING nformation - ask for personal inforr pasics - pronunciation practice - con y - summarizing academic reading	nversati	on sta	rters:				6
	DING			-)			1. N	6
hotos and title	ffective reading - Read and recogr - Read for details - Use of graphic pronoun reference and use of con TING	organiz	zers to	revie	ew and a	id compre	hension -	6
							luding contoneo	
lan before wri Vrite a descrip E-mail writing NIT V INTE	ting - Develop a paragraph: topic s tive paragraph – Write a paragraph - Types of essays- descriptive-nai EGRATION OF LSRW truction: watching a video – Listing	n with re rrative	asons	s and based	example I-argume	s - Write a entative a	an opinion parag inlytical	graph o
lan before wri /rite a descrip E-mail writing NIT V INTE ask based Ins eading a new	tive paragraph – Write a paragraph – Types of essays- descriptive-nai <b>GRATION OF LSRW</b> truction: watching a video – Listing spaper and creating topic-based vi	n with re rative- , Sorting	asons	s and based	example I-argume	s - Write a entative a	an opinion parag inlytical	graph o
lan before wri Irite a descrip E-mail writing NIT V INTE ask based Ins eading a new EXT BOOK(S Gramer F 2011	tive paragraph – Write a paragraph - Types of essays- descriptive-nait <b>GRATION OF LSRW</b> truction: watching a video – Listing spaper and creating topic-based vi ): Margot and Colin S. Ward Readin	n with re rative- l, Sorting deos g and V	asons ssue g, ord Vriting	and based ering, (Levi	example Largume compari sF3) Oxfo	s - Write a antative - a ng and ar ord Unive	an opinion parag inl/tical nalyzing the idea sity Press Oxid	graph 3 as Ad
Ian before wri Vrite a descrip E-mail writing NIT V INTE ask based Ins eading a new EXT BOOK(S Gramer F. 2011 Brooks,Ma 2011	tive paragraph – Write a paragraph – Types of essays- descriptive-nait <b>GRATION OF LSRW</b> truction: watching a video – Listing spaper and creating topic-based vi ):	n with re rative- l, Sorting deos g and V and Sp	asons ssua g, ord Vriting eakin	s and bases ering, (Levi g. Lev	example 1 argume compari compari cr3) Oxfo vel 4 Oxfo	s - Write a notative a ng and ar ord Unive ord Unive	an opinion parag inl/tical nalyzing the idea sity Press, Oxid rsity Press, Oxid	graph 3 as Ad

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1.	Davis, Jason and Rhonda Liss. Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006.
2.	E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan
3.	Anderson, Kenneth et al. Study Speaking: A Course in Spoken English for Academic Purposes. United Kingdom: Cambridge University Press 1992.

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# **SEMESTER IV**

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Department	CHEMICAL ENG	SINEE	RING	;		R2019	SEMESTER IV	BS
Course	Course Name	Hou		eek	Credit	Total	Maximum Ma	irks
Code	A STREET BUILDING	L	Т	Ρ	С		and the side of the	
19BS402	NUMERICAL METHODS	L           AL METHODS         3           rpose of learning this courcepts of solving algebraic techniques of interpolation in understanding of number to role in engineering and of various techniques and ge of various techniques and ge of various techniques of techniques of interpolation are of various techniques of interpolation are of various techniques and techniques of and techniques of and techniques are of various techniques and techniques of and techniques of and techniques of and techniques are of various techniques are of various techniques are of and techniques are of a differentiation are differentiation	1	0	4	60	100	
<ul> <li>Introduce</li> <li>Introduce</li> <li>Acquaint</li> <li>Which play</li> <li>Acquaint</li> <li>Understand</li> <li>Understand</li> <li>Understand</li> <li>Appreciate life situation</li> <li>Apply the n</li> <li>Understand</li> </ul>	the numerical techniques of inter the student with understanding ys an important role in engineer the knowledge of various techni and the knowledge of various techni and tech	LTPCHoursTHODS310460100of learning this course is to f solving algebraic and transcendental equations. ques of interpolation in various intervals in real life situations. erstanding of numerical techniques of differentiation and integration an engineering and technology disciplines. ous techniques and methods of solving ordinary differential equatio various techniques and methods of solving various types of partial s course, learners will be able to and techniques of solving algebraic and transcendental equations. ques of interpolation and error approximations in various intervals in tof differentiation and integration for engineering problems. rious techniques and methods for solving first and second order ferential equations with initial and boundary conditions by using certifications.JATIONS AND EIGENVALUE PROBLEMS ndental equations - Gauss elimination method - Newton Raple of equations - Gauss elimination method - Pivoting - Gauss Jo ss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method	ations. al					
Solve the particular		quatio	ns wit	th init	ial and bo	undary co	onditions by using a	ertain
Unit I	The second se		EIGEI	NVAL	UE PRO	BLEMS		12
and Jacobi's m <b>Unit II</b> Interpolation w Cubic Splines	tive methods of Gauss Jacobi a nethod for symmetric matrices. INTERPOLATION AND APPR ith unequal intervals - Lagrange - Difference operators and relat difference formulae.	COXIM e's inte	<b>IATIO</b> erpola	<b>N</b> Ition -	- Newton'	s divided	difference interpola	<b>12</b> 1100 –
Jnit III	NUMERICAL DIFFERENTIAT			NTEC	PATION			12
Approximation Simpson's 1/3 Evaluation of c	of derivatives using interpolatio rule – Romberg's Method - Two louble integrals by Trapezoidal	on poly	nomi and	als - I three	Numerica point Ga			al,
Unit IV	INITIAL VALUE PROBLEMS							12
Runge - Kutta	thods - Taylor's series method method for solving first order eq corrector methods for solving fir BOUNDARY VALUE PROBLE EQUATIONS	uation st ord	ns - M er eq	lulti s uatio	tep metho ns.	ods - Milne	e's and Adams - Ba	
difference tech domain – One	e methods for solving second niques for the solution of two di dimensional heat flow equation ave equation by explicit method	imensi by ex	ional	Lapla	ice's and	Poisson's	equations on recta	angular
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<b>Text Books</b>	
1.	Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
2.	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna
	Publishers, 10th Edition, New Delhi, 2015
Reference B	Books:
1.	Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi, 2007.
2.	Gerald. C. F. and Wheatley. P. O., "Applied Numerical Analysis", Pearson Education, Asia, 6 <sup>th</sup> Edition, New Delhi, 2006.

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Hours / Week Credit Total Maximu Hours Marks		Credit	ek	rs / w	Hou	ne	Course Name	Course Code
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otic pressure and colligative properties. ance - Electrical conductance - Specific Conductance - Equiv ination of Cell Constant - Variation of conductance with dilu tential - Galvanic cell - Cu - Zn cell - EMF and its measurem vdrogen Electrode - Calornel electrode - Nerst equation	conductar MF and it	Specific ation of cell - E	e pro ice - Varia - Zr	olligativ iductar stant - ell - Cu - Ca	and co cal con ell Cons anic ce ctrode	motic pressure stance - Electri mination of Ce potential - Galv hydrogen Ele	e on omosis and osmo TROCHEMISTRY nce - Specific Resistar ell Constant - Determir - Single electrode pote	Knowledg     ELEC     Iectrical Resista     conductance - C     ohlrausch's law     eference elect
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Chairman - BoS Dept. of Chemical Engg. - ESEC Distribution Co-efficient - Distribution Law -I2-CCI4-H2O System - Nature of interaction of the solute with one of the solvents - Dissociation - Association - applications of Distribution law - Process of Extraction -Colligative properties - Vapour Pressure Lowering - Osmosis and Osmotic Pressure - The boiling Point elevation - The freezing point depression.

XT BOOK(S):
Kundu and Jain, Physical Chemistry, S. Chand and Company, New Delhi (1996).
Puri B. H. Sharma L.R. and M.S. Prathma, " Principles of Physical Chemistry", S. Chand and Company, New Delhi(2005).
B.S.Bahl, ArunBahl and G.D. Tuli, "Essentials of Physical Chemistry", S. Chand and Company, New Delhi , (2005).
FERENCE(S):
Gordon M. Barrow, Physical Chemistry, Sixth Edition, Tata McGraw Hill (1998).
Peters Atkins & Julio de Paula, Atkins' Physical Chemistry, 8th Edition, Oxford university press. (2006).

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Course Code		CHEMICAL ENGINEERING						PC
	Course Name	He	ours/	veek	Credit	Total	Maximum I	Marks
	stars of Philos	L	Т	Р	С	Hours		
19CH402	CHEMICAL ENGINEERING THERMODYNAMICS	3	0	0	3	45	100	
<ul> <li>cycles.</li> <li>Learn the conce</li> <li>Develop the solutions and to the solutions and to the equilibria.</li> <li>Determine the error of the solutions of the error of the erro</li></ul>	e thermodynamic propertie of heat. artial properties and fugacit oncepts of solution thermo	amics applie l equ ions ure c es of cy coe dyna	and cation ilibriur using on the pure f efficie mics f	estima s of th n. simple equilit fluids a nts. to estir	tion of the ermodyna e models f orium con	e fugacity amics to g to provide version of oly the pov	coefficients. as mixtures and knowledge on p chemical reaction ver cycles for the	liquid bhase ons. e
UNIT I	e equilibrium compositions	OPER	RTIES	OF F	LUIDS			9
	for homogeneous phase			ell's e	quations.	racidual	and the second	
	plant, Rankine cycle. Otto			y corre	elations fo	or gases. F	Production of por	wer fro
neat: steam power only).		engi	ne, Di	y corre	elations fo	or gases. F	Production of por	wer fro ussion
neat: steam power only). <b>UNIT II</b> <sup>=</sup> undamental prope	plant, Rankine cycle. Otto SOLUTION THERMODY erty relation, chemical pote acity and fugacity coefficien	engi <b>'NAN</b> ntial,	ne, Di <b>IICS</b> criter	y corre esel er ion for	elations fo ngine, Jet phase eo	or gases. F t engines ( quilibria, pa	Production of por Qualitative Disc artial properties,	wer fro cussion 9 ideal
neat: steam power only). <b>UNIT II</b> <sup>E</sup> undamental prope gas mixtures. Fuga	plant, Rankine cycle. Otto SOLUTION THERMODY erty relation, chemical pote acity and fugacity coefficien	engi NAN ntial, its, g	ne, Di <b>IICS</b> criter enera	y corre esel en ion for lized c	elations fo ngine, Jef phase eo orrelation	or gases. F t engines ( quilibria, pa s for fugad	Production of por Qualitative Disc artial properties,	wer fro cussion 9 ideal
neat: steam power only). <b>UNIT II</b> Fundamental prope gas mixtures. Fuga deal solution, exce <b>JNIT III</b> Liquid phase prop equation, data rec changes of mixing, /apor-Liquid Equili pehavior, simple mo	plant, Rankine cycle. Otto SOLUTION THERMODY erty relation, chemical pote acity and fugacity coefficien ess properties.	engi <b>NAN</b> ntial, its, go <b>NAN</b> activit consi consi consi consi consi consi consi	ne, Di riter enera IICS / ty coo stenc es. nase r	y corre esel el ion for lized c APPLIC efficien y, mo	phase economic or relations for or relations of the second state o	ar gases. F t engines ( quilibria, pa s for fugad s Gibb's excess C neorem, V	Production of por Qualitative Disc artial properties, city coefficients, energy, Gibb's Bibb's energy,	wer fro ussion 9 ideal the 9 Duhe
heat: steam power only). UNIT II Fundamental prope gas mixtures. Fuga deal solution, exce UNIT III Liquid phase prop equation, data red changes of mixing, /apor-Liquid Equili	plant, Rankine cycle. Otto         SOLUTION THERMODY         erty relation, chemical pote         acity and fugacity coefficient         ess properties.         SOLUTION THERMODY         poerties from VLE data, a         duction, thermodynamic of         heat effects of mixing proc         brium: Nature of equilibrium	engi <b>NAN</b> ntial, its, go <b>NAN</b> activit consi	ne, Di ne, Di criter enera IICS / ty coo stenc es. nase r ubble	y corre esel el ion for lized c APPLIO efficien y, mo ule, Du point o	phase economic or relations for or relations of the second state o	ar gases. F t engines ( quilibria, pa s for fugad s Gibb's excess C neorem, V	Production of por Qualitative Disc artial properties, city coefficients, energy, Gibb's Bibb's energy,	wer fro ussion 9 ideal the 9 Duhe

Chairman - BoS Dept. of Chemical Engg. - ESEC

UNIT V	CHEMICAL REACTION EQUILIBRIUM 9
The reaction of	oordinate, application of equilibrium criteria to chemical reactions, the standard Gibl
evaluation of	e and the equilibrium constant, Effect of temperature on the equilibrium constar equilibrium constants. Relation of equilibrium constants to composition, equilibriu single reactions, phase rule and Duhem's theorem for reacting systems, quilibria.
Text Books:	
1.	Introduction to Chemical Engineering Thermodynamics, Smith, J.M., Van Ness, H.C and Abbott, M.M., 6 <sup>th</sup> Edition, McGraw Hill.
Reference Boo	oks:
1.	Chemical Engineering Thermodynamics, Daubert, McGraw Hill.
2.	Chemical Engineering Thermodynamics, Y.V.C.Rao, University Press.
3.	A textbook of Chemical Engineering Thermodynamics by K.V. Narayana, PHI.

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Department		CHEMICAL ENGINEERING				R2019	SEMESTER IV	P
Course Code		1	Credit	Total	Maximum Ma	arks		
1		L	T	P	С	Hours		2.11
19CH403	MECHANICAL OPERATIONS	3	0	0	3	45	100	
<b>Course Object</b>	ives: The purpose of learning	this co	urse	is to				
Learn the e	quipment involved in mechani	ical sep	oarati	ion, m	ixing and	size redu	iction.	
	ematical problems related to c							n
	asic concepts of screening pro							
<ul> <li>Learn the u</li> </ul>	nit operations involved in the o	contact	ting a	nd ph	ysical se	paration o	of phases, such as	5
	dimentation and centrifugation							
	oncepts of clarifiers, cyclone s					ration equ	ipment.	8
	ne: At the end of this course, I							
	he characterization of solid pa			1.5				
	matical problems related to con					•		
	opriate screening equipment a							
	he concepts of filtration, equip							
	he concepts of clarifiers, cyclo					eparation	equipment.	
	appropriate mixing process for							
UNIT I	<b>PROPERTIES AND HANDLI</b>	ING OF	= PAI	DTICI	II ATE SI			9
mixtures, average masses, differer size reduction e	of solid particles, shape an ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, u	nd size ysis an rage of	e, mi nd sta f solie	ixed p andar ds. <b>Si</b>	barticle s d screen <b>ze Redu</b>	ize analy series. F c <b>tion</b> : Pri	Properties of part nciples of commin	ace o iculat
mixtures, average masses, differer size reduction en closed-circuit op <b>UNIT II</b>	of solid particles, shape an ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, u eration. SEPARATION	nd size ysis an rage of ultra-fir	e, mi nd sta f solie ne gri	ixed p andar ds. <b>Si</b> nders	oarticle s d screen ze Redu and cutti	ize analy series. F c <b>tion</b> : Pri ng machi	Properties of part nciples of commines. Open circuit	ace of iculation iculation and
mixtures, average masses, different size reduction en closed-circuit op <b>UNIT II</b> Screening, scree	of solid particles, shape an ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, u eration. SEPARATION ening equipment–grizzlying, gy	nd size ysis an rage of ultra-fir yratory,	e, mi nd sta f solia ne gri , vibra	andar ds. <b>Si</b> nders ating,	and cutting revolving	ze analy series. F ction: Pri ng machi screens.	Properties of part nciples of commin nes. Open circuit Capacity and	ace of iculation iculation and
mixtures, average masses, differer size reduction en closed-circuit op <b>UNIT II</b> Screening, scree effectiveness of	of solid particles, shape an ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, u eration. <b>SEPARATION</b> ening equipment–grizzlying, gy screens. Magnetic separators	nd size ysis an rage of ultra-fir yratory,	e, mi nd sta f solia ne gri , vibra	andar ds. <b>Si</b> nders ating,	and cutting revolving	ze analy series. F ction: Pri ng machi screens.	Properties of part nciples of commin nes. Open circuit Capacity and	ace of iculation and
mixtures, average masses, different size reduction ent closed-circuit op <b>UNIT II</b> Screening, screet effectiveness of <b>UNIT III</b>	of solid particles, shape an ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, u eration. <b>SEPARATION</b> ening equipment–grizzlying, gy screens. Magnetic separators, <b>FILTRATION</b>	nd size ysis an rage of ultra-fir yratory, , Electr	e, mi nd sta f solie ne gri , vibra ro- sta	andar ds. <b>Si</b> nders ating, atic se	oarticle s d screen ze Redu and cutti revolving eparators	ze analy series. F ction: Pri ng machi screens. and froth	Properties of part nciples of commines. Open circuit Capacity and flotation.	ace of iculat nution and 9
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mixtures, average masses, different size reduction ere closed-circuit op UNIT II Screening, screet effectiveness of UNIT III Theory of filtration and incompression optimum cycle of UNIT IV	a of solid particles, shape and ge particle size, screen analy nt types of conveyers and stor quipment–crushers, grinders, useration. <b>SEPARATION</b> ening equipment–grizzlying, gy screens. Magnetic separators, <b>FILTRATION</b> on, Batch and continuous filters ble filter cakes, filtration equip f operation, filter aids. <b>PARTICLE SEPARATION (G</b>	nd size ysis an rage of ultra-fir yratory, , Electr s, Flow ments	e, mi nd sta f solid ne gri , vibra ro- sta v thro - sele <b>DLID</b>	xed p andar ds. <b>Si</b> nders ating, atic se ugh fi ection	and cutti revolving eparators Iter cake , operatio	ize analy series. F ction: Pri ng machi screens. and froth and filter n and des SOLID SY	Properties of part nciples of commines. Open circuit Capacity and flotation. media, compressi sign of filters and <b>'STEM)</b>	ace c iculat nutior and 9 9 ble 9
mixtures, average masses, differer size reduction en- closed-circuit op <b>UNIT II</b> Screening, scree effectiveness of <b>UNIT III</b> Theory of filtratic and incompression optimum cycle oo <b>UNIT IV</b> Gravity settling,	a of solid particles, shape and ge particle size, screen analy at types of conveyers and stor quipment–crushers, grinders, useration. <b>SEPARATION</b> ening equipment–grizzlying, gy screens. Magnetic separators, <b>FILTRATION</b> on, Batch and continuous filters ble filter cakes, filtration equip f operation, filter aids. <b>PARTICLE SEPARATION (G</b> sedimentation, thickening,	nd size ysis an rage of ultra-fir yratory, , Electr s, Flow ments GAS-SC elutriat	e, mi nd sta f solid ne gri , vibra ro- sta v thro - sele <b>DLID</b> tion,	xed p andar ds. <b>Si</b> nders ating, atic se ugh fi action <b>AND</b> doub	and cutti revolving eparators Iter cake , operation	ize analy series. F ction: Pri ng machi screens. and froth and filter n and des SOLID SY classifier	Properties of part nciples of commines. Open circuit Capacity and flotation. media, compressi sign of filters and <b>/STEM)</b> , rake classifier,	ace of iculation and and 9 9 ble 9 ble 9 bov
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	Harriot, 7thEdition. – McGraw Hill.							
2.	Unit Operations, R. S. Kulakarni and Hiremath, Everest Publishers.							
Reference I	Books:							
1.	Chemical Engineering vol.–II, Coulson,J.H., and Richardson, Paragon Press and ELBS.							
2.	Unit Operations, Brown George, CBS							
3.	Mechanical Operations for Chemical Engineers, C. M. Narayana and B.C.Bhattacharyya,							
4.	Coulson & Richardson's Chemical Engineering, Volume:2, 4 <sup>th</sup> edition, J.F. Richardson, J. H. Harker and J. R. Backhurst, Elsevier.							
5.	Perry's Chemical Engineers Hand Book, Perry Rober H, 7thedition, McGraw Hill							

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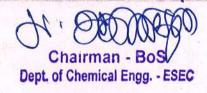
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Department	CHEMICAL ENG	INEE	RING	G	- Parts	R2019	SEMESTER IV	PC
Course Code	Course Name	Ηοι	urs/w	eek	Credit	Total	Maximum Mark	
		L	T	Р	С	Hours		
19CH404	INTERNET OF THINGS FOR CHEMICAL ENGINEERS	2	0	2	3	60	100	
Course Object	tives: The purpose of learning f	this co	ourse	is to		1		
<ul><li>Understand</li><li>Understand</li><li>Identify type</li></ul>	I what Internet of Things is and I the various means of commun I Cloud Computing & its relevan es of data analytics and data vis	icatio nce in sualiz	on from IoT ation	m No tools	de / Gate	way to C	loud Platforms	
Course Outco	ents aware of security concerns me: At the end of this course, le	anu	unane	lbo	while in	piementii	ig for olutions	-
of IoT e Describ Describ Describ	what Internet of Things is and t cosystem e and choose Sensors and Act e and implement edge network e Big Data Analytics, transform the DIY (Do it yourself) open so	uators data	s and o	draw	meaningf	ul conclu	sions	
UNITI	Introduction to IoT	Juice	elect	TOTIL	spiation			12
Definition of IoT	- Evolution of IoT - IoT and rel	ated	terms	s - Bu	siness So	cope.		
	Elements of IoT	1		- 15			The second second second	12
	Elements of IoT - Basic Archited	cture	of an	IOT A	Applicatio	n Sensor	s & Actuators - Ec	2538
	SN) – Gateways - IoT Commun							ge
Networking (VV	stig sateriaje tet somman			aur	VVI / 114 CA			
		ctivit	v Tec					12
	Communication and Conne			hnol	ogies			12
UNIT III Cloud Computir	Communication and Conner ng in IoT - IoT Communication I	Mode	I – CI	hnol	ogies			
UNIT III Cloud Computir UNIT IV	Communication and Conner og in IoT - IoT Communication I Data Analytics and IoT Platf	Mode orms	I – CI	hnol	ogies			12 12
<b>UNIT III</b> Cloud Computir <b>UNIT IV</b> Big Data Analyt	Communication and Conner ng in IoT - IoT Communication I Data Analytics and IoT Platf ics - Data Visualization - IoT Pl	Mode orms atform	I – CI	hnol	ogies			12
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		Ho	urs/ W	Veek	Credit	Total	ter IV Max	imum
Course Code	Course Name	L	T	P	C	Hours		larks
19HS402	UNIVERSAL HUMAN VALUES 2 : UNDERSTANDING HARMONY		1	0	3	60	100	
<b>Course Object</b>	ive (s): The purpose of learning t	his co	urse i	is to		4	10	
<ul> <li>To help 'SKILLS' human be To facilit profession the Huma Universal</li> <li>To highlig conduct, Nature</li> <li>To highlig right.</li> <li>Course Method</li> <li>To explor the huma</li> </ul>	the students appreciate the e to ensure sustained happiness	essent and p and p and p nce. S oward a Ho nan b atures educa is") the asis of a towa of and e the cours otable ence.	ial co rospe rospe Such a s valu blistic ehavio this c ation l rough a dial d the of thei rough a dial d the of thei stude se is : , It inv	ompler rity wh ctive a rity ba a holis le-bas unders or and ourse by dev the pr logue stude ir natu ecting tion. mplica ents di	hich are t among s ased on a atic persp ed living i standing i mutually is to veloping t rocess of whereby nts are en aral accep a qualita ations, a scern the	tudents to correct of ective for n a natur in terms of enriching the right of self-explo a set of ncourage otance with tive trans critical a e differen	aspirations owards lif- understan- rms the b al way. of ethical g interaction understan- oration. proposals d to self-e- thin onese sformation appraisal ce on the rational st	s of a fe and ding o asis o humar on with ding o abou explore elf and in the of the ir owr
<ul> <li>It is a provise found a their own the whole</li> <li>This processure</li> </ul>	rom any dogma or value prescrip ocess of self-investigation and se as truth or reality is stated as a p right, based on their Natural Ac existence is the lab and every ac cess of self-exploration takes the to begin with, and then to conti us self-evolution.	elf-exp roposa ccepta ctivity e form	al and nce a is a se n of a	I the s and su ource dialog	tudents a bsequent of reflecti gue betw	re facilita Experier on. een the	ted to ver ntial Valida teacher a	ify it in ation – nd the
	-exploration also enables them	to c	riticall	y eva	luate the	eir pre-co	onditioning	is and

#### Module 1 – Introduction to Value Education

**Lectures** - Understanding Value Education - Self-exploration as the Process for Value Education -Continuous Happiness and Prosperity – the Basic Human Aspirations - Right Understanding, Relationship and Physical Facility - Happiness and Prosperity – Current Scenario - Method to Fulfill the Basic Human Aspirations

6+3

6+3

6+3

4+2

6+3

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**Tutorials** [Practice Session] - Sharing about Oneself - Exploring Human Consciousness - Exploring Natural Acceptance

Module 2 – Harmony in the Human Being

**Lectures** - Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body – The Body as an Instrument of the Self - Understanding Harmony in the Self - Harmony of the Self with the Body - Programme to ensure self-regulation and Health

**Tutorials** [Practice Session] - Exploring the difference of Needs of Self and Body - Exploring Sources of Imagination in the Self - Exploring Harmony of Self with the Body

Module 3 – Harmony in the Family and Society

*Lectures* - Harmony in the Family – the Basic Unit of Human Interaction - Values in Human-to-Human Relationship – 'Trust' – the Foundational Value in Relationship - 'Respect' – as the Right Evaluation - Understanding Harmony in the Society - Vision for the Universal Human Order

**Tutorials** [Practice Session] - Exploring the Feeling of Trust - Exploring the Feeling of Respect - Exploring Systems to fulfil Human Goal

Module 4 – Harmony in the Nature/Existence

*Lectures* - Understanding Harmony in the Nature - Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature – Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence

**Tutorials** [Practice Session] - Exploring the Four Orders of Nature - Exploring Co-existence in Existence

#### Module 5 – Implications of the Holistic Understanding

Lectures - Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct – A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order -Competence in Professional Ethics - Holistic Technologies, Production Systems and Management Models-Typical Case Studies - Strategies for Transition towards Value-based Life and Profession **Tutorials** [Practice Session] - Exploring Ethical Human Conduct - Exploring Humanistic Models in Education - Exploring Steps of Transition towards Universal Human Order

Course Outcomes: At the end of this course, learners will be able to:

- Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
- Students would become more responsible in life, and in handling problems with sustainable solutions.
- Students become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
- Students would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
- Students would have better critical ability.

TEXT BOOK(S):

A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1

Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978- 93-87034-53-2

#### REFERENCE BOOK(S):

Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999

Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004

The Story of Stuff (Book)

The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

Small is Beautiful - E. F Schumacher

Slow is Beautiful - Cecile Andrews

Economy of Permanence - J C Kumarappa

Bharat Mein Angreji Raj – PanditSunderlal

Rediscovering India - by Dharampal

Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

#### SUGGESTED ASSESSMENT:

This is a compulsory credit course. The assessment is to provide a fair state of development of the student, so participation in classroom discussions, self-assessment, peer assessment etc. will be used in evaluation. *Example*:

Assessment by faculty mentor. 10 marks

Self-assessment: 10 marks & Assessment by peers: 10 marks

Socially relevant project/Group Activities/Assignments: 20 marks

Semester End Examination: 50 marks

The overall pass percentage is 40%. In case the student fails, he/she must repeat the course

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Departme	ent	COMMON TO ALL BRAN	ICHE	S	-lót	1.1	R 2019	Semester IV	/EEC
Course Co	ode	Course Name		Hour Wee		Credit	Total Hours	Maximur	n
			L	Т	P	С	nouis	Marks	
19TPS04	4	QUANTITATIVE APTITUDE AND LOGICAL REASONING - II	2	0	0	0	30	100	
Course O	bjecti	ve (s):	_		1	-			1.1.1
• To le	arn the	e basic of partnership and chain rule in	simp	lified	way				
• To so	olve pr	oblems using fast track method by lear	ning (	orofit	and	loss with	percentag	je.	
• To	teach	the angle of elevation and depression.							
• To	know	the relationship, direction concepts in e	asy v	vay.					
• To k	know a	bout coding and decoding through logic	cal wa	ay.					
Course O	utcon	nes: At the end of this course, learners	will b	e ab	le to	:	1	P. 9	
• Solv	e prob	plems by using shortcut in partnership a	nd ch	nain i	ule.				
• Know	w the t	tips and tricks of profit and loss with per	centa	age t	hrou	gh fast tra	ack metho	ds.	
• Unde	erstan	d the concepts of angles.							
• Eval	uate c	ritically the real life situations by resorti	ng an	id an	alyz	ing analy	tical reaso	ning of key	
		factors.	U						
• Enha	ance tl	he logical way of thinking by solving pro	blem	s co	des	and ranki	ngs conce	pts.	
	Berger	VERSHIP & CHAIN RULE	- 5					to a second	6
	ing and the state of the	Ratio of division of gains: Simple Partn	ershi	p – (	Com	pound Pa	artnership	- Working and	1
sleeping pa								والمتحاجر الأ	
		finition – Direct proportion and Indirect T &LOSS, PERCENTAGE	prop	ontion	1.	1. Yes	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	WENCH	6
		SS: Basic definition and types of profit	and I	oss ·	- Co	ncept of	discount a	nd marked pr	ice -
Concept of	true v	/s false value - Application in data inte	rpreta				The second street		
		Percentage – Percentage using shortcu	ts.	142	Here's a				6
						10.000 concerns the		and the second second second	
HEIGHT AN	ND DIS	STANCES: Line of sight - Angle of elev	ation	– Ar	ngle	of depres	sion.	This de la compañía de la comp	
		D RELATIONSHIP & DIRECTION SEN	ICE T	EST					6
CINIT 4		BALLATIONSHIT & DIRECTION SER							
		<b>DNSHIP:</b> Analysis the gender relations <b>SE TEST:</b> Distance between the startin							ctly.
UNIT 5	OGIC	AL SEQUENCE OF WORD, CODING	AND	DEC	OD	ING, NUN	BER RAN	NKING &	6
T SINT S	TIME S	SEQUENCE TEST			1				
group – Sec	juende	ENCE OF WORDS: Sequence of occur of increasing/decreasing size, value, if CODING: Introduction – Description of	itens	ity, e	tc.		1. 0 A.		
						(	H CHE	hemical Engg	ESEC

coding & decoding – Problems involving coding & decoding method.
NUMBER RANKINGS & TIME SEQUENCE TEST: Number test – Ranking test – Time sequence test.
TOTAL : 30 HOURS
REFERENCES:

Abbijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
R.V.Praveen," Quantitative Aptitude and Reasoning "Third Edition, PHI Learning ,2016.
Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
Arun Sharma "How to Prepare for Quantitative Aptitude"Eight Edition, McGraw Hill Education,2018
"Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

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Department	CHEMICAL	ENGI	NEEF	RING	Say Died	R2019	SEMESTER IV PC
Course Code	Course Name	Ho	ours/	week	Credit	Total	Maximum Marks
		L	T	P	С	Hours	
19CH406	ORGANIC CHEMISTRY LABORATORY	0	0	4	2	60	100
Course Object	ives: The purpose of lear	ning th	nis co	urse	is to	340	
Learn basic	principles involved in an	alysis	and s	synthe	esis of diffe	erent orga	nic derivatives.
Course Outcor	ne: At the end of this cou	rse, le	arnei	's will	be able to	)	din de sourre production
<ul> <li>Identify wh</li> </ul>	at distinguishes a strong	g and	weal	k nuc	leophile a	nd recall	the rules of reactions. The
						omide is r	not drawn out. The studen
	list of compounds and de	termin	ies th	eir re	activity.		
LIST OF EXPE	a sea anna anna anna an anna an						
	analysis of organic compo	ounds ·	– Ide	ntifica	tion of alip	ohatic/aror	natic, saturated/unsaturated
compounds.		14					e serie (de la company) più rein essi
	and characterization of va				-		
	dehyde, c) ketone, d) carl		acid	, e) p	henol, f) e	ster, g) pri	mary, secondary and
	h) imide i) nitro compound		ų., 1				
	n unknown organic comp	ound a	ind pi	repara	ation of su	itable solid	d derivatives.
4. Analysis of ca	en e						
5. Analysis of pr							and the second second second
	of filtration and recrystalli		•				
	o organic synthetic proce						
CONTRACT OF 151 151 155	Preparation of acetanilide						
	Preparation of salycilic ac - Conversion of acetone t			nyisai	ycillate.		
	eparation of m-dinitroben					ul alaahal	
and the second sec	reparation of benzoic acid	ine Breaksta	mer anna i	- 87 ( State 1 - 43	yae/ benz	yi alconol.	
and the second second in the second	MENT FOR BATCH OF	30STL	JDEN	ITS	19 A.		
1. Silica Crucible							
2. Heating Mant							
3. Muffle Furnac							
4. Hot air oven 1	and the second sec	NI ATTAC	1	1	and the last	-	all and a second second second
5. Desiccator 5N							
<ol> <li>Vacuum pum</li> <li>Condenser 51</li> </ol>							
B. Reflux Conde	STAR						
Reference B			and a federation	Stewart	and the second		
1.	Vogels'sText Book of Pr	actica		anic (	hemistry	Fifth Editi	on, Longman Singapore
SUNAR	Publishers Pte. Ltd., Sin				, normoury,	- nur Lutu	on, conginan oingapore
2.		-	•		ry Division	Chemics	al Engineering Department,
The second s	A.C. Tech, Anna Univer			Sinat	19 DIVISIO	, onemice	a Engineering Department,
Farmer Spirat 101	And Onver	ony (20					and the second se

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Department	CHEMICAL	ENGIN	ERIN	NG	12024	R2019	SEMESTER IV	PC
Course Code	Course Name	Ho	urs/w	eek	Credit	Total	Maximum Marks	
2		L	Т	Ρ	С	Hours		
19CH407	MECHANICAL OPERATIONS LABORATORY	0	0	4	2	60	100	
Course Objective	s: The purpose of lear	ning thi	s cou	rse is				SCHC 10
• Enable the stu	udents to develop a sou	und wor	king l	knowl	edge on	different	types of crushing eq	uipment
and separatio	n characteristics of diff	erent m	lecha	nical	operatior	separato	ors.	
Course Outcome	: At the end of this cou	rse, lea	rners	will b	e able to	No. of the	4-2.5-44-5-4	
	tical knowledge and ha					technique	es like filtration,	
and the second	, screening, elutriation	, and ce	entrifu	gatio	n.	5		(
LIST OF EXPERIM	MENTS						No. No.	
1. Sieve analysis								
anna - Afrikan ann an 1886 ann an 1886	studies using a Leaf filte							
	studies using a Plate ar		e Filt	er pre	ess			
	of batch Sedimentation							
	in Jaw Crusher / Pulve	rizer/ H	amme	er Mil	l.		199	
6. Reduction ratio								
	acteristics of Cyclone	separat	or					
8. Reduction ratio								
Contraction and the second second second second second	acteristics of Elutriator						1	
	o of Drop weight crushe	er			Ŷ			
	n using Sub-Sieving							
	of specific surface area	and the second s		12 YO 12 YO 12 YO 12 YO 12	bility setu	up		
	ENT FOR BATCH OF	30STU	DENT	'S		11 March 1	the state of the state	
1. Sieve shaker 1N	No.				- 42			
2. Leaf filter 1No.								
3. Plate and Frame								
4. Sedimentation J								
	lo. <sup>eggeneration</sup> de la company			S. C. S. C.	erangen 200 (*	er harrar ar an	Street of the Constant	and the Barth -
	rizer / Hammer Mill Any	one m	ill					
7. Cyclone Separa								
8. Roll Crusher 1N	lo.							
9. Elutriator 1No.								
10. Drop Weight C								
11. Test Sieves. 1								
12. Air Permeabil	lity apparatus 1No.		(William)			Sel Colorado		

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# **SEMESTER V**

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Department	CHEMICAL EN	GINE	ERIN	IG		R2019	SEMESTER V	PC
Course	Course Name	-	irs/w		Credit	Total	Maximum I	Marks
Code		L	T	P	C	Hours		
19CH501	CHEMICAL REACTION ENGINEERING – I	3	0	0	3	45	100	
Course Objec	tives: The purpose of learnir	ng this	cour	se is	to	(-		
<ul> <li>Provide</li> </ul>	knowledge on different ty	pes c	of rea	action	s, reactio	on rate, c	collection and a	nalysis c
reaction	n rate data to derive rate exp	ressio	ns.					
	knowledge on different kir							
	dge of different types of re					h, CSTR,	, PFR) and to c	lerive the
	equations of ideal reactors fr					a burn i	3.1	
	a foundation on deriving ra							
reaction	wledge about product distrib	ution	n mu	litiple	reactions	, recycle i	eactors and auto	Catalyti
	the knowledge on thermal c	harac	terist	ics of	various r	eactions		
	me: At the end of this course		100 - 10 - 10 - 10 - 10 - 10 - 10 - 10			Cublichio		
	e kinetic data and determine					ction orde	r and specific rea	action
	r a reaction.	uno ru		prooc				
	and solve design equations f	or bat	ch, se	emi b	atch and	steady sta	ate flow reactors.	Solve
	riate rate expressions for ser							
Underst	tand the performance charac	teristi	cs an	d the	advantag	ges and di	isadvantages of	major
reactor	types.							
	e multiple reactions to determ							
	explain the thermal characte	ristics	and	desig	n of adia	batic reac	tors for single an	d
	reactions			1	5			-
	INTRODUCTION							9
	o Chemical Reaction En							Reactions
	and Heterogeneous Reaction. Kinetics of homogeneous							
	ependent term for rate equati							
from theory.		011, 00	aron	ing io	r a moone	anom, pre	alotability of roa	stion rate
	BATCH REACTOR	- 17			8			9
Constant volum	ne batch reactor- Analysis of	Rate	Data:	integ	gral and d	ifferential	Methods Method	d of Half-
Lives, Method	of Initial Rates, Method of Fra	action	al life	. Ana	lysis of to	tal pressu	ure data. Variable	e volume
	ractional volume change, ter			and re	eaction ra	te, and se	earch for a rate e	quation.
	nifting order, design of batch	reacto	or		Con Westmannen and		Contraction of the	New Street
	IDEAL FLOW REACTOR							-9
	ermal Flow reactors-general							
	and space velocity, steady s id space time for flow system							
	atalytic reactions and Recycl			•	SOIT OF SIT	gie reacto	ns, multiple reac	
UNIT IV	MULTIPLE REACTOR	e nea	CIOIS					9
	allel reactions- introduction	to m	ultiple	e rea	ctions. au	alitative	discussion abou	The state of the second st
	antitative treatment of prod							
	ies, qualitative discussion at							
	or, quantitative treatment of r							the second
JNIT V	NON-ISOTHERMAL REAC		100	2	S.C.			9
	e methods for solving second							re and
pressure effect	s: Single reaction-heats of re	action	is from	m the	ermodynai	nics, heat	t of reaction and	1
								- 900
	X			. \	The states	A	NOXO IL	NAK
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general gra reactors: he reactors, mi	e, equilibrium constants from thermodynamics, equilibrium conversion from thermodynamics, ohical design procedure, optimum temperature progression. Design of non-isothermal at effects, adiabatic and non-adiabatic operations. Exothermic reactions in mixed flow ultiple reactions.
TEXT BOO	K(S):
1 <b>1</b> . C	Chemical Reaction Engineering, Octave Levenspiel, 3rdedition, Wiley Eastern
REFERENC	E BOOK(S):
1.	Elements of chemical reaction engineering, H.S.Fogler, 2 <sup>nd</sup> edition, PHI
2.	Chemical Engineering Kinetics, J.M.Smith, 3 <sup>rd</sup> edition, McGraw Hill.

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	CHEMICAL EI	NGINEE	ERING		R2019	SEMESTER V	PC
Course	Course Name		rs/week	Credit	Total	Maximum	Marks
Code		L	TP	C	Hours		
19CH502	MATERIAL SCIENCE AND TECHNOLOGY	3	0 0	3	45	100	
Course Object	ives: The purpose of learni	ing this	course is	to			
<ul> <li>Provide</li> </ul>	knowledge on different type	es of ma	aterials &	properties	3.		
	knowledge on nano materi						
	a foundation on deriving m						
	the knowledge on thermal				<b>)</b> .		
	<b>ne:</b> At the end of this cours different properties of mate		iers will r	be able to			
Derive a	lloy with required character	rietice					
	and the performance chara		s and the	advantar	ib bre an	sadvantages of	different
material	s.	otoriotio		auvantag	jes and u	sauvantages of	unerent
<ul> <li>Able to e</li> </ul>	explain the characteristics a	and fabr	ication o	nanomate	erials.		
	INTRODUCTION						9
Atomic structure	e and chemical bonding: St	tructure	of an at	om, quanti	um states	periodic table.	Ionization
potential, electr	on affinity and Electro neg	gativity.	Chemic	al bonding	g: Types	of bonds, lonic	covalent
netallic and se	condary bonding, propertie	es and	bond ch	aracteristic	cs. Crysta	I geometry and	structure
letermination g	eometry of crystals: space	e lattices	s, crysta	structure	s, miller i	ndices of crysta	allographic
phases and dire	ctions, structure determina	tion by	x-ray diff	raction, Br	agg law p	owder method.	
Structures of so	lids and crystal imperfection	ns: crys	talline ar	id non-cry	stalline sc	lids, inorganic s	solids,
montoctions; me	etals and alloys, cubic sys	stems p	backing e	efficiency a	and co-or	dination number	er. Crysta
JNIT II	oint, line and surface imper PHASE DIAGRAMS AND	DUASE	S. TDANC	FORMAT			0
	s and phase transformati						9
systems and tw	o component systems, bin	ary pha	ase diad	ams – tie	line rule	lever rule isor	norphous
eutectic, eutecte	oid, peritectic and peritecto	oid syst	ems with	example	s. Non ec	uilibrium coolin	norprious
Phase transform	nation, solidification and cry	at alling					ia: corina
	and on, solution and ory	stalliza	tion.				ig: coring
Strengthening	of metals and alloys: G	Grain re	efinemen	t, solid s	olution s	trengthening, o	
Strengthening strengthening, s	of metals and alloys: G train hardening and precipi	Brain re tation h	efinemen ardening				dispersior
Strengthening strengthening, s Heat treatment	of metals and alloys: G train hardening and precipi of steels applied to the m	Brain re tation h	efinemen ardening				dispersior
Strengthening strengthening, s leat treatment nardening and to	of metals and alloys: G train hardening and precipi of steels applied to the m empering.	Brain re tation h naterials	efinemen ardening s used ir	chemica	l industry	Annealing, no	dispersior rmalizing
Strengthening strengthening, s leat treatment nardening and to <b>UNIT III</b>	of metals and alloys: G train hardening and precipi of steels applied to the m empering. ELASTIC BEHAVIOR OF I	Brain re tation h naterials <b>MATER</b>	efinemen ardening s used ir RIALS PL	chemica ASTICDE	l industry	Annealing, no	dispersior
Strengthening strengthening, s leat treatment nardening and to JNIT III Elastic behavior	of metals and alloys: G train hardening and precipi of steels applied to the m empering. ELASTIC BEHAVIOR OF I of materials Plastic deform	Grain re tation h naterials <b>MATER</b> nation: N	efinemen ardening s used ir RIALS PL Mechanis	chemica <b>ASTICDE</b> m of slip a	l industry	Annealing, no	dispersior rmalizing
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Strengthening, s Heat treatment hardening and to <b>JNIT III</b> Elastic behavior Creep Mechani racture in duction	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ	Grain re tation h naterials <b>MATER</b> nation: N Creep i Igue-Me pes of c	efinemen ardening s used ir RIALS PL Mechanis in materi achanism	chemica ASTICDE m of slip a มร.	I industry FORMAT nd twinnir	Annealing, no	dispersior ormalizing 9
Strengthening strengthening, s leat treatment nardening and to <b>JNIT III</b> Elastic behavior Creep Mechani racture in ducti Dxidation and co <b>JNIT IV</b>	of metals and alloys: G train hardening and precipi of steels applied to the m empering. ELASTIC BEHAVIOR OF I of materials Plastic deform sm and methods to reduce le and brittle materials, Fat prosion: Basic principle, ty COMPOSITE MATERIALS	Grain re tation h naterials <b>MATER</b> nation: M Creep i igue-Me pes of c	efinemen ardening s used ir RIALS PL Mechanist in mater echanist corrosion	ASTICDE M of slip a als and preve various c	I industry FORMAT nd twinnir entive me ombating	Annealing, no ION ng thods methods.	dispersior ormalizing 9 9 9
Strengthening strengthening, s Heat treatment hardening and to JNIT III Elastic behavior Creep Mechani- racture in ducti Dxidation and co JNIT IV	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ	Grain re tation h naterials <b>MATER</b> nation: M Creep i igue-Me pes of c	efinemen ardening s used ir RIALS PL Mechanist in mater echanist corrosion	ASTICDE M of slip a als and preve various c	I industry FORMAT nd twinnir entive me ombating	Annealing, no ION ng thods methods.	dispersior ormalizing 9 9 9
Strengthening, s Heat treatment hardening and to <b>JNIT III</b> Elastic behavior Creep Mechanii racture in ducti Dxidation and co <b>JNIT IV</b> Types of metals construction in p Composite Mat	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ <b>COMPOSITE MATERIALS</b> is and alloys used in cher process industry. terials: Classification, Lat	Grain re tation h naterials <b>MATER</b> nation: N Creep i Igue-Me pes of c pes of c mical pr rge pa	efinemen ardening s used ir RIALS PL Mechanis in materi echanism corrosion rocess ir rticle re	ASTICDE m of slip a als and preve Various co dustry, Ci	I industry FORMAT Ind twinnin entive me ombating riteria of and dis	Annealing, no ION 19 Inods methods. selection of ma	dispersion ormalizing 9 9 aterials of
Strengthening, s Heat treatment hardening and to <b>JNIT III</b> Elastic behavior Creep Mechanic racture in duction Dividation and co <b>JNIT IV</b> Types of metals construction in p Composite Mat composites; Fi	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ <b>COMPOSITE MATERIALS</b> is and alloys used in cher process industry. terials: Classification, Lan ber orientation and Co	Grain re tation h naterials <b>MATER</b> nation: N Creep i igue-Me pes of c pes of c mical pr rge pa	efinemen ardening s used ir RIALS PL Mechanis in materi echanism corrosion rocess ir rocess ir rticle re ation In	ASTICDE m of slip a als and preve various co dustry, Ci inforced fluences,	I industry FORMAT nd twinnin entive me ombating riteria of and dis discontin	Annealing, no ION Ig thods methods. selection of ma spersion stre tuous and	dispersion ormalizing 9 9 aterials of engthenec
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Strengthening strengthening, s leat treatment nardening and to <b>JNIT III</b> Elastic behavior Creep Mechani- racture in ducti Dxidation and co <b>JNIT IV</b> Types of metals construction in p Composite Mat composites; Fi andomlyoriente composites, app	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials, Fat prosion: Basic principle, typ <b>COMPOSITE MATERIALS</b> is and alloys used in cher process industry. terials: Classification, Lan ber orientation and Co d;processingtechniquesford lications.	Brain re tation h naterials <b>MATER</b> nation: M Creep i igue-Me pes of c pes of c mical pr rge pa poncentra compos	efinemen ardening s used ir RIALS PL Mechanist in materi echanist corrosion rocess ir rticle re ation In itemateri	ASTICDE m of slip a as and preve various co dustry, Co inforced fluences, alsandfibre	I industry FORMAT nd twinnin entive me ombating riteria of and dis discontin	Annealing, no ION ng methods. selection of ma spersion stree nuous and d	dispersion ormalizing 9 9 aterials of angtheneo alignment
Strengthening, s leat treatment nardening and to <b>JNIT III</b> Elastic behavior Creep Mechanic racture in ducti Dxidation and co <b>JNIT IV</b> Types of metals construction in p Composite Mat composites; Fi andomlyoriente composites, app <b>JNIT V</b>	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ <b>COMPOSITE MATERIALS</b> is and alloys used in cher process industry. terials: Classification, Lan ber orientation and Co d;processingtechniquesford dications.	Grain re tation h naterials <b>MATER</b> nation: N Creep i igue-Me pes of c pes of c mical pr nical pr rge pa oncentra compos	efinemen ardening s used ir RIALS PL Aechanis in materi echanism corrosion rocess ir rticle re ation In itemateri NOLOG	ASTICDE m of slip a als and preve various co dustry, Co inforced fluences, alsandfibre	I industry FORMAT nd twinnir entive me ombating riteria of and dis discontin ereinforce	Annealing, no ION Ig thods methods. selection of ma spersion stre huous and d	dispersion malizing 9 9 aterials of angtheneo alignment 9
Strengthening, s trengthening, s leat treatment nardening and to <b>JNIT III</b> lastic behavior creep Mechani racture in ducti Dxidation and co <b>JNIT IV</b> Types of metals construction in p Composite Mat composites; Fi andomlyoriente composites, app <b>JNIT V</b>	of metals and alloys: G train hardening and precipi of steels applied to the m empering. <b>ELASTIC BEHAVIOR OF I</b> of materials Plastic deform sm and methods to reduce le and brittle materials. Fat prosion: Basic principle, typ <b>COMPOSITE MATERIALS</b> is and alloys used in cher process industry. terials: Classification, Lan ber orientation and Co d;processingtechniquesford lications. INTRODUCTION TO NANG to Nanotechnology-	Grain re tation h naterials MATER nation: N Creep i igue-Me pes of c mical pr mical pr rge pa oncentra compos OTECH Zero-I	efinemen ardening s used ir RIALS PL Mechanis in materi echanism corrosion rocess ir rticle re ation In itemateri NOLOG Dimensio	ASTICDE m of slip a als and preve various co dustry, Co inforced fluences, alsandfibre	I industry FORMAT nd twinnir entive me ombating riteria of and dis discontin ereinforce	Annealing, no	dispersion malizing 9 9 aterials of alignment 9 Nano
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	Films – Special Nano Materials – Nanostructures fabricated by Physical Techniques – ation and Properties of Nano Materials – Applications of Nano Structures.
<b>FEXT BOOI</b>	۲(S):
1.	Material Science and Engineering, V.Raghavan, PHI
2.	Material Science and Engineering, William D.Callisters Jr, Weily& Sons
REFERENC	E BOOK(S):
1.	Material Science and Metallurgy, Dr.V.D.Kodgire, New age India.
2.	Material Science and Engineering, R.K.Rajput, S.K.Kataria& Sons.
3.	Brenner D, "Hand book of Nanoscience and technology" (2002).

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Department	CHEMICAL E	NGINE	ERIN	IG	•	R2019	SEMESTER V	PC
Course	Course Name	Hou	ırs/w	eek	Credit	Total	Maximum	Marks
Code		L	Т	Ρ	С	Hours	-	
19CH503	MASS TRANSFER OPERATIONS – I	3	0	0	3	45	100	13. A F
phases L arn giv diffusion correlati Explain processe Discuss Describe Course Outcor Define th Calculate Identify f An ability UNIT I	the students with the basi es with examples. the principles of drying. e and illustrate to the stude <b>ne:</b> At the end of this cours ne basic principles of mass e the mass transfer coeffic the major parts of various of numidification and dehumic y to calculate the design th <b>DIFFUSION</b>	accordin of a sy efficient c princi ents the se, lean transfe ients. drying e dification e crysta	ng to vsterr s fro iples equi ners er op allize	the c , be a om m of ma pmen will be eratio ment cesse r, crys	hanged e able to co athematic ass transf t used in a able to ns and ot es. stallization	nvironme ompute or cal mode fer operat operation her separ	nt. determine the els, engineering ions and other s s involving cryst ration processes	applicabl data, c separatio allization
oefficient, cont ounter diffusior ypes of solid d	sion: Steady state diffusion inuity equation, diffusion in n. Diffusivity of liquids, estin iffusion-diffusion through p MASS TRANSFER COEF	binary mation olymer	gas of dif s, cry	mixtu fusivit	res–one o ties in liqu	componer uids and g	nt stagnant, equi ases. Diffusion i	molar
	coefficients: notation for ma	18 19 21 20 1 37.2	3.1.4.1.0242.K			0.01		1.000
from gas into a number, mass ransfer theories and momentum relationship of o <b>UNIT III</b>	a flat falling liquid film, Sh transfer coefficient correla s: film theory, penetration transfer.Inter-phase Mass verall mass transfer coeffic <b>HUMIDIFICATION</b> Vapor-gas mixtures, abs	erwood ations fo theory, Transfo cient wit	num or lai surfa er: Eo th eit	nber, minar ace re quilibr her si	Peclet nu and turk enewal th ium, Diffu de mass	umber, So pulent flov eory; ana usion on b transfer c	chmidt number, w in circular pip logy between m ooth sides of an i oefficient	Reynolds bes. Mass hass, hea interface, 9
bercentage satu system, wet bull Humidification E	uration, dew point, enthalp temperature, Lewisrelatio quipment: water-cooling to ion – evaporative cooling.	oy, Hun n,Adiab	nid V patico	olum operat	e and he ion-desig	at, psych	rometric charts, coolingwithair.	air-wate
	DRYING							9
Drying: Batch dr	ying, rate of batch drying, nuous drying operations.	time of	dryin	g, me	chanism	of batch o	drying, equipmer	nt for

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UNIT V	CRYSTALLIZATION 9	
Crystallizat tube crysta	ion: Crystal geometry, nucleation, crystal growth, equipment – vacuum crystallizer & draft Ilizer.	
TEXT BOO	OK(S):	-
1	N. Anantharaman, "Mass Transfer Theory and Practice", PHI Learning Pvt. Ltd. June 1 2017.	k
2	Robert E. Treybal, "Mass Transfer Operations", 3 <sup>rd</sup> edition, International Edition, McG Hill.	Grav
3	Binay K. Dutta, "Principles of Mass Transfer and Separation Process", PHI, New Dell	hi.
REFEREN	CE BOOK(S):	
1	Warren, L., McCabe, Julian C.Smith, Peter Harriot, "Unit Operations of Chemical Engineering", 7 <sup>th</sup> Edition, McGraw Hill.	
t 2	Christie JohnGeankoplis, "Transport process and separation process principles" 4 <sup>th</sup> edition, PHI	
3	J D Seader and E J Henly, "Separation Process Principles", John Wiley & sons.	
4	Robert H. Perry, "Perry's Chemical Engineers Hand Book", 7thedition, McGraw Hill	

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Chairman - Bos Dept. of Chemical Engg. - ESEC

Department	CHEMICAL EN	IGINEE	RING	G	Billio	R2019	SEMESTERV	PC
Course Code	Course Name	C. C	urs/w		Credit	Total	Maximum N	arks
19CH504	HEAT TRANSFER	L 3	Т 0	P 0	C 3	Hours 45	100	1.
	OPERATIONS	3117	-			11 L. (201	A really get the	8.1.0
	es: The purpose of learning	-						
transfer pro- Solve prob transfer op Develop th radiation, I Course Outcome Describe t Estimate th application Calculate o Design or Design of Design diff	he student's ability to desig Heat exchangers & evapor a: At the end of this course he three modes of heat tra he thermal conductivity, co	ometries er by co n or pre- ators. , learne nsfer m nvective befficien differen	s. edict t ers will hather e hea hts for ht typ	tion a the per l be a matica t tran force es of eat tr	and acqui erformance able to ally and p sfer coef ed, free, p heat excl	re a basic ce of heat ohysically. ficient and ohase cha hangers.	e understanding of exchangers. Und d emissivity for an nge problems.	of heat derstand ny <b>9</b> nduction:
nfinite long solid on finite solids.	ADIATION & CONVECTION ADIATION & CONVECTION Al radiation, emission of ra- s, radiation to semitransp indiation. Convection: Heat its, LMTD, relation between	flow wit DN adiation parent exchai	h var n, abs mate	iable sorptio rials, equipr	surface to on of rad combine ment, ene	emperatu liation by ed heat t ergy balar	re. Heat flow in s opaque solids, r ransfers by cor nces, heat flux a	emi- 9 adiation duction, and heat
	mensionless numbers in h						coemcienta, then	nai
the second s	ATURAL CONVECTION							9
	n: Heat transfer by forced				e tubes a			sition &
leat transfer to liq low. Natural conve	uid metals, forced convect ection:Grashoff number, na	tion ove	onved	erior s	Reynold surfaces. rom verti	Heat tran cal and he	sfer for tubes in a	alogies. pross 8.
leat transfer to liq ow. Natural conve INIT IV H	uid metals, forced convect ection:Grashoff number, na EAT EXCHANGE WITH P	ion ove atural co HASE	onved CHAI	erior s ction f	Reynold surfaces. rom verti AND RAI	Heat tran cal and he DIATION	sfer for tubes in o prizontal surfaces	alogies. cross s. <b>9</b>
leat transfer to liq low. Natural conve JNIT IV H leat transfer to fl	uid metals, forced convect ection:Grashoff number, na EAT EXCHANGE WITH P uids with phase change:	ion ove atural co HASE Heat tra	onvec CHAI ansfe	erior s ction f NGE	Reynold surfaces. rom verti AND RAI n conden	Heat transcal and he DIATION	sfer for tubes in o prizontal surfaces purs, film wise a	alogies. cross 3. <b>9</b> nd drop
Iow. Natural convergence         JNIT IV       H         Heat transfer to fl         vise       condensation         superheatedvapout         quids; Boiling of state	uid metals, forced convect ection:Grashoff number, na EAT EXCHANGE WITH P uids with phase change: on, derivation and pr irs, Effect of non-condense aturated liquid, maximum	tion ove atural co HASE Heat tra ractical able ga	onveo CHAI ansfe use ses o	erior s tion f NGE r fron e of on rat	Reynold surfaces. rom verti AND RAI n conden Nusse e of cond	Heat trans cal and ho DIATION ising vapo It equat densation	sfer for tubes in o prizontal surfaces purs, film wise a tion, condensat . Heat transfer to	alogies. cross s. <b>9</b> nd drop tion of b boiling
leat transfer to liq ow. Natural conve INIT IV H leat transfer to fl vise condensation uperheatedvapou quids; Boiling of so oiling, sub-cooled	uid metals, forced convect ection:Grashoff number, na EAT EXCHANGE WITH P uids with phase change: on, derivation and pr irs, Effect of non-condense aturated liquid, maximum	tion ove atural co <b>HASE</b> Heat tra- ractical able ga flux and	onvec CHAI ansfe use ses c d critic	erior s tion f NGE r from e of on rat	Reynold surfaces. rom verti AND RAI n conden Nusse e of cond	Heat trans cal and ho DIATION ising vapo It equat densation	sfer for tubes in o prizontal surfaces purs, film wise a tion, condensat . Heat transfer to	alogies. cross s. <b>9</b> nd drop tion of b boiling

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Heat-Exchange Equipment: Shell & tube heat exchangers, plate – type exchangers, extended surface equipment, scraped - surface exchangers, condensers and vaporizers, heat transfer in agitated vessels and packed beds.

Evaporation: Types of evaporators. Performance of evaporators; capacity and economy of evaporators, boiling point elevation and Duhring's rule, material and energy balances in single effect evaporator. Multi effect evaporators; methods of feeding, capacity and economy.

TEXT BOO	K(S):
1.	Warren,L., McCabe, Julian C.Smith, Peter, "Unit Operations of Chemical Engineering". Harriot, 7 <sup>th</sup> Edition, McGraw Hill.
2.	Kern, "Process Heat Transfer", Mcgraw Hill Publishers.
REFERENC	E BOOK(S):
1.	Christie John Geankoplis, "Transport process and separation process principles", 4 <sup>th</sup> edition, PHI
2.	Robert H. Perry, "Perry's Chemical Engineers Hand Book", 7thedition, McGraw Hill.

H. 200 Chairman - Bo Dept. of Chemical Engg. - ESEC

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Department	CHEMICAL E	NGINE	ERIN	IG		R2019	SEMESTER IV	PC
Course Code	Course Name	Ηοι	urs/w	eek	Credit	Total	Maximum M	larks
andron	ma la l	L	Т	Р	С	Hours		
19CH405	INSTRUMENTAL METHODS OF ANALYSIS	3	0	0	3	45	100	
Course Obiecti	ves: The purpose of learn	ina this	cour	se is	to			
	inciple and importance of	a a des <del>us</del> a la transfere				nte used	for the characteriz	ration of
various mat		vanous	5 anai	lytica	rinstrume			ation of
	ne: At the end of this cour	se. lear	ners	will b	e able to			100
used in inc • Know the i	bugh understanding of the dustries for testing quality mportance of analytical in g the finished product.	of raw r strume	mater ntatio	ials, i In dui	intermedi ring the p	ates and urification	finishedproducts. , compounding an	
UNITI	INTRODUCTION TO SPI	ECTRO	sco	PICA	L METH	ODS OF	ANALYSIS	9
compounds, exc	le radiations, various ener itation by UV and visible r		10.5	5 M				-
Lamda max and Lamda max) fo he absorption n nstrumentation of UV and Visible JNIT III Beer-Lambert's	QUANTITATIVEANALYS law, limitations, deviation	IS BY L odward mpound absorp ophotom SIS BY ns (real	JV AN -Fies ds, Effotion p neters UV A	ND Vi ser ri fects peaks s (sou ND V	ISIBLE S ules for t of auxoc s (Bathoc urce, optic /ISIBLE \$ I, instrum	PECTRO the calcul thromes a thromic, h cal parts a SPECTRO thental), e	COPY ation of absorption and effects of conj anypsochromic, hyp and detectors), Ap COPY stimation of inorg	9 on maxim ugation o ochromic plications 9 anic ion
(Lamda max) fo the absorption n nstrumentation of UV and Visible <b>JNIT III</b> Beer-Lambert's such as Fe, Ni a	d epsilon max rules, Wo r dienes and carbonyl cor naxima, Different shifts of for UV and Visible spectro e spectroscopy. QUANTITATIVEANALYS	IS BY L odward mpound absorp ophotom SIS BY ns (real sing Be	JV AN -Fies ds, Ef otion p neters UV A l, che er -La	ND Vi ser ri fects peaks s (sou ND V emica	ISIBLE S ules for t of auxoc s (Bathoc urce, optic /ISIBLE S I, instrum rt's law, r	PECTRO the calcul thromes a thromic, the cal parts a SPECTRO thental), e multicomp	COPY ation of absorption and effects of conj appsochromic, hyp and detectors), App DCOPY stimation of inorg oonent analysis (no	9 on maxim ugation o ochromic plications 9 anic ions o overlap
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amda max and (Lamda max) fo (Lamda max) fo nstrumentation of UV and Visible <b>JNIT III</b> Beer-Lambert's such as Fe, Ni a single way over litrations and the	d epsilon max rules, Wo r dienes and carbonyl con naxima, Different shifts of for UV and Visible spectro e spectroscopy. <b>QUANTITATIVEANALYS</b> law, limitations, deviation and estimation of nitrite us ap and two-way overlap),	IS BY L odward mpound absorp ophotom SIS BY ns (real sing Be	JV AN -Fies ds, Ef otion p neters UV A l, che er -La	ND Vi ser ri fects peaks s (sou ND V emica	ISIBLE S ules for t of auxoc s (Bathoc urce, optic /ISIBLE S I, instrum rt's law, r	PECTRO the calcul thromes a thromic, the cal parts a SPECTRO thental), e multicomp	COPY ation of absorption and effects of conj appsochromic, hyp and detectors), App DCOPY stimation of inorg oonent analysis (no	9 on maxim ugation o ochromic plications 9 anic ions o overlap
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amda max and (Lamda max) fo (Lamda max) fo nstrumentation of UV and Visible JNIT III Beer-Lambert's such as Fe, Ni a single way over l itrations and the JNIT IV Theory of IR sp both linear and nstrumentation of qualitative analys	d epsilon max rules, Wo r dienes and carbonyl com naxima, Different shifts of for UV and Visible spectro e spectroscopy. <b>QUANTITATIVEANALYS</b> law, limitations, deviation and estimation of nitrite us ap and two-way overlap), ir corresponding curves). <b>IR SPECTROSCOPY</b> ectroscopy, various streto nonlinear), various rang (only the sources and dete sis of alkanes, alkenes an	IS BY L odward mpound absorp ophotom SIS BY as (real sing Bed photom ching ar es of If ectors u d carbo	JV AN -Fies ds, Effotion p neters UV A l, che er -La netric nd vik R (ne used in onyl co	ND Vi ser ro fects peaks s (sou ND V emica ambe titrat	ISIBLE S ules for t of auxoc s (Bathoc urce, optic /ISIBLE \$ I, instrum rt's law, r ion (expe n modes nid, finge erent regi	PECTRO the calcul thromes a thromic, the cal parts a SPECTRO mental), e multicomp rimental s for diato r print ar	COPY ation of absorption and effects of conj hypsochromic, hyp and detectors), Ap DCOPY stimation of inorg oonent analysis (no set-up and various mic and triatomic ind far) and their u	9 on maxim ugation o ochromic plications 9 anic ions o overlap types of 9 molecule sefulnes echniques
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Dept. of Chemical Engel-ESEC

3.	Gurdeep R. Chatwal, Sharma K. Anand, Instrumental methods of ChemicalAnalysis
	Himalaya Publishers, New Delhi, 2014

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Chairman - Bd3 Dept. of Chemical Engg. - ESEC

Department	partment COMMON TO ALL BRANCHES						Semester	VEE
Course Code	Course Name	Hours/ Week			Credit	Total	Maximu	m
	QUANTITATIVE APTITUDE AND		LTF		С	Hours	Marks	
19TPS05			0	0	0	30	100	
Course Object				L			L	0
	to help people make sense of numerica	l data						
and the second	te the calendars and series in simplified							
	and the concept of the interest amount			CI				
	e procedure to deal with a situation and				letermine	the answe	r	
	eating arrangements in rows or in small							
	omes: At the end of this course, learner	-		hle t	·O.			
	te various principles involved in solving					and there	ov reducing th	10
	to solve Aptitude Questions.	mau	iema	licai	problema	and therei	by reducing th	ie.
	uestion based on calendar, odd man ou	it on		ion h		antout mot	hada	
15.1							inous.	
	ne interest by using shortcut methods in					10 <b>0</b> \$.		
	r critical thinking by solving the syllogisr	n and	a cou	rse o	of action.			
	e conditions and do interpretation.	Ğц	and a		$\langle S_1 \rangle^{(n)}  _{L^{\infty}}$		(	
	A INTERPRETATION & CLOCKS				C. Andrew			6
	<b>RETATION:</b> Tabulation – Bar graphs – I ition – important points – Angular different						nt timings-	
ncorrect clock.	ender in entropy and a strategy and a st		-8.	12		e dearraid is		
UNIT 2 CAL	ENDARS, ODDMAN OUT & SERIES			1		1		6
ALENDARS: (	Odd days – Leap year – Ordinary year	– Co	untir	g of	odd days	- Day of t	he week.	-10°% &
	& SERIES: Odd man out - Power serie	es – N	lumb	ber s	eries-Seq	uence of re	eal numbers.	
and the second	LE & COMPOUND INTEREST			-				6
SIMPLE INTERI methods.	EST: Principal – Rate of interest – Num	ber o	f yea	ars —	Using for	mulae and	shortcuts	
and the second of the second	TEREST: Compounded Annually - Co	mpol	unde	d Ha	If-Yearly	- Compou	nded Quarter	rly –
compounded ar	nnually – Rates are different for differen	nt yea	ars.				and the second	
UNIT 4 STAT	EMENT & COURSE OF ACTION, SYL	LOG	ISM			1	1.1.1	6
	ND COURSE OF ACTION: Courses of			ecisi	ion taken	- Improven	nent, Follow-u	up or
urther action in SYLLOGISM/ LO	regard to the given statement. OGICAL VENN DIAGRAMS: Relations nmediate deductive inference – Immedi	hip b	etwe	en th	ne two thir	ngs or not -		
	TING ARRANGEMENTS & DATA SUF				interence	- New Carlo State	100 100 - 100	6
	INC ARRANGE MENTS & DATA SUIT	WA (			<u> </u>	Arie	DOMOG	Ô
						0,0	chairman	Bos
						Dept	of Chemical E	<b>v</b> gg

**SEATING ARRANGEMENTS:** Persons seating in the circular – Rectangular – Square. **DATA SUFFICIENCY:** Reasoning ability using a set of directions.

TOTAL: 30 HOURS

### **REFERENCES:**

- 1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
- 2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
- 3. R.V.Praveen,"Quantitative Aptitude and Reasoning"Third Edition, PHI Learning ,2016.
- 4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
- 5. Arun Sharma "How to Prepare for Quantitative Aptitude" Eight Edition, McGraw Hill Education, 2018.
- 6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

1 · PORDADA Dept. of Chemical Engg. - ESEC

Department	CHEMICAL	ENGI	NEEF	RING		R2019	019 SEMESTER	
Course Code	Course Name	Ηοι	Hours/week (		Credit	Total	Maximum	Marks
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19CH505	HEAT TRANSFER LABORATORY	0	0	4	2	60	100	
<ul> <li>Enable the st equipment.</li> </ul>	The purpose of learnir tudents to develop a so	und w	vorkin	ng kno	owledge o	on differer	nt types of heat	transfer
Calculate hea     these phenor     LIST OF EXPERIME		on, diff	erent			ection usi	ng classical mo	dels for
<ol> <li>Heat transfer in SI</li> <li>Heat Transfer in a</li> <li>Heat transfer in cc</li> <li>Heat transfer by F</li> </ol>	hell and Tube Heat Exc Bare and Finned Tube omposite wall orced / Natural Convec Radiation - Determination Radiation – Emissivity r	change Heat tion on of t neasu	er Exch Stefai ireme	n Boli ent	tzmann c			
10. Boiling Heat Tran 11. Heat Transfer thr 12. Heat Transfer in 13. Heat Transfer in 14. Heat Transfer in	nsfer ough Packed Bed a Horizontal Condense Helical Coils Agitated Vessels	r / Vei	rtical	Cond				
<ol> <li>Double Pipe Heat</li> <li>Shell and Tube he</li> <li>Bare and Finned T</li> <li>Composite wall se</li> <li>Natural convection</li> <li>Stefan Boltzmann</li> <li>Emissivity measure</li> <li>Open Pan Evapora</li> <li>Single effect evapora</li> <li>Solier 1 Compuls</li> <li>Packed Bed 1No.</li> </ol>	at exchanger 1No. Tube Heat Exchanger 1 t up 1No. In set up or Forced conv Apparatus 1No. ement set up 1No. ator 1No. prator or Multiple effect ory equipment	No. ection evapo	n set u orator	up 1N				
<ol> <li>Agitated Vessel 1</li> </ol>								

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Course Name COMPUTATIONAL ENGINEERING PRACTICES LABORATORY he purpose of learning EXCEL/MATLAB skill lynomial regression pro- s involving iterative so mploy programming but	L 1 g this IIs robler	ms	P 2	Credit C 2 to	Total Hours 45	Maximum I 100	Marks
ENGINEERING PRACTICES LABORATORY he purpose of learning EXCEL/MATLAB skii lynomial regression p involving iterative so mploy programming b	g this lls robler	0 cour ms	2	2		100	
ENGINEERING PRACTICES LABORATORY he purpose of learning EXCEL/MATLAB skii lynomial regression p involving iterative so mploy programming b	g this Ils robler	cour			45	100	
EXCEL/MATLAB skil lynomial regression p involving iterative so nploy programming b	lls robler lution	ms	se is	to			
AB Basics: Introdu Iterative Solutions, U Roots of algebraic Extrapolation an ferential equations. Derical Methods to -Fluid flow operation	e, lear B skii robler olution oth In uction sing equat nd Sol	ners Ils ms EXC A, plot Mac tion; Nut	Will be CEL a tting ros, F Solut meric Chei	e able to nd MATL Graphs, Programm ion of sin al Dif	AB. Using ing in multaneo fferentiati	Excel and MA us equations; R on; Numerical Ir ng Problems:	egressiontegratio Materi
1			_		т	OTAL HOURS :	30 Hour
	involving iterative so ploy programming b AB Basics: Introducterative Solutions, U Roots of algebraic Extrapolation a erential equations. Arical Methods to	involving iterative solution ploy programming both In <b>AB Basics:</b> Introduction terative Solutions, Using Roots of algebraic equat Extrapolation and erential equations. erical Methods to Sol Fluid flow operations-Hea	involving iterative solutions ploy programming both In EXC AB Basics: Introduction, plot terative Solutions, Using Mac Roots of algebraic equation; Extrapolation and Nu erential equations. erical Methods to Solve Fluid flow operations-Heat tra	involving iterative solutions ploy programming both In EXCEL a <b>AB Basics:</b> Introduction, plotting terative Solutions, Using Macros, F Roots of algebraic equation; Solut Extrapolation and Numeric erential equations. erical Methods to Solve Cher Fluid flow operations-Heat transfer	involving iterative solutions ploy programming both In EXCEL and MATL <b>AB Basics:</b> Introduction, plotting Graphs, terative Solutions, Using Macros, Programm Roots of algebraic equation; Solution of sin Extrapolation and Numerical Dif erential equations. erical Methods to Solve Chemical E Fluid flow operations-Heat transfer and Eva	involving iterative solutions ploy programming both In EXCEL and MATLAB. <b>AB Basics:</b> Introduction, plotting Graphs, Using terative Solutions, Using Macros, Programming in Roots of algebraic equation; Solution of simultaneo Extrapolation and Numerical Differentiati erential equations. erical Methods to Solve Chemical Engineerir Fluid flow operations-Heat transfer and Evaporation- manical Operations	involving iterative solutions ploy programming both In EXCEL and MATLAB. AB Basics: Introduction, plotting Graphs, Using Built in Func- terative Solutions, Using Macros, Programming in Excel and MA Roots of algebraic equation; Solution of simultaneous equations; R Extrapolation and Numerical Differentiation; Numerical In- erential equations. Erical Methods to Solve Chemical Engineering Problems: Fluid flow operations-Heat transfer and Evaporation-Mass transfer o

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Department	SHEINIGAE ENGI	NEERING	3			R 2019	Semester V	EE
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<ul> <li>Develop stra</li> </ul>	ategies for vocabulary development	nt.						
<ul><li>qualities suc</li><li>Manage the</li></ul>	undergraduate students to such m ch as character, effective commun time during each activity in their c es: At the end of this course, learn	ication, a areer	ptituo	de ar		and the second second		ure
<ul> <li>Calculate per knowledge</li> <li>Produce sol</li> <li>Identify the</li> <li>Improve the</li> </ul>	ercentages in real life contexts, find of fraction multiplication and increa- lutions the Ratio, Proportions and V percentage gain or percentage los ir performance in the verbal ability	d any per use / decr /ariation s. sections	rcenta rease	age o a gi	ven whole	e by a pero	centage.	
	time for various activities in day to	o day life						_
	ENTAGES & AVERAGES inition and Utility of percentage - ir			5.1				6
vo – variation. ice – relation a old at two differ	tio- properties-dividing a given r	number i	n the	e giv		1.00		
ercentage loss (	tio- properties-dividing a given r ful results on proportion- continue Gain/Loss and percentage gain o mong cost price, sale price, gain/lo ent selling price - two different ar	number i d propor r percen oss and p ticles so	n the tion - tage ercei ld at	e giv relat loss- ntage sam	ven ratio ion amor -multiplyin e gain or e selling	ng the qua ng equival percentage price - pe	ntities more ents to find e loss - an a	tios tha sa artic
	tio- properties-dividing a given r ful results on proportion- continue Gain/Loss and percentage gain o mong cost price, sale price, gain/lo ent selling price - two different ar on selling price - percentage gain o	number i d propor r percen oss and p ticles so	n the tion - tage ercei ld at	e giv relat loss- ntage sam	ven ratio ion amor -multiplyin e gain or e selling	ng the qua ng equival percentage price - pe	ntities more ents to find e loss - an a	tios e tha I sal articl ain c
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## **SEMESTER VI**

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Course	Course Name	Hou	irs/w	Concern and the	Credit	Total	Maximum	Marks	
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	ctives: The purpose of learn								
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process e	e fundamentals of mass tr equipment.							- N - N	
	an appropriate separation					ar applic	ation. To unde	erstand th	
	of membrane separations a								
	ome: At the end of this cours								
	stand the basic concepts of o								
	tand the Continuous rectific								
	he principles Liquid-Liquid E	xtracti	on an	id equ	uipment fo	or Liquid-I	_iquid Extractio	n.	
	absorption column.								
<ul> <li>Select</li> </ul>	suitable equipment for leach	ning an	d des	ign o	f solid liqi	uid extrac	tion, membrane	9	
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	ABSORPTION							9	
as Absorptio	n and Stripping – Equilibriun	n; mate	erial b	aland	ce; limiting	g gas-liqu	id ratio; tray tov	ver	
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JNIT II	e based approach; determin	ation o	rneig	Int OI	packing	Ising HTC	and NTO calc	9	
	equilibria - Raoult's law, vap	or liqui	ط معب		una dia ana	nee fen ide	al and non ide	-	
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2.	N. Anantharaman, K.M. Meera Sheriffa Begum, "Mass Transfer Theory and Practice" (2011, Prentice Hall).
3.	Binay K. Dutta, "Principles of Mass Transfer and Separation Process", PHI, New Delhi.
REFERENC	CE BOOK(S):
1.	Warren, L., McCabe, Julian C.Smith, Peter, "Unit Operations of Chemical Engineering", Harriot, 7 <sup>th</sup> Edition, McGraw Hill.
2.	Christie John Geankoplis, "Transport process and separation process principles' 4thedition, PHI
. 3.	J D Seader and E J Henly, "Separation Process Principles", John Wiley & sons, NY 1998.

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Department	CHEMICAL EN	ERIN	G		R2019	SEMESTER VI	PC		
Course	Course Name	Но	urs/w	eek	Credit	Total	Maximum	Marks	
Code		L	Т	P	C	Hours			
19CH602	CHEMICAL REACTION ENGINEERING – II	3	0	0	3	45	100		
Course Object	tives: The purpose of learnin	g this	cours	se is	and the second	S. A. A.			
	olish knowledge on non-ideal								
<ul> <li>Provide</li> </ul>	the knowledge on kinetics	of flui	d par	ticle	reacting s	ystems a	along with desc	ribing	
	rent kinetic models for non-c								
	knowledge on determination								
<ul> <li>Provide</li> <li>Provide</li> </ul>	the knowledge on mechanis the knowledge on mechanis	ms of	catal	ytic h	eterogene	eous read	tions.		
Course Outco	me: At the end of this course	loor	Catal	yst de	eactivation	1.			
<ul> <li>Apply th</li> </ul>	ie non-ideality concepts in the	, lean	ting of		able to	rundara	tanding of the d	oviotiona	
from ide	ality by applying the tanks-in	-serie	s mo	del ar	n for belle	persion m	canding of the d	eviations	
	the progressive conversion							fluid	
particle	reaction.			0	ing core	moderno	explaining the	indid	
<ul> <li>Underst catalyst.</li> </ul>	and the properties of o	cataly	st a	nd t	o estima	ate the	surface area	of the	
	and the principles and mecha	anism	invol	ved ir	heteroa	eneous c	atalysis and ana	lyze the	
data of I	neterogeneous catalytic reac	tions.			incloregi			ayze the	
	e the conversion of reactions		/ing d	eactiv	vating cat	alysts.			
NITI	NON-IDEAL FLOW	7 5	-		11.			9	
asics of Non	-Ideal flow, the residence am, earliness of mixing,	ce tir	me d	distrik	oution (R	TD), St	ate of aggree	gation o	
nethods for f nalysis of Nor ossibleapplica	termining reactor behavi finding E –pulse, step ex n-ideal reactors - basic tions.Dispersionnumberfrom( pries models for the first order	xperin idea. CandF	nents Con Curve	, Re npartr es.Co	ment mo	betwee dels -	n F and E hints, suggest	erimenta curves ions and	
	HETEROGENEOUS REACT							9	
	lesign for heterogeneous rea				Rate equa	tions for I			
ontacting patte traight mass tr ith mass trans	erns for two phase systems ransfer of A (absorption). Th fer. Kinetics of fluid-particle I situations. Shrinking core m	e ger reacti	etics neral ons, s	of flu rate e select	id - fluid equation a tion of a r	reactions and the rand nodel, PC	s. The rate equation fo CM, SCM, comp	uation for r reaction parison o	
rough gas	film controls, Diffusion	thro	or sp	ast	a particle	controls	chemical	reaction	
ontrols. Rate o	f reaction for shrinking spher	ical pa	article	S.	Citta	Gonacon	, e chichhodi	reaction	
	CATALYTIC REACTION			1.1.1.1.1.1.1.1	A REAL PROPERTY OF A REAL PROPER			9	
olid catalysts ensity, Pore vo	- Adsorption, Adsorption	n iso of hete	thern	ns, s	Surface s catalysis	area, Vo Classifi	oid volume a	nd solid	
atalyst prepara	ation, Promoters and inhibitor	S.	2010	1. Orto					
	CATALYTIC REACTOR I		の日本	P. C. S. S. S.	Carlo Carlo	1-241月1日	The sectores and	9	
eterogeneous	Reactions - Introduction.	Solid	Ca	talyze	ed reac	tions; [	Development	of rate	
id desorption lindrical pore, actors, isother	m L - H - H - W models for r controlling condition. Pore d first order reaction) Porous c mal packed bed (PFR) reacted	liffusio atalys	on res	sistar ticles.	Data ana	ned with	surface kinetic heterogeneous r finding rates.	s (Single catalytic	
NITV	CATALYTIC REACTOR II		1	Martin	102 200	1		9	
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Deactivating catalysts, Mechanisms of catalyst deactivation, the rate and performance equations: The rate equation from experiment. Determining the rate for batch solids in contact with fluid in batch, mixed flow and plug flow modes for independent deactivation. Effect of pore diffusion resistance

TEXT BOO	
1.	Levenspiel, Octave, "Chemical Reaction Engineering", 3rdedition, Wiley Eastern
2.	Smith J.M. "Chemical Engineering Kinetics", McGraw Hill.
REFERENC	CE BOOK(S):
1.	Fogler, H.S. "Elements of Chemical Reaction Engineering", 2 <sup>nd</sup> edition, PHI

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	CHEMICAL EN					R2019	SEMESTER VI	PC	
Course Code	Course Name	Hou	urs/w	eek P	Credit	Total	Maximum	Marks	
19CH603	PROCESS DYNAMICS AND CONTROL	3	0	0	C 3	Hours 45	100	100	
Course Object	ives: The purpose of learning	a this	cours	se is					
<ul> <li>Provide the system in to system in to Provide fun automatic of Provide the approaches</li> <li>Provide the context</li> <li>Provide wo the context</li> <li>Course Outcom</li> <li>Analyze Laplace</li> <li>Be able to apply the second the context</li> </ul>	e working knowledge of Lapla erms of transfer functions. Indamental background of pro- control systems for chemical e knowledge of stability analy s. rking knowledge in analysis, of various control strategies <b>ne:</b> At the end of this course, typical process dynamics with domain approaches. to analyze open loop and clo to develop the closed loop tra- e Routh test, root locus meth- to apply the frequency respon- ince.	ace tra process proce vsis, fr desig <u>used</u> , learr th and osed le ansfe ods fo nse b	ansfo contr ess. reque to co ners v d with oop s r func or sta ased	rms to ol the ncy re d turn ontrol vill be out fe ystem tions bility a analy	ory To pro- esponse a ing of fee chemical able to eedback c n propertie for single analysis. vsis for co	ovide the analysis a dback / fe processe ontrol usi es. and mult ntrol syste	working knowle nd control syste eed forward cor s. ng both time do i-loop systems em stability and	edge of em desig ntrollers i omain an and to	
controller		ng an	d test	ing of	PID cont	rollers an	d other types o		
	INTRODUCTION in Process control, Laplace							9	
transforms. Line systems, respon Transducers and	ar open loop systems: Resp se of first order systems in s their dynamics. Controller n SECOND ORDER SYSTEM	onse eries. nodes	of firs Mea	st orde	er system	s. Physic	al examples of iables: sensors	first orde	
	development, response of s		d ord	er sve	stems an	d transno	rtation lag Lin		
eactor control s	ems: Control system, control ystem.	lers a	nd fir	al co	ntrol elem	ients, blo	ck diagram of a	ichemica	
	CLOSED LOOP TRANSFER					10 A		9	
Stability: Routh t	ns for single loop and multiloo est for stability and Root locu	op sys Js.	stems	s, tran	sient resp	oonse of s	State of the second state	and Taste come	
INITIN	REQUENCY RESPONSE							9	
	stitution rule Dada distant	S LOI	HEOL S	vsten		Station of the lot of the state of the state	while fight a second second	Stand Barriston of the St	
JNIT IV   I ntroduction, sub remperature cor	stitution rule, Bode diagrams htrol systems, Bode stability o	criteri	a, Zie	gler-	Nichols c	by frequer ontrol set	ncy response tings, transient	and the second	
JNIT IV [] I ntroduction, sub remperature cor esponses.	ntrol systems, Bode stability of	criteri	a, Zie	gler-	Nichols c	by frequer ontrol set	tings, transient	9	
JNIT IV I Introduction, sub Femperature cor esponses. JNIT V C Cascade control, process identifica izing, characteri	CASCADE AND FEED FOR feed forward control, ratio c ation: Tuning, tuning rules, pr stics, and positioner.	war war	a, Zie D CO Land	gler– NTRO	Nichols co OL Ial model	ontrol set	tings, transient	<b>9</b> ) and uction,	
JNIT IV I Introduction, sub Temperature cor esponses. JNIT V C Cascade control, process identifica sizing, characteri TEXT BOOK(S):	Antrol systems, Bode stability of CASCADE AND FEED FOR feed forward control, ratio c ation: Tuning, tuning rules, pr stics, and positioner.	criteri WAR ontro roces	a, Zie D CO I and s ider	gler– NTR( intern ntifica	Nichols c DL nal model tion, Cont	ontrol set control. C rol Valve	tings, transient Controller tuning s: Valve constr	) and uction,	
UNIT IV     I       ntroduction, sub       remperature cor       responses.       JNIT V       Cascade control,       process identification       sizing, characteri       TEXT BOOK(S):	CASCADE AND FEED FOR feed forward control, ratio c ation: Tuning, tuning rules, pr stics, and positioner.	criteri WAR ontro roces	a, Zie D CO I and s ider	gler– NTR( intern ntifica	Nichols c DL nal model tion, Cont	ontrol set control. C rol Valve	tings, transient Controller tuning s: Valve constr	) and uction,	

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2.	Hill, 4 <sup>th</sup> edition, Elsev	ering", Volume:3, Tata-McGraw	

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Department	CHEMICAL ENGI	R2019	SEMESTER IV	PC				
Course	Course Name		urs/w	1	Credit	Total	Maximum M	ark
Code 19CH604	CHEMICAL PROCESS INDUSTRIES	3	Т 0		<u>С</u> 3	Hours 45	100	
Study the Know the Study the	ctives: The purpose of learning this of basic concepts of process industrie process methodology regarding chlor basic ideas of fertilizer and nitroger process methodology regarding pap	es and prine ai n and p	variou nd sul phosp	phur. horou	ıs industri		process indust	ries.
Acquire kno of productio Get fundam Apply know Acquire kno sugar and s Get skilled	ome: At the end of this course, learned owledge about basics of various aspe- ton of different chemicals. The the the the the test of the test ledge about sulphur, nitrogen and fea- towledge about the Manufacturing an other the test of the test of the test of the test in monomers, types of polymers, pre-	ects of uipmer rtilizer id proc	proce nt desi indust cessin es and	ss ind ign. try. g of µ d app	paper and	l pulp, Su	ıgar, byproduc	ts of
Unit I	roperties and manufacture of Natural Introduction & Inorganic Chemic				ers and fil	ms.		9
	a chemical engineers in process i				uction to	common	devices use	
	processes, block diagrams, flow		and	stand	dard sym	bols used	d for devices,	uni
operations, uni	t process, process utilities and econo	omics.						
Manufacture of	Soda ash, sodium bicarbonate, sod	ium ch	loride	caus	stic soda	Bleaching	a powder	
Jnit II	Acid and Fertilized Industries	ium on	londo	, 000	5110 00000,	Dicuorning	g potraci.	9
Sulphuric acid	, Hydrochloric acid, Phosphoric ac	id, Am	moni	a and	d Nitric a	cid Plant	nutrients, gro	
	regulators. Manufacture of ammoniu						Contraction of the contraction o	
							ionium phosph	ate,
	ride, potassium sulphate, single, trip		er pho	spha	te and Ur	ea.		
Jnit III	Pulp and Paper, Sugar Industries	(J-22)			1			9
Manufacture of	f pulp – different processes of pulping	g – Ma	nufact	ture c	f paper a	nd Boards	s. Raw and refi	ned
sugar, by produ	ucts of sugar industries, Starch and s	tarch o	deriva	tives.		and the state		
Jnit IV	Oil & Dye Industries			1		a e con a cara cara cara cara cara cara cara c		9
soaps, synthet	and animal fats, their nature, ana ic detergent. Manufacture of dye- A NT, RDX & HMX.	iysis a zo Dye	ind e: es, ar	xtract	uinone d	ods, hydr ye, vat dy	ogenation of ves, pigments	oris, and
Jnit V	Rubber and Polymers, Synthetic	Fibre a	and F	ilm Ir	dustries		and the second second	9
Ionomers – Th	nermosetting and Thermoplastic mate	erials,	Natur	al rub	ber: Synt	hetic rubb	er such as SB	R,
IBR, CR - Fun	damental methods of processing of s	synthet	ic rub	bers.	Natural a	ind synthe	etic fibers -	1580 ft
roperties of - I	Poly amides – manufacture of Nylon	6. 6. P	olyest	ers F	ibers – m	anufactur	er of- Viscose	
ext Books:	on manufacture of films - PVC, Polye	esters -	- poly	ethyle	ene.			_
1.	Austin, G.T., Shreve's "Chemical	Droo	000	Indus	trico" F		ion MaCrean	LUU
	International Book Co, Singapore, 1		855	maus	sules, F	ifth Edit	ion, McGraw-	-HIII
2.	Dryden, C.E., "Outlines of Chemica		hnolo	av"	Edited an	d Revise	d by Gonala R	20
	M. and M.Sittig, Third Edition, Affilia	ted Ea	st-We	est pre	ess. 1997		u by Copaia N	a0,
Reference Boo		ot teres		- pro	1001	CARL CORE	19	1
(1-3	Shukla and G.N. Pandey "Text company,1997	book	on C	Chem	ical, Tech	nology",	Vikas publish	ning

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Kirk and Othmer,"Encyclopedia of Chemical Technology", Fifth Edition, Wiley, 2007.

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N. Wal

	COMMON TO ALL BRAN	R 2019	Semester	VIEEC					
Course Code	Course Name	1.	lour Wee T		Credit C	Total Hours	Maximu Mark		
19TPS06	QUANTITATIVE APTITUDE AND LOGICAL REASONING - IV	2	0	Р 0	0	30	100		
Course Obje		-				1	6		
	ains the occurrence of an event on the ba	isis c	of alre	eadv	present	informatio	n.		
	ea models to represent the distributive pro								
<ul> <li>To calcula</li> </ul>	te the work capacity by chocolate based	meth	nod.				5		
	ith time, speed and distance by relative s			ncep	ts.				
<ul> <li>To determ</li> </ul>	ine how various phenomena are related.								
<b>Course Outc</b>	omes: At the end of this course, learners	s will	be a	ble t	0				
	outcome of an event developed the conce				ility.				
	the area and surface volume in real time								
	d the concepts of Times and Work and P	pipes	and	Cist	ern and (	Correlating	g the Concep	ots of	
both.									
	concepts of Time, Speed and Distance a					and Stream	ns.		
	e cause and effect of problems by using				ıg.				
	BABILITY, PERMUTATIONS & COMBI							6	
ROBABILITY	: Rolling an unbiased dice – Tossing a fa	air c	oin –	Dra	wing a ca	ard from a	pack of we	1	
	- Picking up balls of certain color from a	bag	cont	ainii	ng balls o	of differen	t colors.		
rangomente	NS: Numbers with digits - Words with let	ters	- Arr	ange	ements o	r person i	n a row -		
	of books on a shelf.	of a.	ti		rom aug	ation non			
UNIT 2 ARE	NS: Formation of committee – Selection	of qu	lestic	ons i	rom que	stion pape	ers.		
and the second s	Devine ten Insmentent neinte et eut trieve		0	1.1.1.4		-1.11.1		6	
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#### **REFERENCES:**

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- 1. Abhijit Guha, Quantitative Aptitude for Competitive Examinations, Fourth Edition, Tata McGraw-Hill Publishing Company Ltd, 2012
- 2. Arun Sharma, How to prepare for Data Interpretation for the CAT, First Edition, Tata McGraw-Hill Publishing Company Ltd, 2012.
- 3. R.V.Praveen,"Quantitative Aptitude and Reasoning"Third Edition, PHI Learning, 2016.
- 4. Dr.R S Aggarwal, Quantitative Aptitude, Revised and Enlarged Edition, S.Chand Publishing Company Ltd, 2017.
- 5. Arun Sharma "How to Prepare for Quantitative Aptitude" Eight Edition, McGraw Hill Education, 2018.
- 6. "Reasoning and Aptitude" for GATE and ESE Prelims, Made Easy Publication, 2020.

Dept. of Chemical Engg. - ESEC

Department	CHEMICAL	ENGI	NEEF		R2019	SEMESTER VI	PC	
Course Code	Course Name	Hou	ırs/w	eek	Credit	Total	Maximum	Marks
		L	Т	Ρ	С	Hours		
19CH605	PROCESS CONTROL LABORATORY	0	0	4	2	60	100	
Course Objectives:					100			
	experimentally the m		of co	ontroll	ing the p	rocesses	including measu	urements
	simulation technique							
Course Outcome: A								
	we knowledge on the				d use of r	right type	of control dynan	nics for
	der different operativ	e cond	itions					
LIST OF EXPERIME			_					
1. Response of first of								
2. Response of second								
<ol> <li>Response of Non-l</li> <li>Response of Intera</li> </ol>		em						
5. Open loop study of								
6. Closed loop study								
7. Closed loop study								
8. Closed loop study								
9. Tuning of a level s								
10. Tuning of a press								
11. Tuning of a therm							a - 1	
12. Flow co-efficient of	of control valves							
13. Characteristics of	different types of cor	ntrol va	lves			6. I - 36 -		
14. Closed loop study		m						
15. Tuning of pressur		100						
16. Closed loop respo					1			
17. Optimum Controll			nols n	netho	d			
LIST OF EQUIPMEN		RS		1				
1. U tube manometer								
2. Interacting Tank 1								
3. Non-Interacting Ta								
<ol> <li>Open loop control :</li> <li>Closed loop contro</li> </ol>								
6. ON/OFF controller				Camponet	And the same server	a summer they are built on		and the second
7. Control valve chara	The second s		- Inc				al en en la companya de	
8. Pressure Tuner 1N	super- should be a write back to be a grad to be a set of the set	No. Contraction			No.			ATTL MALE TO
9. Temperature Tune							the second second	
10. Proportional Cont					-a his			
11. Flow Transmitter		in the second	and the same	1. 1. 1. 1. 1.				
12. Level Transmitter	And the second	a containte	12 - 14 ×	agent winner			and a subset of a subset of	
12. Level Hansmitter	TINU.	delining of the second of the	Manual Revised To 114	Statistics of the second	Cardendary and a second s	and the state of the second	· · · · · · · · · · · · · · · · · · ·	and the second s

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	CHEMICAL	ENGI	NEEF	RING		R2019	SEMESTER VI	PC
Course Code	Course Name	Ηοι	ırs/w	eek	Credit	Total	Maximum	Marks
		L	T	Ρ	С	Hours		1
19CH606	MASS TRANSFER LABORATORY	0	0	4	2	60	100	
<ul> <li>Develop sour</li> </ul>	The purpose of learnin nd working knowledge of	on diff	erent	types	of mass	transfer e	quipments.	- 3-
	at the end of this course							
	portant data for the des tion, diffusivity and dryir							various
LIST OF EXPERIME	NTS				91	1.1	Contraction of the	
<ol> <li>Separation of bina</li> <li>Measurement of d</li> <li>Liquid-liquid extraction</li> <li>Drying characteris</li> <li>Drying characteris</li> <li>Drying characteris</li> <li>Water purification</li> <li>Mass transfer chains</li> <li>Surface evaporal</li> <li>Adsorption studies</li> </ol>	ction tics of Vacuum Dryer tics of Tray dryer tics of Rotary dryer using ion exchange coll aracteristics of Rotating ss/heat transfer coeffici tion es	d colu umns disc ent fo	ımn d conta	istilla				
	ITS FOR 30 MEMBERS		-			6 K		
7. Rotary dryer 1No. 3. Ion exchange colu 9. Rotating disc conta	setup 1No. No.69 ctor 1No. o. mn 1No. actor 1No.		and					nen ore
<ol> <li>Cooling tower 1N</li> <li>Absorption colum</li> <li>Surface evaporat</li> </ol>	nn 1No.				COUNTRAL AND			

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Course Name CHEMICAL REACTION ENGINEERING AND IRON SPONGE LABORATORY e purpose of learnin n design of reactors e end of this course king knowledge on of S	L 0 g this s.		P 4	Credit C 2	Total Hours 60	Maximum 100	Marks
REACTION ENGINEERING AND IRON SPONGE LABORATORY e purpose of learnin n design of reactors e end of this course king knowledge on of	0 g this s. e, learr	0 cours	4	2		100	
REACTION ENGINEERING AND IRON SPONGE LABORATORY e purpose of learnin n design of reactors e end of this course king knowledge on of	g this s. e, learr	cours			60	100	
LABORATORY e purpose of learnin n design of reactors e end of this course king knowledge on o	s. e, learr		se is t	0		- 18 - 18 - 18 - 18 - 18 - 18 - 18 - 18	
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5		nt typ	bes of	reactors.			
tch reactor						Survey and the second	Juni
mi Batch reactor ug flow reactor STR cked bed reactor dies in a PFR and C red bed reactor R / CSTR in series atalysis dependence of rate no chemical reactor nical reaction Volatile matter, Inhe on, iron matter and	e cons erent r loss o	noisti f ignit	tion in	given iro	n ore san	n coal sample. nple.	
to be offered					1		
FOR 30 MEMBERS	S	1999	- W.			1.1.1	- 1
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ent kinetics set up '	INo.	N CONTRACT	C. C		and the second second		
	ed bed reactor R / CSTR in series atalysis dependence of rat no chemical reactor mical reaction Volatile matter, Inhe on, iron matter and n Oxide, Magnesium to be offered FOR 30 MEMBERS o. 1No. 1No. PFR 1No.	ag flow reactor STR cked bed reactor dies in a PFR and CSTR red bed reactor R / CSTR in series atalysis dependence of rate cons to chemical reactor mical reaction Volatile matter, Inherent r on, iron matter and loss on Oxide, Magnesium oxid to be offered FOR 30 MEMBERS o. 1No. 1No. 1No. Io.	ag flow reactor STR cked bed reactor dies in a PFR and CSTR add bed reactor R / CSTR in series atalysis dependence of rate constant to chemical reactor mical reaction Volatile matter, Inherent moistr on, iron matter and loss of ignit n Oxide, Magnesium oxide and to be offered FOR 30 MEMBERS o. 1No. 1No. PFR 1No.	ag flow reactor STR cked bed reactor dies in a PFR and CSTR add bed reactor R / CSTR in series atalysis dependence of rate constant to chemical reactor mical reaction Volatile matter, Inherent moisture, A on, iron matter and loss of ignition in n Oxide, Magnesium oxide and Silic to be offered FOR 30 MEMBERS o. 1No. 1No. PFR 1No.	ag flow reactor STR cked bed reactor dies in a PFR and CSTR red bed reactor R / CSTR in series atalysis dependence of rate constant to chemical reactor mical reaction Volatile matter, Inherent moisture, Ash conter on, iron matter and loss of ignition in given iro n Oxide, Magnesium oxide and Silica from Do to be offered FOR 30 MEMBERS o. 1No. 1No. PFR 1No.	In the sector of	ag flow reactor STR cked bed reactor dies in a PFR and CSTR red bed reactor R / CSTR in series atalysis dependence of rate constant to chemical reactor mical reaction Volatile matter, Inherent moisture, Ash content in given coal sample. on, iron matter and loss of ignition in given iron ore sample. In Oxide, Magnesium oxide and Silica from Dolamite. to be offered FOR 30 MEMBERS o. 1No. 1No. 1No. PFR 1No.

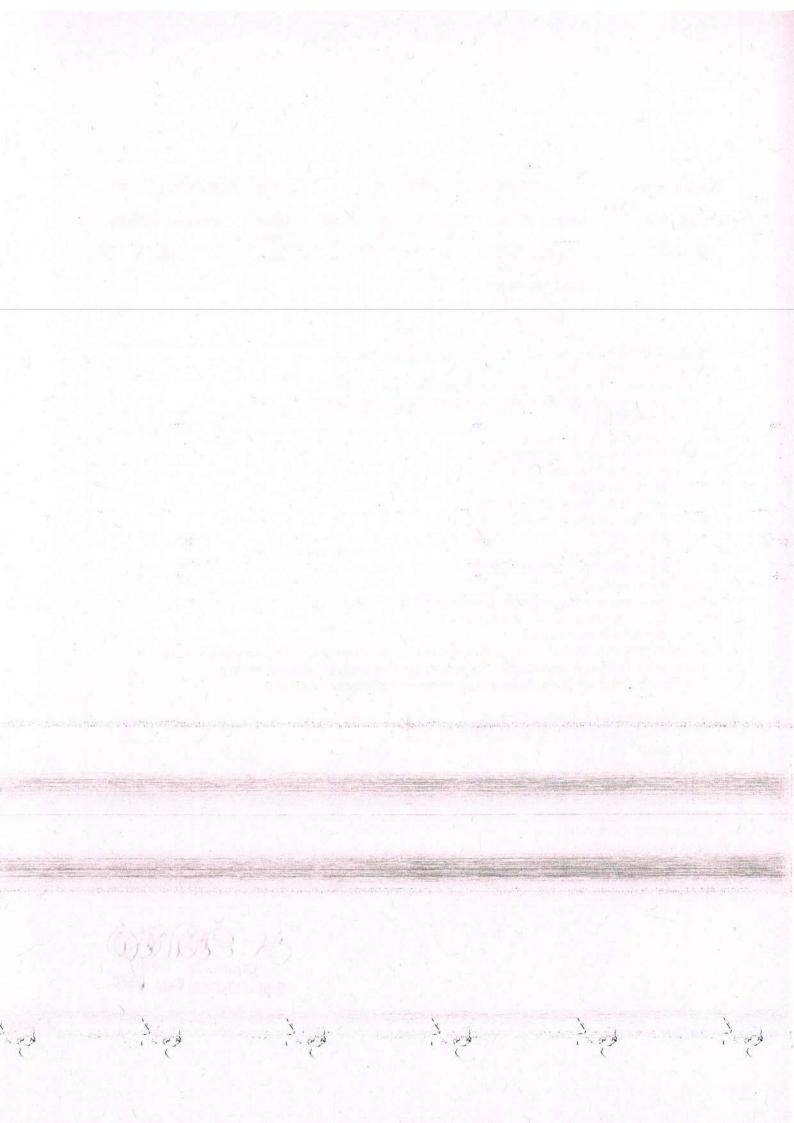
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Department	t CHEMICAL ENGINEERING R2019 S		SEMESTER VII	PC				
Course	Course Name	Hou	irs/w	eek	Credit	Total	Maximum Ma	ırks
Code		L	T	P	С	Hours		
19CH701	TRANSPORT PHENOMENA	3	0	0	3	45	100	
<b>Course Object</b>	ctive(s): The purpose	of lea	rning	this	course is	to		
	e different types of F							
• Understa	and their flow charact	teristic	cs and	d diff	erent mat	hematical n	nodels.	
							erature and concentration	on profile of
complex	transport processes.	8- 10			, une ven	, eng, tempe	stature and concentration	on prome of
	and the mechanism of	ffluid	e in n	notio	n under d	ifferent con	ditions	
	and the concept of tur				n under d	inerent con	attions.	
Develop	me: At the end of this	is cou	rse, Ie	earne	rs will be	able to		
• Develop	mathematical model	s or n	nome	ntum	, heat and	d mass tran	sport to determine resp	ective fluxes
	city, temperature and							
• Apply e	quations of change	to de	eterm	ine t	he veloci	ity, temper	ature and concentratio	n profile of
	transport processes.							
<ul> <li>Understa</li> </ul>	and the turbulence and	d bour	ıdary	layer	r concept	and analog	y between transport pro	cesses.
<ul> <li>Apply in</li> </ul>	Transport in Turbule	ent and	d Bou	ındar	y Layer F	low.		
Understa	nd Analogies betwee	n Tra	nspor	t Pro	cesses.			
UNIT I		RAN				AMINAR	FLOW (SHELL	9
	BALANCE)							
Newton's law	of viscosity ; Newton	nian a	nd no	on-Ne	ewtonian	fluids; rhec	ological models; Genera	al method of
shell balance a	approach to transfer	probl	ems;	Cho	osing the	shape of	the shell: most commo	on boundary
conditions; mo	mentum flux and ve	locity	distr	ibuti	on for flo	w of Newt	onian and non-Newton	ian fluids in
pipes for flow	of Newtonian fluids i	n plan	ies, sl	its ar	nd annulu	S.		
6 1. 12	BALANCE)						R FLOW (SHELL	9
Fourier's law of	of heat conduction; I	Definit	ions	of co	oncentratio	ons, velocit	ies, and mass fluxes, F	ick's law of
diffusion. Heat	t flux and temperature	re dist	tribut	ion f	or heat s	ources such	as electrical, nuclear	viscous and
chemical; force	ed and free convecti	on; m	ass f	lux a	and conce	entration pro-	ofile for diffusion in s	tagnant gas,
	ing reaction and force							
UNIT III Conservation 1	EQUATIONS OF C	HAN	GE A	AND	THEIR .	APPLICA	<b>FIONS</b>	9
single multi or	aws and equations of	chan	ge; D	evelo	opment of	equations	of continuity motion an	nd energy in
simplified form	on ponents systems i	n reci	tangu	lar c	o-ordinat	es and the	forms in curvilinear c	o-ordinates;
discussed under	r shell balance by an	licati	case	s, so	ation of a	momentur	n mass and heat transf e factors; applications in	er problems
UNIT IV	TRANSPORT IN T	IIDRI		NT A	ND POL	INDADVI	AVED ELOW	a scale-up.
	omena: phenomenol	orical	relat	ione	for transf	or fluxes: t	ime smoothed equation	9
and their app	lications for turbule	ent fl	ow i	in ni	nes hou	ndary lave	er theory; laminar an	d turbulant
hydrodynamics	thermal and concent	tration	bou	ndary	v laver ar	d their thic	knesses; analysis of flo	w over flat
surface.				in and y	, iujei al	a then the	analysis of In	w over nat
UNIT V 🔄 🎙	ANALOGIES BET	WEED	TR	ANS	PORT	ROCESSE	S S	9 5
Importance of	analogy; developme	nt and	apr	licat	ions of a	nalógies be	etween momentum hea	

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transfer; Re	ynolds, Prandtl, Von Karman and Colburn analogies.
<b>Text Books</b>	8
1.	R.B. Bird, W.E. Stewart and E.W. Lighfoot, "Transport Phenomena", John Wiley, 1978.
2.	Robert, S Brodkey, Harry C. Hershey, "Transport Phenomena", McGraw-Hill International
3.	B.M.Suryavanshi and L.RDongre, "Transport Phenomena", NiraliPrakashan, First Edison.
Reference	Books:
1.	L.S.Sissom, and D.R.Pitts, "Elements of Transport Phenomena", McGraw-Hill, New York
	1972
2.	R.W.Fahien, "Elementary Transport Phenomena", McGraw-Hill, New York, 1983.
3.	J.R. Welty, R.W. Wilson, and C.W.Wicks, "Fundamentals of Momentum Heat and Mass Transfer", 2 <sup>nd</sup> Edn. John Wiley, New York, 1973.

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Department	CHEMICAI	EMICAL ENGINEERING				R2019	SEMESTER VII	РС
Course Course Name		Ηοι	irs/w	eek	Credit	Total Hours	Maximum Marks	
Code	014:51713		T	P	C			
19CH702	CHEMICAL PROCESS EQUIPMENT DESIGN AND DRAWING	3	0	0	3	45		100
<ul><li>Do in de</li><li>Understa</li></ul>	tives: The purpose of tail study on unit pro- and the mechanical of the engineering d	ocess. lesign	ofun	it pro	ocess equi	pment.		

- Understand the thermal design of different chemical engineering equipment.
- Find the better way of design of the equipment.

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

- Understand the unit process equipment.
- Apply the skill in thermal design of heat transfer equipment like shell and tube, double pipe heat exchangers and evaporators, and assessing thermal efficiency of the above equipment in practice.
- Demonstrate the skills in basic design and drawing of different dryers, cooling towers and cyclone separators.
- Apply the concepts involved in phase separation and design of distillation, Extraction and absorption columns.
- Demonstrate the skills in mechanical design of process equipment, design considerations of pressure vessels and its auxiliary devices design the layout of process industries

UNIT I	HEAT TRANSFER EQUIPMENTS	9
Heat Exchan	gers, Condensers, Evaporators	
UNIT II	MASS TRANSFER EQUIPMENTS – I	9
Cooling Tow	er, Dryers	
UNIT III	MASS TRANSFER EQUIPMENTS – II	9
Absorption c	olumn, Distillation Column, Extraction Column, Adsorption column	
	REACTORS	-9
Packed bed H	Reactors, Pressure Vessel, Storage Vessel	
UNIT V	DESIGN OF LAYOUT	9
Design of Pl	ant Layout, Pipe Lines and Pipe Layouts, Schematics and Presentation	Materials of Construction
and Selection	of process equipments.	
<b>Text Books:</b>		
-	Cream D. W. "D. 2. Cl., 1 D. 1 J. W. W. LW. O.L. DI	
1.	Green D. W., "Perry's Chemical Engineer's Handbook", 8th Edi should be permitted for the end semester examination	ition McGraw Hill, 2007,
I. Reference B	should be permitted for the end semester examination	ition McGraw Hill, 2007,
1. Reference B 1.	should be permitted for the end semester examination	
	should be permitted for the end semester examination	ishing Co, Texas, 1996.



4.	Coulsion and Richardson's., "Chemical Engineering Design - Volume 6", Pergamon; 2n
	edition, 1993.

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Department	CHEMICA ENGINEERI				R20	19	SEMESTER VII	PC
Course Code	Course Name	Hours/we		eek	Credit	Total	Maximum Ma	rks
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	L	T	P	С	Hours		
19CH703	PROCESS ENGINEERING ECONOMICS	3	0	0	3	45	100	
	s: The purpose of lear				is to			
<ul> <li>Understand t</li> </ul>	he various concepts o	fecor	nomic	cs.				
• Know the de	velopment concept of	proce	ess.					
• How to consi	ider the best design.							
• Understand t	he cost estimation in c	hemi	cal ir	ndust	ry.			
• Know the con	ncepts of managemen	t						
	At the end of this cou		earne	rs wi	ll be able	e to	ALC: PAR	77
	he theory behind Inve							
• Work on pro	duction plant control.	i 11						
	ncepts of managemen	t.					· · ·	
	wledge about financia		emer	ts			and the second second	
-	he concept of deprecia				ng and of	her greas		
	INTEREST AND	5.8				ner areas.		9
	ney - equivalence, De					estimation of	canital cost Total A	-
	rement for complete p						capital cost, rotal r	imidumze
UNIT II	PROJECT PROFI						TIOS	9
Estimation of proj	ect profitability, Inve							s, balanc
sheet preparation-						1911 V		
U <b>NIT III</b>	ECONOMIC BAL						de l'Andrea	9
	omic balance, econom						ic operations, econom	nicbalanc
	oration, heat transfer					Cash flow.		
	PRINCIPLES OF	Statistics of the second	ASPENDED DUE	The star say street	102 D. V. Branner and and	1	l'institut annuture	9
	nagement, planning,							lling and
JNIT V	pes of organizations, PRODUCTION PI						/115).	19
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	ng, routing, scheduli							
production and qua			nopu		5,			Star Cont
Fext Books:				14.2		Production of the second		
1	Peters and Timmerl	naus, Ì	Plant	desią	gn and E	conomics for	Chemical Engineers	McGrav
	Hill 5th Edition, 200		MINIST			語の言語的なども		
2.	Ahuja K.K, Industri	al ma	nage	ment	, Khanna	publishers, 1	New Delhi, 1985.	13.1.1
3.	Schweyer. H.E, "Pro	ocess	Engi	neeri	ng Econ	omics", Mc (	Graw Hill, 1969	
Reference Books:					14-19	1940		12-3-17-
1.	F.C. Jelen and J.H.	Black	, "Co	st an	d Optimi	ization Engin	eering", McGraw Hil	1,1992.
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Department	CHEMICA	AL E	NGIN	EER	ING	R 2019	Semester VI	HS
Course Code	Course Name	Hou	irs / V	Veek	Credit	Total	Maximum Marl	
19HS601	RESEARCH	L	T	Р	С	Hours		
	METHODOLOGY	0	0.	3	45	100		
• imp effe	ive (s): The purpose of part scientific, statistical ectively.	l and	analy	tical	knowledg		ying out res	earch v
	nes: At the end of this c							
	knowledge about the p	•					rch.	
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Rating scale and								ng scale
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2.	Donald H.McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002
REI	FERENCE(S):
1.	Donald R. Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2000
	G.W.Ticehurst and A.J.Veal, Business Research Methods, Longman, 1999.
	Ranjit Kumar, Research Methodology, Sage Publications, London, New Delhi, 1999.
	Raymond-Alain Thie'tart, et.al., Doing Management Research, Sage Publications, London, 1999

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Department	CHEMICA	L EN	GIN	EER	ING	R2019	SEMESTER VII	РС
Course	<b>Course Name</b>	Hou	irs/w	eek	Credit	Total	Maxi	mum Marks
Code		L	Τ	P	С	Hours		C. C. L. L. L.
19CH704	PROJECT- PHASE – I	0	0	2	1	30		100

Make use of the knowledge gained by the student at various stages of the degree course.

Course Outcomes: At the end of this course, learners will be able to

- Identify the recent research activities.
- Identify the industrial difficulties and challenges.
- Acquire a knowledge on finding the solution for the challenges

#### **METHOD OF EVALUATION**

• Each student is required to submit a report on the project assigned to him by the department. The report should be based on the information available in the literature or data obtained in the laboratory/industry. Students, in addition to the home problem will be permitted to undertake industrial/ consultancy project work, outside the department, in industries/Research labs for which proportional weightage will be given in the final assessment.

Dept. of Chemical Engg. YESEC

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Department	CHEMICAL E	NGII	NEE	RINO	G	R2019	SEMESTER VII	PC
Course	Course Name	Hou	irs/w	eek	Credit	Total	Maximu	m Marks
Code		L	T	P.	С	Hours		
19CH705	COMPREHENSIVE	0	0	2	0	60	1	00
	REVIEW	2			1. A			

Course Objectives: The purpose of learning this course is to

• Comprehend the knowledge acquired from the first Semester to seventh Semester of B.TECH Degree Course through periodic exercise.

Course Outcomes: At the end of this course, learners will be able to

• Prepare and present technological developments.

### **METHOD OF EVALUATION:**

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The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics.

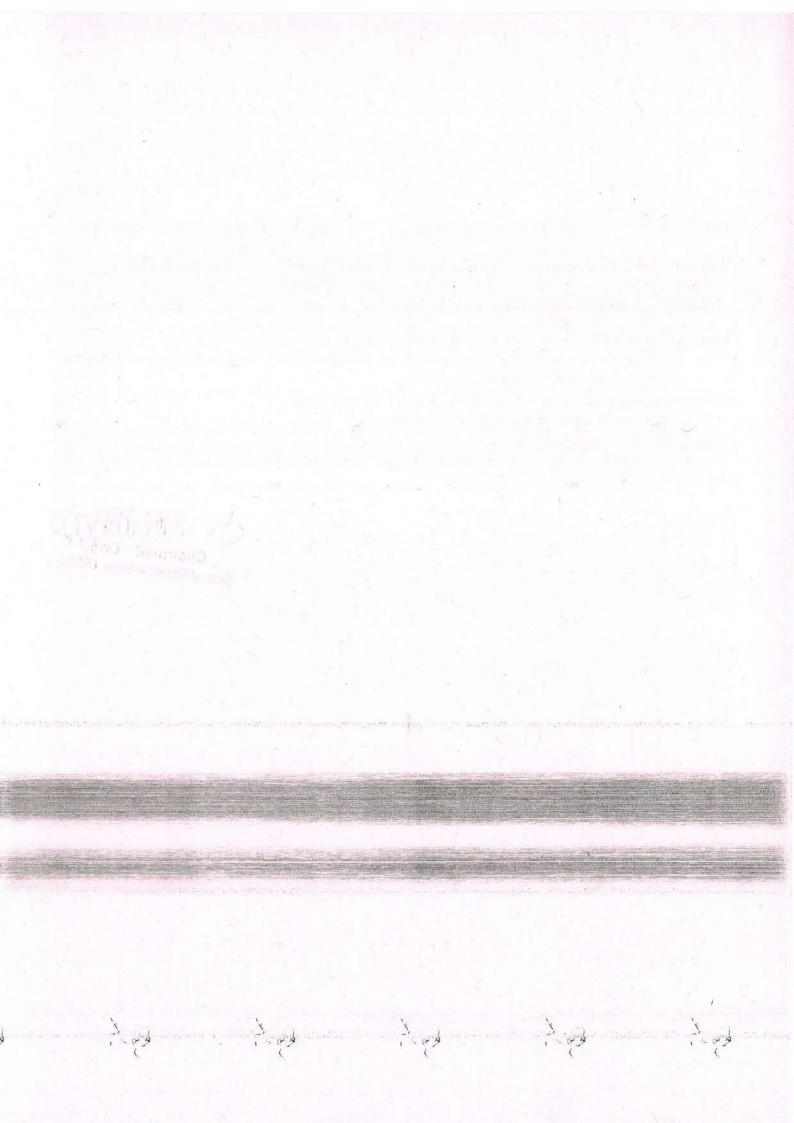
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# **SEMESTER VIII**

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Department	CHEMICAL E	NGIN	VEER	ING		R2019	SEMESTER VIII	PC
<b>Course Code</b>	Course Name	Hou	rs/we	ek	Credit	Total	Maximum	Marks
		L	T	P	C	Hours		
19CH801	PROJECT- PHASE – II	0	0	12	6	180	100	

Course Objectives: The purpose of learning this course is to

• Make use of the knowledge gained by the student at various stages of the degree course.

Course Outcomes: At the end of this course, learners will be able to

- Identify the recent research activities.
- Identify the industrial difficulties and challenges.
- Acquire a knowledge on finding the solution for the challenges

### **METHOD OF EVALUATION**

the work

• Each student is required to submit a report on the project assigned to him by the department. The report should be based on the information available in the literature or data obtained in the laboratory/industry. Students, in addition to the home problem will be permitted to undertake industrial/ consultancy project work, outside the department, in industries/Research labs for which proportional weightage will be given in the final assessment.

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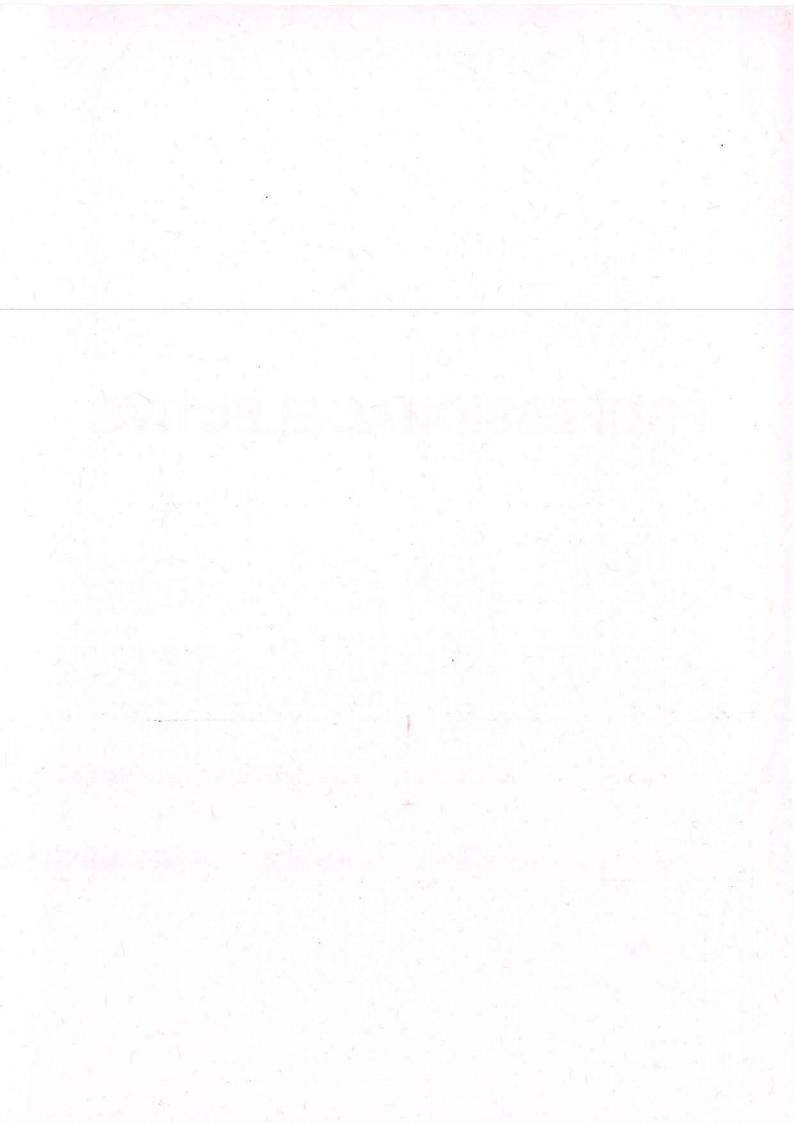
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	he students to compute mol sation polymerization and tra					the mole	cular weight dist	ributio
Course Outcor	ne: At the end of this course	e, learne	rs wil	l be a	ble to		S. MARIA	in spiri
	trate knowledge and unders rization of polymers.	standing	on th	e prin	iciples rel	ated to the	e synthesis and	
	INTRODUCTION					1		6
listory of Macro	omolecules - structure of na	tural pro	ducts	s like	cellulose,	rubber, p	roteins - concep	ots of
macro molecule	es - Staudinger's theory of m	nacromo	lecule	es – d	lifference	between :	simple organic	
and the second se	nacromolecules.					14 L		
	POLYMERIZATION	. Ca		*		S. Park	18 A	12
	finsandDienes-doublebonds							
	n: Initiation – types of initiation							
anionic polyme	erization -coordination polyn	nerizatio	n- ir	ndustr	ial polym	erization	<ul> <li>bulk, emulsio</li> </ul>	n,
suspension and UNIT III	solution polymerization tech CONDENSATION	nniques	– Kin	etics ·	- Copolyi	nerization	concepts.	9
				Alon .	reations	to nolum	ar aunthonia fi	136
	sation reactions – Extension							
	<ul> <li>polycondensation – ki</li> </ul>							- Line
	condensation-Interfacialpoly	ymerizat	ion-c	rossli	nkedpoly	mersbyco	ndensation-gel	
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UNIT IV Simple condens	ation reactions – Extension			ion re				
UNIT IV Simple condens group reactivity	ation reactions – Extension – polycondensation – kineti	cs of pol	ycond	ion re densa	tion- Car	other's eq	uation – Linear	tional
UNIT IV Simple condens group reactivity polymers by pol	ation reactions – Extension	cs of pol	ycond	ion re densa	tion- Car	other's eq	uation – Linear	tional
UNIT IV Simple condens group reactivity polymers by pol point.	ation reactions – Extension – polycondensation – kinetic ycondensation – Interfacial	cs of pol	ycond	ion re densa	tion- Car	other's eq	uation – Linear	tional on – ge
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Department	CHEMICAL ENG	GINEE	RING	3		R2019	SEMESTER V	PE
Course	Course Name	Hou	urs/w	eek	Credit	Total	Maximum	Marks
Code		L	Т	P	C,	Hours		1 V
19CHX02	CHEMICAL PROCESS OPTIMIZATION	3	0	0	3	45	100	
<ul> <li>Gain kr</li> </ul>	tives: The purpose of learning nowledge about process modeli	ng an	d opti	mizat				a servi
	me:At the end of this course, le							1.0
<ul> <li>Unders process mix pat</li> </ul>	experiments and formulate mo- tand different search methods a s problems like optimization of p tern product distribution etc., tand the non-linear programmin	and lin proces	ear p s var	rogra iables	mming m to get m	ethods fo aximum y	r solution of che rield/conversion	
UNITI	INTRODUCTION						at the set to	9
Introduction to optimization pr	optimization; applications of op oblems.	timiza	tion i	n che	mical eng	ineering;	classification of	1
UNITII	SINGLE VARIABLE OPTIMIZ	ZATIO	N		the second s			9
	sufficient conditions for optimu	ım; reg	gion e	elimina	ation met	hods; inte	erpolation metho	ods;
direct root met		_						
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	sufficient conditions for optimu			earch	methods	; indirect	search methods	
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UNIT V	geometric, dynamic and intege APPLICATIONS OF OPTIMIZ			ling a	na geneti	c algorith	ms	9
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	objective functions; fitting mode							
TEXT BOOK(S	reaction engineering, equipmer	nt desi	gn, re	esour	ce allocat	ion and ir	iventory control	•
1.	Rao, S. S., "Engineering Optim	nizatio	n - Tl	neory	and Prac	tice", Thir	d Edition, John	Wiley
REFERENCE	&Sons,New York, 1996.			-	- Andrews -	- for in sec	AT THE REAL PROPERTY	0
1.	Edgar, T.F., Himmelblau, D.M.	"Ont	imier	tion o	f Chemic	al Proces	ses" McGraw	Hill
1.	Book Co., New York, 2003.	., Op			or chemic	arrioces		

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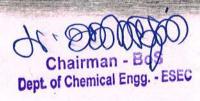
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Department	CHEMICAL EN	IGINEE	RING			R2019	SEMESTER	PE
Course	Course Name	Hou	urs/w	eek	Credit	Total	Maximum N	larks
Code		L	T	Ρ	С	Hours	a transmission of the	
19CHX03	CORROSION ENGINEERING	3	0	0	3	45	100	( ) P
<ul> <li>Study t</li> <li>Study t</li> <li>Acquire</li> </ul>	tives: The purpose of learning the principles of different forms the testing procedures and pro e knowledge regarding predict	s of corr otection ing corr	osion syste osion	ms of beha	avior and	e material designing	s process.	
<ul> <li>Learn t</li> <li>Different</li> <li>Apply c</li> <li>Adopt c</li> </ul>	me: At the end of this course, he principles of Corrosion and ntiate possible types of corrosi lifferent corrosion testing meth different corrosion prevention r and apply modern protection	l unders ion in a nods for methods	tand f partic a sys s.	he e ular s	nvironme	ntal effect	S.	
UNIT I	INTRODUCTION			1995	S. 8. 8. 6	The first of the		9
Corrosion prine	ciples - electro-chemical aspec	cts, env	ironm	ental	effects, e	conomica	al, metallurgical	
other aspects	and the second states and the						.,	
UNIT II	FORMS OF CORROSION	199	1.1.1	100	1240			9
Forms of corro and stress corr	sion uniform attack, galvanic, osion	crevice,	pittin	g, Int	er granul	ar, selecti	ve, leaching, er	osion
UNIT III	CORROSION TESTING	4		1	and the second	1000		9
Standard Expr	purpose - materials and spec ession for Corrosion Rate - Hu Test - NACE Test Methods - S	ley Test	for S	tainle	ess Steel	n - Exposi - Streiche	ure Techniques r Test for Stainl	- ess
UNIT IV	CORROSION PREVENTION					1	and the second second	9
Material Select	ion - Alteration of Environmen	t - Desig	qn - C	atho	dic and A	nodic Pro	tection - Coatin	as
UNIT V	DESIGNING PROTECTION	11.000						9
Modern Theory Predicting Corr TEXT BOOK(S	<ul> <li>Principles - Thermodynamic osion Behavior - Corrosion Principles</li> <li>Corrosion Principles</li> </ul>	cs and E evention	Electro	ode K rosic	(inetics. Mon Rate M	lodern Th easurem	eory Application	
1.	Fontana, M.G., "Corrosion er	naineeri	na" M	lcGr	aw Hill 3rd	Ed 200	5	
2.	Pierre R. Roberge, "Corros 1 <sup>st</sup> Edition, 2008	120	- 198					aw Hill
REFERENCE	BOOK(S):	1,100		No.	11111		the second s	- 1
1	R. Winston Revie, "Uhlig's Ha	andbool	k of C	orros	ion", Wile	y, 3 <sup>rd</sup> editi	on, 2011.	1.
2.	Zaki Ahmad, "Principles Control", Butterworth Heinema			rosio	n Engii	neering	and Corrosi	on



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Course	Course Name	Ηοι	irs/w		Credit C	Total Hours	Maximum I	Marks
Code 19CHX04	ENERGY ENGINEERING	L	1	P			100	
19011204	ENERGY ENGINEERING	3	0	0	3	45	100	
	tives: The purpose of learning			is to				
	nowledge about different energy					Charles .	Segura States	
Course Outco	me: At the end of this course, I	earne	rs will	be a	ble to			
Unders	tand conventional Energy source	ces, N	on- co	onver	ntional En	ergy sour	ces, biomass s	ources
	signparametersforequipmenttok	beused	linCh	emica	alprocess	industries	Understand	
JNIT I	vation in process industries			1.31		,	and the second	9
	energy – Global energy scene	_ India	on on	orav	scone - II	nits of en	erav conversio	
	al classification of energy, energy						ergy, conversio	
JNIT II	ENERGY RESOURCES	<i>yy</i> 01131	3, CH	cigy	alternative			9
THE REPORT OF THE	energy resources, Thermal, hyd	el and	nucle	ear re	actors th	ermal, hy	del and nuclea	r powe
plants, efficien	cy, merits and demerits of the a	bove	powe	r plan	ts. combi	ustion pro	cesses, fluidize	d bed
combustion.	-,,							
JNIT III	SOLAR, WIND AND TITAL E	NERG	Ϋ́					9
Solar energy, s	solar thermal systems, flat plate	collec	ctors,	focus	sing colled	ctors, sola	r water heating	, solar
cooling, solar o	distillation, solar refrigeration, so	olar dr	yers,	solar	pond, sol	ar therma	l power genera	tion,
olar energy a	pplication in India, energy plant	ations.	Wind	d ene	rgy, types	s of windn	nills, types of w	ind
otors, Darrieu	s rotor and Gravian rotor, wind	electri	c pow	ver ge	eneration,	wind pow	ver in India, eco	nomics
of wind farm, o	cean wave energy conversion,	ocean	ther	mal e	nerav cor	version, 1	idal energy	
							idai onorgy	
conversion, ge	othermal energy						idal offorgy	
conversion, ge JNIT IV	othermal energy BIOFUELS		-	-				9
conversion, ge JNIT IV Biomass origin	othermal energy BIOFUELS - Resources – Biomass estima	ation. 1	Therm	noche	emical cor	version -	Biological con	version
conversion, ge <b>JNIT IV</b> Biomass origin Chemical conv	othermal energy BIOFUELS - Resources – Biomass estima rersion – Hydrolysis & hydroger	ation. 1	Therm	noche	emical cor	version -	Biological con	version
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Department	CHEMICAL	ENGIN	EERI	NG		R2019	SEMESTER V	PE
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	1.4.4.4	L	Т	P	C	Hours		
19CHX05	CHEMICAL PROCESS FLOW SHEETING	3	0	0	3	45	100	
<ul> <li>Understand i</li> <li>Understand t screen them</li> <li>Simulate the</li> <li>Course Outcome: A</li> <li>Know the bas calculations i</li> <li>Apply the sed</li> <li>Gain the abil</li> <li>Suitably appl</li> </ul>	The purpose of learning mportance of Flow sheet he methods to generate a quickly. steady-state behavior of At the end of this course, sic concepts of flow shee involving constraints prev quential method for modu- ity to solve complex prob ly P&ID methods for any various applications for C	s for Sp and de proces learner ting on rention ular app lems us proces	s flov s flov s will sym oroac sing I	c Proc proc v she be a bols a h Equat	ess alterr ets using ble to and their p tion modu	a suitable presentati Ilar approa	e simulation soft on, the	
	FLOW SHEETING							9
	s, Flowsheet presentation	n with e	exam	ples.	Manual fl	oweheet	calculation (Con	etrain
heet	s in flowsheet calculation		es of	flow s	sheets, Sy	nthesis o	f steady state flo	w
heet	SEQUENTIAL MODUL	AR AF	es of t	flow s	to FLO	nthesis o	f steady state flo	
heet <b>NIT II</b> olution, partitioning	SEQUENTIAL MODUL and tearing a flowsheet,	AR AF	es of t PPRO	flow s ACH ce of t	heets, Sy TO FLO ear strea	vnthesis o WSHEET ms with e	f steady state flo	9
heet NIT II olution, partitioning NIT III	SEQUENTIAL MODUL and tearing a flowsheet, FLOWSHEETING BY I	AR AF conver	PPRO	flow s ACH ce of t SOLV	TO FLO ear stread	nthesis o WSHEET ms with e THODS	f steady state fle I <b>NG</b> xample.	w
heet NIT II olution, partitioning NIT III election, decision a	SEQUENTIAL MODUL and tearing a flowsheet, FLOWSHEETING BY E and tearing of variables in	AR AF conver EQUAT a flows	PPRO rgenc TION sheet	ACH ce of t SOLV t with	TO FLO ear stread	nthesis o WSHEET ms with e THODS	f steady state fle I <b>NG</b> xample.	9 9 9
heet INIT II Solution, partitioning INIT III Selection, decision a INIT IV	SEQUENTIAL MODUL and tearing a flowsheet, FLOWSHEETING BY I and tearing of variables in DEVELOPMENT OF F	AR AF conver EQUAT a flows	PRO PRO Igenc ION sheet HEET	flow s ACH ce of t SOLV t with	theets, Sy TO FLO ear stread VING ME simple ar	vnthesis o WSHEET ms with e THODS nd comple	f steady state fle NG xample. ex examples	9 9 9 9
heet JNIT II Solution, partitioning JNIT III Selection, decision a JNIT IV Piping & Instrumenta	SEQUENTIAL MODUL and tearing a flowsheet, FLOWSHEETING BY E and tearing of variables in DEVELOPMENT OF Fl ation Diagram (P&ID) dev	AR AF conver EQUAT a flows LOWS	PPRO PPRO TON Sheet HEET ent, ty	flow s <b>ACH</b> the of the solution of the solu	TO FLO ear stread VING ME simple ar stages a	vnthesis o WSHEET ms with e THODS nd comple nd Applic	f steady state fle NG xample. ex examples ations of P&ID in	9 9 9 9
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Department	CHEMICAL EN	IGINE	EERII	NG	a. 24	R2019	SEMESTER V	PE
Course	Course Name	Но	urs/w		Credit	Total	Maximun	n Marks
Code 19CHX06	ENZYME ENGINEERING	L 3	0	P 0	C 3	Hours 45	10	0
	tives: The purpose of learni		1	-		40	10	
	p skills of the students in the	_				ering with	emphasis on re	eactor
operatio	on and design.						1000	
	me: At the end of this cours							
	about classification of enzyn	nes, i	mmol	bilizat	ion, extra	ction and	purification of e	nzymes
UNIT I	INTRODUCTION			1				9
and the second se	uction and historic backgrou	nd- C	Gener	al Ter	minoloav	Nomenc	lature and Clas	-
	eria of purity of enzymes- S							
chemical natur	re of enzymes. Protein nati	ure o	f enz	ymes	and Nor	n protein	enzymes- Ribo	ozymes and
	letallo enzymes and metal							
	mes involved in different met	taboli	c pat	hways	s. Classifi	cation of c	coenzymes. Iso	zymes,
Abzymes, Syn: <b>UNIT II</b>	ENZYME CATALYSIS AN		HIBIT	ION	-	A Martin Com	and the statement of the	9
1000 KR 100 R 100 R 100 R	Induced fit and Transition s				Mechar	nism of en	zvme catalysis	
	lent catalysis, Metal ion ca							
	ses-Chymotryspin, Lysozyn							
(Zymogens).								
	ibition- Competitive, Non-C							
	tion. Irreversible Inhibition- Penicillin, lodoacetamide an			Innipi	ion. Exa	mples an	id wiechanism	or various
	Penicilin, lodoacetamide al		-F.					4
	ENZYME KINETICS							9
	ng the enzyme activity- Cond							
	sed reaction, Michealis-Men tyme Inhibition. Kinetics Allo				n, vmax,	L.B Plot,	i urnover numb	er, Kcat.
	ENZYME REGULATION	Sterie	Chizy	mes.				9
2214-220-22 101425	ulation, Allosteric Regulatior	n. Rev	versit	le Co	valent Mo	dification	and Proteolytic	
	f enzymes in the cell. Enzy							
pathways, enzy	ymes in membranes, concer							
	pathways, examples.						Section Francisco	
UNIT V	INDUSTRIAL AND CLINIC	CALI	JSES	OFE	NZYMES	6 (APPLIE	D	9
Industrial Enzy	ENZYMOLOGY) mes- Thermophilic enzymes	am	vlaco	e lina	ses prot	eolytic en	zymes in meat	and leather
	mes used in various fern							
degrading enzy		nome		proce	0000, 00	naiooo a	sgraanig on_j	
			1					
	mes- Enzymes as thror							ptokinasae,
	Isoenzymes like CK and LI							
	Immobilization of enzymes	i, ELI	ZA. Ł	Bioser	nsors. En	zyme Eng	gineering and s	site directed
nutagenesis, L	Designer enzymes							
TEXT BOOKS							-	7.1.1
1/ 1/	Butter worth, "Technologica	al Ap	plicat	ions o	f Bio-cata	alysts", Blo	OTOL series, 1	995.
2.	Cornish. A, Bowden, "Anal	ysis c	of Enz	yme	Kinetic Da	ata", Oxfor	rd University Pr	ress, 1996.
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REFERENC	CE BOOKS:
1.	Wiseman.AandBlakeborough N and Dunnill P, "Enzymic and nonenzymic catalysis", Ex Vol.5 Ellis and Harwood, U.K. (1981).
2.	2. Wiseman A (Ed.), "Topics in enzyme and fermentation Bio-technology", Ellis and Harwood, U.K. Vol-5.
3.	Nicholas Price & Lewis Stevens, "Fundamentals of Enzymology",
4.	Trevor Palmer, "Enzymes: Biochemistry, Biotechnology and Clinical Chemistry".

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Department	CHEMICAL EN	IGINE	ERIN	IG		R2019	SEMESTER V	PE
Course	Course Name	Ηοι	ırs/w	eek	Credit	Total	Maximum	Marks
Code		L	Т	Ρ	С	Hours		
19CHX07	FOOD TECHNOLOGY	3	0	0	3	45	100	
<ul> <li>Learn to</li> </ul>	tives: The purpose of learni o design processing equipm	ent fo	r Foo	d Ind	ustries.			17
Get the	me: At the end of this cours exposure on use of differen	e, lea it cher	rners nical	will b addit	e able to ives in foo	ods during	food processin	g and
preserv	ation. AN OVERVIEW	1		_				9
	ts of food industry; world foo	d noo	de or	d Inc	lion cituat	ion		•
UNIT II	FOOD CONSTITUENTS,					IVE EACT	ORS	9
	food; quality and nutritive a							
their control.	1000, quality and nutritive a	specia	5, 100	u aut	1111003, 310	indardo, c		loro una
UNIT III	GENERAL ENGINEERING	G ASP	ECT	S AN	D PROCI	ESSING M	<b>NETHODS</b>	9
	cessing methods; conversion						Ч.С	
UNIT IV	FOOD PRESERVATION M							9
Preservation b	y heat and cold; dehydratior	n; cond	centra	ation;	drying irr	adiation; r	nicrowave heati	ng;
sterilization and	d pasteurization; fermentation	on and	pick	ling; p	backing m	ethods.		
UNIT V	PRODUCTION AND UTIL	ISATI	ON C	F FC	OD PRO	DUCTS		9
Cereal grains;	pulses; vegetables; fruits; s	oices;	fats a	and o	ils; bakery	; confecti	onery and choc	olate
products; soft a	and alcoholic beverages; da	iry pro	ducts	; me	at; poultry	and fish	products.	
TEXT BOOK(S			1					
1.	Heid J.L. Joslyn M.A., "Fur		entals	of Fo	ood Proce	ssing Op	eration", The A	/1
	publishing Co., West port	1967.					1000	
2.	Potter N.N., "Food Science	e", The	e AVI	publi	shing Co.	, Westpor	t, 1963.	4
REFERENCE					11 1991 4.1		4075	
1.	Heldman D.R., "Food Proc							_
2.	Charm S.E., "The Fundar	nenta	ls of	Food	ls Engine	ering", Th	ne AVI Publishi	ng
	Co., Westport, 1963.							

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Department	CHEMICAL E	INGINE	ERIN	G		R2019	SEMESTER V	PE
Course	Course Name	Hou	irs/w	eek	Credit	Total	Maximum	Marks
Code		L	Т	Ρ	С	Hours		
19CHX08	PLASTICS ENGINEERING	3	0	0	3	45	100	
ourse Object	ives: The purpose of learn	ing this	cours	e is t	0			
<ul> <li>Understar</li> </ul>	nd the structure property re	lationsh	ip of	vario	us plastic	S.		
<ul> <li>Understar</li> </ul>	nd the structure property re	lationsh	ip an	d app	lications	of enginee	ering plastics an	d high-
	nce polymers.							
	nd the design factors involv							
	me: At the end of this cour							1.
<ul> <li>Classif</li> </ul>	y the different types of plas	tics and	dem	onstr	ate an ide	ea about s	tructure property	relatio
	rent plastics and its uses.							
	tand different methods of p		ion of	plas	tic materia	als.		
	tand engineering of plastic			3				
Unders	tand the preparation, prope	erties an	id app	olicati	ions of hig	gh-perforn	nance plastics.	
	various plastic products.				and the life	12.11.1		
	INTRODUCTION TO PL				0.00.00	0	The photo is a set	9
Brief history of	plastics - Advantages and	disadva	intage	es Pla	astics – C	lassificatio	on – Structure –	Proper
UNIT II	fect on thermal, mechanica							-
	PREPARATION, PROPE MATERIALS	RIES	AND	APPI	LICATION	NS OF PL	ASTIC	9
Thermonlastics	and thermosets. Manufac	ture of r	nono	more	nolumou	rization a	tructura propo	rtico
processing and	applications of polyethyle	ne cros	s-link	ed no	lvethylen	e chlorin	ated polyethyler	nies -
olypropylene.	Preparation, properties an	d applic	ation	sofn	olvtetrafli	ioroethyle	ne tetra fluoro	ethylene
conclumore no	lyvinyl fluoride and poly vir		flue	o or p	orytotrane	lorocaryic		Surgicine
supplyments, pu	inverse inductive and poly vir	ivildene	TIUOL	ide.				
JNIT III	ENGINEERING PLASTIC	S	TIUO	ide.	1.1			9
	ENGINEERING PLASTIC	S	1.11		T, PBT, F	Polvacetal		9 ends –
U <b>NIT III</b> <sup>D</sup> olyamides, (n	ENGINEERING PLASTIC ylons), modified polyamide operties & applications, LC	s, polye P's	sters		T, PBT, F	Polyacetal		
UNIT III Polyamides, (n Preparation, pr UNIT IV	ENGINEERING PLASTIC ylons), modified polyamide operties & applications, LC HIGH TEMPERATURE P	S s, polye P's LASTIC	sters	– PE		120	s, PC and its ble	ends – 9
UNIT III Polyamides, (n Preparation, pr UNIT IV Fluorine contai	ENGINEERING PLASTIC ylons), modified polyamide operties & applications, LC HIGH TEMPERATURE P ning Plastics– Preparation,	S s, polye P's LASTIC propert	sters S	– PE	of PTFE	PCTFE,	s, PC and its ble PVDF, other hig	ends – 9 Ih-
<b>UNIT III</b> Polyamides, (n Preparation, pr <b>UNIT IV</b> Fluorine contai cerformance pl	ENGINEERING PLASTIC ylons), modified polyamide operties & applications, LC HIGH TEMPERATURE P ning Plastics- Preparation, astics like PPO, PPS, polya	S s, polye P's LASTIC propert sulphon	sters S ies & es, P	– PE uses EEK,	of PTFE Polyimid	, PCTFE, es, Polybe	s, PC and its ble PVDF, other hig	ends – 9 Ih-
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Department	CHEMICAL E	R2019	SEMESTER VI	PE				
Course	Course Name	Hou	rs/we	ek	Credit	Total Hours	Maximum N	Marks
Code	Contractor of the Look of the	L	Т	P	С			
19CHX09	FLUIDIZATION ENGINEERING	3	0 0		3	45	100	
<ul> <li>Study the</li> </ul>	<b>tives:</b> The purpose of learnir he phenomena and factors a pressure drop calculations in	ffecting th	ne Flu	iidizat		fluidized	beds.	
<ul> <li>Unders</li> <li>Learn d</li> <li>Acquire</li> <li>Acquire</li> </ul>	ome:At the end of this cours tand the properties of Fluidiz lifferent type of Fluidization p knowledge on design aspect knowledge on heat and mass the knowledge of single and	ed bed. rocesses ts of fluid ss transfe	lizatio r in F	n equ luidize	iipment. ed Beds a			
UNIT I	BASICS OF FLUIDIZATIO	N	-	2				9
History of Macr macro molecul	romolecules – structure of na es – Staudinger's theory of n macromolecules.	tural proc						
	FLUIDIZED BED TYPES		1			14	14 - 14 C	9
B 41 - 1 - 1 - 1	zation conditions - Expanded	had I	lu de la de	ion	Moving	olids and	dilute phase -	1997 B
			lutriat	.1011	woving s		didte pridee	in the
spouted bed. UNIT III	DESIGN ASPECTS		Sir.					9
spouted bed. <b>UNIT III</b> Channeling – E			Sir.					9
spouted bed. <b>UNIT III</b> Channeling – E bed systems	DESIGN ASPECTS	id and gas	s – Se	olid flu	uidization.			9
spouted bed. <b>UNIT III</b> Channeling – E bed systems <b>UNIT IV</b> Heat and mass bed systems.	DESIGN ASPECTS Bed expansion in liquid – Soli HEAT AND MASS TRANS transfer in fluidized bed sys	id and gas FER IN F tems – In	s – So LUID	olid flu	uidization. BEDS	Design a	aspects of fluid	9 ized 9 dized
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spouted bed. UNIT III Channeling – E bed systems UNIT IV Heat and mass bed systems. UNIT V Single stage a	DESIGN ASPECTS Bed expansion in liquid – Soli HEAT AND MASS TRANS transfer in fluidized bed sys TYPES OF FLUIDIZATION and multi stage continuous	id and gas FER IN F tems – In fluidizatio	s – So LUID dustri	olid flu IZED ial ap	uidization. BEDS plications	Design a	aspects of fluidi studies of fluid	9 ized 9 dized 9
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Department	CHEMICAL ENG	SINEE	RING		al and	R2019	SEMESTER VI	PE
Course	Course Name	Но	irs/w	eek	Credit	Total	Maximum N	Marks
Code		L	T	P	C	Hours		
19CHX10	MODERN SEPARATION 3 0 0 TECHNIQUES		3	45	100			
Course Object	tives: The purpose of learning t	his cou	urse i	s to		1012004		
<ul> <li>Compar</li> </ul>	e the conventional treatment m	ethods	s and	mod	ern separ	ation tech	niques.	
State of the second state	about the membrane separatio							9
	about the basics of adsorption		10		orption.			
	prief about the inorganic separa							
and the second se	e different cases with advanced				a hour and the state of the sta		211	
	ome: At the end of this course,							
	he understanding of separation	proce	sses	for se	electing o	ptimal pro	cess for new a	nd
	ve applications.							
	he skill to develop membrane p	rocess	ses, a	asor	otion proc	ess and II	norganic separ	ation
process		ical flui	id oud	rooti		oration l	conhilization of	o in
	e latest concepts like super crit al process industries.		iu exi	lacit	n, perva		yophilization et	с., ш
	and Innovative techniques of co	ontrollir	na an	d ma	nanina oi	snills		
	and the different cases with adv					and the second		
JNITI	BASICS OF SEPARATION P							9
Review of Conv	ventional Processes, Recent ad	vances	s in S	epara	ation Tecl	nniques b	ased on size,	
	ies, ionic properties and other s							ept,
heory and Equ	uipment used in cross flow Filtra	ation, c	ross	flow I	Electro Fi	Itration, Si	urface based s	olid-
quid concratio	ns involving a second liquid							
quid separatio	na involving a second liquid							
JNIT II	MEMBRANE SEPARATIONS							9
JNIT II Types and choi	MEMBRANE SEPARATIONS ice of Membranes, Plate and F	rame,		COLO COLORA				9 brane
JNIT II Types and choin Reactors and	MEMBRANE SEPARATIONS ice of Membranes, Plate and F their relative merits, commerci	rame, ial, Pil	ot Pla	ant a	nd Labor	atory Me	mbrane perme	9 brane
JNIT II Types and choin Reactors and the Involving Dialys	<b>MEMBRANE SEPARATIONS</b> ice of Membranes, Plate and F their relative merits, commerci is, Reverse Osmosis, Nanofiltra	rame, ial, Pil	ot Pla	ant a	nd Labor	atory Me	mbrane perme	9 brane
JNIT II Types and choin Reactors and Involving Dialys process and Bio	<b>MEMBRANE SEPARATIONS</b> ice of Membranes, Plate and F their relative merits, commerci is, Reverse Osmosis, Nanofiltra plogical Membranes.	rame, ial, Pili ation, U	ot Pla	ant a	nd Labor	atory Me	mbrane perme	9 brane ators ybrid
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JNIT II Types and choin Reactors and the Involving Dialys Process and Bio JNIT III	MEMBRANE SEPARATIONS ice of Membranes, Plate and F their relative merits, commerci- is, Reverse Osmosis, Nanofiltra ological Membranes. SEPARATION BY ADSORPTI ce of Adsorbents, Adsorption Te	rame, ial, Pile ation, U ION echniq	ot Pla Jltra f ues,	ant a iltrati Dehu	nd Labor on and M midificatio	atory Me icro filtrati	mbrane perme on, Ceramic H	9 brane ators ybrid
JNIT II Types and choin Reactors and the process and Bio JNIT III Types and choin Chromatograph	MEMBRANE SEPARATIONS ice of Membranes, Plate and F their relative merits, commerci is, Reverse Osmosis, Nanofiltra ological Membranes. SEPARATION BY ADSORPTI ce of Adsorbents, Adsorption Te by and Immuno Chromatography	rame, ial, Pile ation, U ION echniq	ot Pla Jltra f ues,	ant a iltrati Dehu	nd Labor on and M midificatio	atory Me icro filtrati	mbrane perme on, Ceramic H	9 brane eators ybrid 9
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	CHEMICAL EN	GINEE	RING	;		R2019	SEMESTER VI	PE	
Course	Course Name	Hou	rs/we	ek	Credit	Total	Maximum Mark		
Code		L	Т	P	C	Hours			
19CHX11	INDUSTRIAL SAFETY	3	0	0	3	45	100	100	
<ul> <li>Learn</li> <li>Under</li> <li>Learn</li> <li>Know</li> <li>Impari</li> </ul> Course Outo <ul> <li>Gain k</li> <li>Asses</li></ul>	ctives: The purpose of learning about safety procedures. stand risk analysis and assess hazard identification about standards and regulation knowledge through case stud omes: At the end of this course mowledge on safety procedure s risk & analyse the risk. by hazards.	sment. Ins. dies.							
	standards and regulations.								
	INTRODUCTION					1		9	
extreme of	afety in industries; Safety Prog perating conditions, toxic chem	and a subscription of the sub-				iu realiza	tion, Potential r	· · ·	
UNIT II	SAFETY PROCEDURES			No.	a da la	Sec. LY	- States	9	
	ation of safety procedures – p on and prevention; promotion o					acement;	Accidents –		
	RISK ASSESSMENT	1	1.1					0	
and the second second second second			//////				and the second se	9	
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ISO 14000	, EMS models case studies.	Quantita	ative	risk a	assessme	ent - rapid	and comprehe	nagemer	
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ISO 14000 analysis; R UNIT IV Hazard ide fault tree a UNIT V Hazop-guid	, EMS models case studies. O lisk due to Radiation, explosion <b>SAFETY ANALYSIS</b> ntification safety audits, check nalysis, Hazan past accident a <b>CASE STUDY</b>	Quantita n due to dist, wh analysis on-cau	ative o ove at if a s Fixb	risk a r pre analy orou	assessme ssure, jet sis, vulne gh-Mexic	ent - rapio fire-fire b rability m o-Madras	and comprehe all. odels event tree -Vizag-Bhopal	nagemer ensive ris 9 e analysis analysis. 9	
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1.	Handley, W., "Industrial Safety Hand Book", 2 <sup>rd</sup> Edition. McGraw-Hill Book Company, 1969.
2.	Heinrich, H.W. Dan Peterson, P.E. and Rood, N., "Industrial Accident Prevention", McGraw- Hill Book Co., 1980.

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Department	CHEMICAL EN	GINE	ERIN	NG		R2019	SEMESTER VI	PE	
Course	Course Name						Maximur	n Marks	
Code	4	L T P C Hours							
19CHX12	RENEWABLE ENERGY TECHNOLOGIES	3	0	0	3	45	10	0	
Get   Knov	tives: The purpose of learn exposure on solar radiation w about the various collecto w about the various applica	and ors us	its er sed fo	nviror or sto	nmental i ring sola	and the second	power.		
<ul> <li>Lear</li> </ul>	n about the wind energy ar w about geothermal energy	nd bio	mas	s and	l its econ		ects.		
<ul> <li>Unde</li> <li>Abiliti</li> <li>Know</li> <li>Know</li> <li>Know</li> </ul>	me: By the end of the course erstanding the physics of so ty to classify the solar energy wledge in applying solar en wledge in wind energy and wledge in capturing and applying applying solar energies	olar r gy co ergy biom	adiati illecto in a u ass v	ion. ors ar usefu vith it	nd metho I way. s econor	dologies o nic aspec	ts.		
UNIT I	geo- thermal energies. PRINCIPLES OF SOLAR	RAL		ON	_			9	
shine, solar JNIT II Flat plate ar	olar radiation on titled surf radiation data. SOLAR ENERGY COLLE nd concentrating collectors,	стю	ONS	, Y		anna a'		9	
thermal ana	lysis, advanced collectors.		a.						
	SOLAR ENERGY STORA	1.22-50.054.3	and the second	Constantine (				9	
	ethods, Sensible, latent hea g/cooling technique, solar c								
	WIND ENERGY							9	
BIO-MASS: Pri	otentials, horizontal and ver nciples of Bio-Conversion, on characteristics of bio-ga	Anae	erobic	/aero	obic dige	stion, type	es of Bio-gas d	ligesters, gas	
	GEOTHERMAL ENERGY		1	Copella Pris				9	
OTEC, Principle Potential and	es of wells, methods of har es utilization, setting of OTI conversion techniques, m VERSION: Need for DEC,	EC p ini-h	lants, ydel	ther powe	modynan er plants	nic cycles , and the	. Tidal and wav eir economics.	ve energy:	
TEXT BOOK(S	):	ta dede	<u>ar sau</u>	NATES OF STREET	31	and the part of the	S. C. C. S. Marriaga, "Reference"		
1.	Rai G.D., "Non-Convention	nal E	nergy	Sou	rces", Kh	nanna Pul	olishers,2011.		
	An extension of the second	e Ene	ergy F	Reso	urces", C	RC Press	(Taylor & Fran	ncis) 2011	
2.	Twidell& Wier, "Renewable							1013),2011.	

1.	Tiwari and Ghosal, "Renewable energy resources", Narosa Publishing House, 2007.
2.	Ramesh R & Kumar K.U, "Renewable Energy Technologies", Nervosa Publishing House, 2004.
3.	Mittal K M, "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003.
4.	Kothari D.P, Singhal., K.C., "Renewable energy sources and emerging technologies" P.H.I, New Delhi, 2010.

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Department	CHEMICAL	ENG	INEF	ERIN	IG	R2019	SEMESTER VII	PE
Course	Course Name	Hou	rs/w	eek	Credit	Total	Maxim	um Marks
Code		L	Т	Р	С	Hours		
19CHX13	PETROLEUM REFINERY ENGINEERING	3	0	0	3	45	- 1	100
	tives: The purpose of nowledge about petro					l producti	on of petrochem	ical products.
<b>Course Outco</b>	me: At the end of this	s cour	se, lea	arner	s will be	able to		
<ul> <li>Unders</li> </ul>	tand the classification	n, com	positi	ion a	nd testing	methods	of crude petrole	um/ product
<ul> <li>Develo</li> </ul>	p innovative refining	proce	ss and	d dev	elop qual	ity contro	and assurance	techniques.
Apply	the knowledge of trea	tment	proce	esses	to develo	p the man	nufacture of petr	oleum products.
UNITI	<b>TESTING OF PET</b>	ROL	EUM	PR	ODUCTS	}		9
Drigin, Forma	tion and Evaluation of			and the state of the			Products. Refin	ing of Petroleur
	nd Vacuum Distillatio				J. J			J
UNIT II	CRACKING	-			a a			9
Cracking, The	rmal Cracking, Vis-bi	reaking	g, Ca	talyti	c Crackir	ng (FCC),	Hydro Cracking	g, Coking and A
Blowing of Bit	tumen.							*
JNIT III	TREATMENT TE	CHNI	OUF	n				
							784	9
reatment Te	chniques: Removal				mpounds	in all 1	Petroleum Fract	
erformance, S	Solvent Treatment Pro	of Su	lphu s, Dev	· Co				ions to improv
erformance, S J <b>NIT IV</b>	Solvent Treatment Pro	of Su ocesses	lphu s, Dev ING	· Co waxii	ng, Clay	Freatment	and Hydrofinin	ions to improv g. <b>9</b>
Derformance, S UNIT IV Cracking of N Butadiene. Pro	Solvent Treatment Pro CATALYTIC REF aphtha and Feed stor duction of Acetylene	of Su ocesses ORM ck gas	lphur s, Dev ING for	Co waxii the p	ng, Clay	Freatment	and Hydrofinin lene, Propylene,	ions to improv g. 9 , Isobutylene and
Derformance, S JNIT IV Cracking of N Butadiene. Pro Extraction of A	CATALYTIC REF aphtha and Feed stor duction of Acetylene Aromatics.	of Su ocesses ORM ck gas from	lphur s, Dev ING for Meth	the p	ng, Clay production Catalytic	Freatment	and Hydrofinin lene, Propylene,	ions to improv g. Jsobutylene and Feed Stocks and
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the second se	eactors for heterogeneou	us cat	alytic	c read	ctions			
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	f solid state chemistry,							/
Optimal distrib	ution of catalyst in a	pelle	t of	diffe	rent geo	metry.Str	ucture-property	relationship an
infrared spectros	surface area and pore v	olum	e ana	lysis	, A-ray c	intraction	n, scanning elec	etron microscopy
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2.	J. M. Smith, "Chemical Engineering Kinetics", 3 <sup>rd</sup> ed., MGH, 1981.
3.	R.A Sheldon, I. Arends, U. Hanefeld 'Green Chemistry and Catalysis', Wiley-VCH 2007.
Reference	Books:
1.	Lann D. Schmidt, "The Engineering of Chemical Reactions", 2 <sup>nd</sup> Edition, Oxford University Press, 2007.
2.	J.J. Carberry, "Chemical and catalytic reaction Engineering", Dover Publications, 2001.

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t Total	Martinen Martes
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Hours	
45	100

Course Objectives: The purpose of learning this course is to

• Understand the fundamentals of process control, multi variable control and advanced control strategies

- Know the control strategies for heat exchangers and separation units
- Explain the concepts of control for reactors
- Explain the control fundamentals for recycle processes
- Discuss the plant wide control ideas for various cases.

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

- Describe the fundamentals of process control, multi variable control and advanced control strategies
- Explain the control strategies for heat exchangers and separation units.
- Explain the concepts of control for reactors.
- Explain the control fundamentals for recycle processes.
- Discuss the plant wide control ideas for various cases.

### UNIT I ESSENTIALS OF PROCESS CONTROL

Process dynamics, Laplace transform models and identification. 2. Concept of feedback control, block diagram representation, PID control algorithm and tuning.

#### UNIT II CONTROL STRUCTURES

Multivariable control: Niederlinski Index, Relative Gain Array, SVD. Decoupling, Decentralized controller tuning, dynamic matrix control.

#### UNIT III CONTROL STRUCTURES FOR COMMON UNIT OPERATIONS

Advanced control structures: Feedforward control, ratio control, cascade control, override control and optimizing control.Control structures for simple distillation columns: LV, LB, DV, DB. Single ended and dual ended temperature inferential control, criteria for temperature control tray selection.

#### UNIT IV PLANT-WIDE CONTROL FUNDAMENTALS

Control of complex column configurations: Side draw columns, side rectifier/side stripper columns, heat integrated columns. Petlyuk and Kaibel columns, homogenous and heterogenous azeotropic distillation. Reactive distillation, Do's and dont's of distillation control. CSTR control: Reaction heat removal and corresponding control schemes. Multiple steady states and stability analysis, heat integration. PBR control: Adiabatic operation, Reaction heat removal schemes and control structures, heat integration. Control of heat exchangers.

### UNIT V PLANT-WIDE CONTROL FOR IMPROVED ECONOMICS

Degrees of freedom: control dof, steady state performance dof, dynamic dof. Rigorous dof analysis for example processes. Plant-wide implications of material (energy) recycle: The snowball effect, effect on process time constant, component inventory balancing. Through-put manipulation and its relation to local inventory control loops. Consistent and inconsistent control structures for a simple recycle process. Plant-wide regulatory Control Structure Design Case Studies: Recycle process with side reaction, cumene manufacture process, hydrodealkylation of toluene, vinyl chloride process

Dept. of Chemical E

Text Books:

1.	Gade Pandu Rangaiah, Vinay Kariwala, "Plantwide Control: Recent Developments and Applications",2012.
Reference	
1.	Luyben, W.L., Tyreus, B.D. and Luyben, M.L. "Plantwide Process Control" McGraw Hill: New York, 1998.

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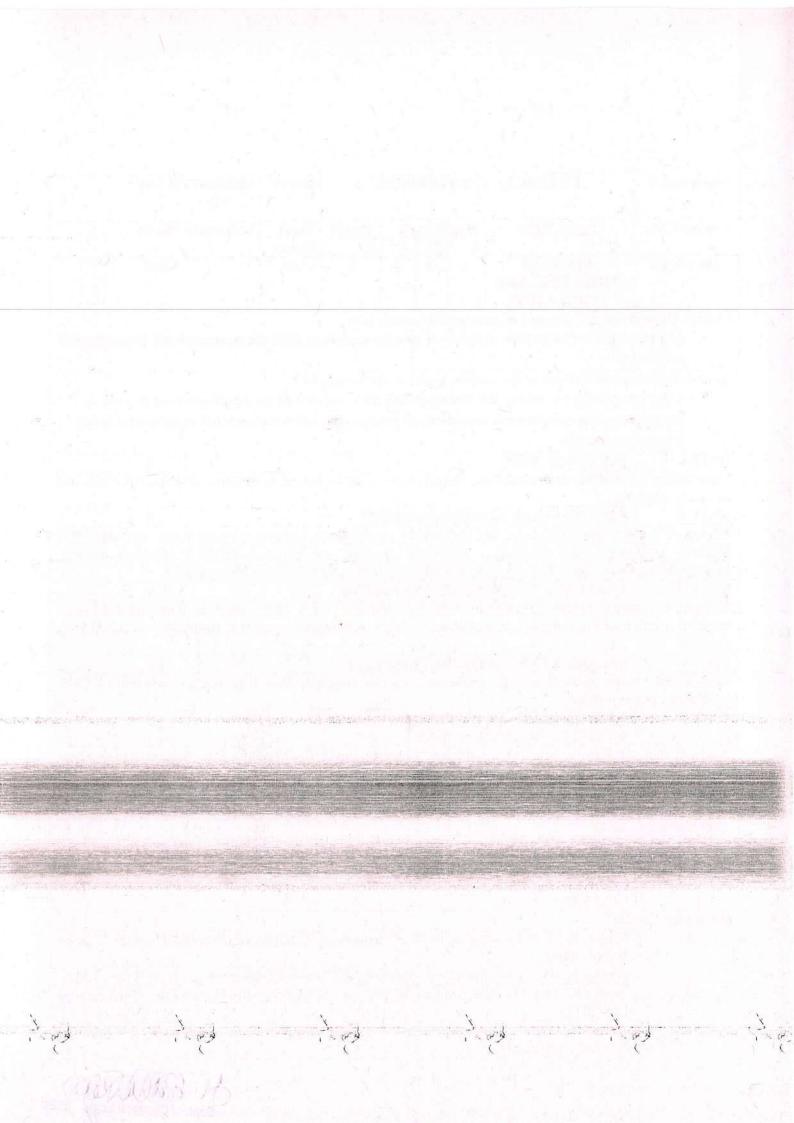
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	based on conservation p	meip	nes ai	na pro	ocess data	and com	butational techni	iques to solve
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Department	CHEMICAL EN	GIN	EER	ING	i de la	R2019	SEMESTER VIII	PE
Course	6 N	Hou	irs/w	veek	Credit			
Code	Course Name	L	Т	Р	С	<b>Total Hours</b>	Maximum M	Marks
19CHX17	DRUGS AND PHARMACEUTICAL ENGINEERING	3	0	0	3	45	100	
Under     indust	<b>ctives</b> : The purpose of learn standing of the polytechnic ry involving Chemical Eng	al nat	ture o ing.	of en	gineering		in the pharmaceut	ical
<b>Course Outc</b>	ome: At the end of this cou	rse, l	earne	ers w	ill be able	to		
<ul> <li>Transf</li> </ul>	form raw materials into u	seful	phari	mace	utical and	d fine chemical p	roducts with com	mercia
	st through systematic use of							
UNIT I	INTRODUCTION	-		-			9	119.10
	of drugs and pharmaceutica	al ind	ustry	org	anic there	neutic agent's uses		
	DRUG METABO				AND	PHARMACO		1.00
	KINETICS&MICROBIC PRODUCTS				AN		10 - 1975 - 19 - 19 - 19 - 19 - 19 - 19 - 19 - 1	
Drug metabo	lism; physico chemical	princ	iples	; ph	arma kir	etics-action of d	rugs on human	bodies.
	ram positive, gram negative							
UNIT III	<b>IMPORTANT UNIT PR</b>	OCE	SSE	SAN	D THEI	R	9	
	APPLICATION							
	nversion processes; alkyla halogenation, oxidation, su							dration,
TATTT TY7	MANUFACTURING PR	INC	IPLE	ES &	PACKIN	NG AND	9	
UNITIV	QUALITY CONTROL		-	N	-		X	
Compressed to compression, solutions, ora packing techni	QUALITY CONTROL tablets; wet granulation; of tablet presses formulation l liquids; injections; ointr iques; quality control.	; coa nents	ting ; sta	pills ndare	; capsule d of hyg	s sustained action iene and manufact	dosage forms; pa turing practice. P	arential
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Department	CHEMICAL				R2019	SEMESTER VIII	PE	
Course Code	Course Name	Hours/week Credit				Total	Maximum Marks	
19CHX18	DIOCHEMICAL	L 3	T 0	P 0	C 3	Hours 45	100	-
	BIOCHEMICAL ENGINEERING					45	100	
	tives: The purpose of lea	1 m m					Section 1	
	ovide the knowledge on						iotechnology se	ctors.
	me: At the end of this co						rite are de Arr	
	sign novel bioprocesses							
	nd solutions to the prob	olems w	hich	occu	r when m	aterials a	ind processes in	neraci
	e environment.	<u>dinana</u>	- surger	le lo l	<u></u>	10		9
UNIT I Industrial bic	INTRODUCTION ochemical processes	with	tunio	1 0	examples,	compar	ring chemical	and
biochemicalpro	pocesses, development a portant microbial strains	and sco		f bio	chemical	engineer	ring as a disci	
UNIT II	KINETICS OF ENZY	and a second	and the second se			-,	8	9
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modulation an	nd regulation of enzy	me acti	ivity,	type	s of inh	ibition.	Immobilized er	nzyme
	nzyme immobilization,	Immob	ilized	enz	yme kine	tics: effe	ect of external	mass
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unstructured, si cells and spore biological react UNIT IV Transport pher determination scaling of mass UNIT V Down stream products, filtra separation of ultrafiltration a electrophoresis Text Books: 1.	KINETICS OF MICH ellular growth in batc tructured and cybernetic es, stoichiometry of cel- tors. TRANSPORT PHEN nomena in bioprocess of oxygen transfer rate transfer equipment, hea DOWN STREAM PR processing: Strategies tion and centrifugation; soluble products: liq and reverse osmosis),chr , final steps in purification Biochemical engineer 1986, McGraw Hill. Bioprocess Engineerin edition, Pearson educa	h and c model ll growt OMEN system es, powe at transfe OCESS to reco cell dis juid-liqu romatog on –crys ing fun g by M	contin s, me h and A s: Ga er req er SING ver a sruption stallize	nuous edium 1 pro- ns-liqu juiren nd p on-m xtract c sep ation	s culture, formulat duct form uid mass nents for urify pro- echanical tions, me aration-ge and dryin by J.E.E	ion. Ther ation, De transfer sparged lucts; se and non- embrane el permea g Bailey and	mal death kinet esign and analy in cellular sys and agitated ve paration of inse- mechanical me separation (dia tion chromatoge d D.F.Ollis, 2r	rowth ics of sis of g stems, essels, g oluble thods; alysis, raphy,
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UNIT III Kinetics of ce unstructured, si cells and spore biological react UNIT IV Transport pher determination scaling of mass UNIT V Down stream products, filtra separation of ultrafiltration a electrophoresis Text Books: 1. 2. Reference Boo	KINETICS OF MICH ellular growth in batc tructured and cybernetic es, stoichiometry of cel- tors. TRANSPORT PHEN nomena in bioprocess of oxygen transfer rate transfer equipment, hea DOWN STREAM PR processing: Strategies tion and centrifugation; soluble products: liq and reverse osmosis),chr final steps in purification Biochemical engineer 1986, McGraw Hill. Bioprocess Engineerin edition, Pearson educa	h and c model ll growt OMEN system: ss, powe at transfe OCESS to reco cell dis puid-liqu romatog on –crys ing fun g by M tion.	contin s, me h and A s: Ga er req er SING ver a sruption id ex graphic stallizzed dame	nuous edium 1 pro- as-liqu puiren nd p on-m xtract c sep ation entals -1 L.	s culture, formulat duct form uid mass nents for urify pro- echanical tions, me aration-ge and dryin by J.E.E Shuler an e – Prentic	ion. Ther ation, De transfer sparged ducts; se and non- embrane el permea g Bailey and d Fikretk	mal death kinet esign and analy in cellular sys and agitated ver paration of inse- mechanical me separation (dia tion chromatogr d D.F.Ollis, 2r Cargi, 2nd	rowth ics of sis of g stems, essels, g oluble thods; alysis, raphy,

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Department	CHEMICAL I	ENG	INEE	RING	G	R2019	SEMESTER VIII	PE
Course Code	Course Name	Name Hours/week		Credit	Total	Maximum M	arks	
Sec. 1		L	T	P	C	Hours	5 14 11	
19CHX19	PROFESSIONAL ETHICS	3	0	0	. 3	45	100	
<b>Course Objec</b>	tives: The purpose of lea	rning	g this o	cours	e is to			
• Create aw	areness on professional e	ethics	and h	numai	n values.			÷
• Provide b	asic familiarity about e	ngine	eers a	s res	ponsible	experimen	nters, research e	ethics
codes of e	thics, industrial standard	s.						
• Inculcate	knowledge and exposure	e on c	liffere	ent sa	fety aspec	cts of a pr	ocess and intell	ectua
property r	ights.							
Course Outco	mes: At the end of this c	ourse	e, lear	ners v	will be abl	le to		
	ent awareness of profess		- CO.					
	career with professional							
	with more responsibility		1.		-		l issues by add	onting
	industrial standards.	y Oy	unuc	1 Starr	ung van	ous socia	i issues by add	pung
		1		c			. 1 C	D
	various safety procedures							
	ole in various global issu	ies an	id app	ly eth	nical princ	ciples to re	esolve situations	
UNIT I	HUMAN VALUES							9
	and Ethics - Integrity -							
	iving peacefully – Cari							me –
	Commitment – Empathy		If con	fiden	ce – Char	acter – Sp	orrituality.	0
	ENGINEERING ETH					0.1		9
	ineering Ethics' – Varie							
	nomy – Kohlberg's theo							
	ofessional roles - Theores of Ethical Theorem	ies a	ibout	ngm	action -	- Sen-ma	erest – Custom	s and
UNIT III	ENGINEERING AS S	SOCI	ALF	YPF	RIMENT	TATION		9
	Experimentation – Eng						s – Codes of Etl	
A Balanced Ou	tlook on Law – The NA	SA's	Chall	enger	r Case Stu	idv.	s codes of Ed	ines
UNIT IV	SAFETY, RESPONSI							9
	k – Assessment of Safety						and Reducing F	
	le Island and Chernoby							
	ollective Bargaining -							
Crime – Profe	essional Rights – Emp	loyee	e Rig	hts –	- Intellect	tual Prop	erty Rights (IP	PR) –
Discrimination					la ang kalang	-		Adam
THIS AT THE PARTY AND AND A DECK OF A	GLOBAL ISSUES				1. 1		the second s	9 =
	Corporations - Envir							
	Engineers as Managers					Engineer	s as Expert Witr	nesses
	Moral Leadership - San	nple (	Code	of Co	nduct.	1.5		12.2
<b>Fext Books:</b>								10
1.	Mike W. Martin and Ro				er, "Ethics	s in Engin	eering", Tata	
	McGraw Hill, New Del				. /			
2.	John R Boatright, "Eth	nics a	ind th	e Co	nduct of	Business"	', Pearson Educ	ation,
<u> </u>	New Delhi, 2003.	Sec. 1	1	1	<u>`</u>			191
Reference Boo		11.04		1	1.20		- ord	11-1-
1. (	Charles B. Fledderman	ın, "	Engin	eerin	g Ethics"	, Pearson	Prentice Hall,	New
							11,000	JAM
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	Jersey, 2004.
2.	Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Thompson Wadsworth, A Division of Thomson Learning Inc., United States, 2000
3.	Edmund G Seebauer and Robert L Barry, "Fundametals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

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Department	CHEMICAL	ENGIN	NEEF	RING		R2019	SEMESTER VIII	PE
<b>Course Code</b>	Course Name	Hou	rs/we	ek	Credit	Total	Maximum N	larks
		L	T	Р	С	Hours	2	
10011200	PROGRAMMING	3	0	0	3	45	100	
19CHX20	USING MATLAB		1.3					
Course Obje	ctives: The purpose of lear	ning th	is cou	irse is	s to			
• Give a	complete programming ki	nowled	ge ab	out N	<b>IATLAB</b>			
<ul> <li>Acqui</li> </ul>	eknowledge with the basic	conce	pts of	f MA'	TLAB, va	riables, a	rays and functi	ons of
MATLAB.								
<b>Course Outco</b>	ome: At the end of this cou	irse, lea	arners	will	be able to			
	MATLAB basics in solvir							
	ne solution for Problems re					ng		
	nent algorithms to find sol						tements	
	nent concepts of MATLAI							
	e solutions for multidiscip					ai Liigiik	ering.	
UNIT I	INTRODUCTION TO					the set		
	MATLAB- Creating Va				aful MA	TIAD C.	notions Date	9
Script files –	video lecture on plotting	Intro	ductic	ine u	arrays G	TLAB IU	Exercises Gr	types-
Functions Usi	ng MATLAB.	, muo	uuen	011 10	allays, C	napining,	Exercises- Gia	ipning
UNIT II	PROGRAMMING PR	ACTIC	TES					9
	-Creating Code- Video Le	The contract of the contract o		put S	tatements	Output S	statements Exe	
Input/OutputS	tatements.		on m	puro	uternemes,	output	futements Exc	01505.
UNIT III	CONDITIONAL STAT	EME	NTS	AND	LOOPS	1000		9
Conditional S	tatements: Logical Operat	ors, if	, else	, and	l elseif, S	witch, E	xercises- condi	tional
statement. Loc	ps: Repetition Structure: In	ntroduc	ction 1	o Loo	ops, For L	oops, Wh	ile Loops.	
UNIT IV	NESTED LOOPS							9
Nested Loops	Breaks - Video Lecture	: Rep	etition	n Stru	uctures: N	Nested Lo	oops and the	Break
Statement.						2		
UNIT V	ARRAYS AND ARRAY				1000		unie Sines	9
Arrays-Exercis	es: Arrays, Video Lectur	e: Son	ne Us	seful	Functions	for Arra	ys-Exercises:	Array
runchons			and the second		AND DO THE ST			
				a a an				0.1
Text Books:	MATLAD. A Dreatical	ludua 1.		I D		1 D		
	MATLAB: A Practical	Introdu	ction	to P	rogrammi	ng and P	roblem Solving	g, 3rd
Text Books:	edition, Stormy Attaway,	Elsevi	er, 20	13.	And the second	and a state of the state of the	·	En X BRENET
<b>Fext Books:</b>	edition, Stormy Attaway, Chemical Engineering	Elsevi Compu	er, 20 itation	13. nal	with M	and a state of the state of the	·	(ANAL SHE
Text Books: 1. 2.	edition, Stormy Attaway, Chemical Engineering Hanyang University, CR	Elsevi Compu	er, 20 itation	13. nal	with M	and a state of the state of the	·	(axidation)
Text Books:	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRO ks:	Elsevi Compu C Press	er, 20 itation s, Inc.	013. nal , 2018	with N 8.	IATLAB,	Yeong Koo	Yeo,
Text Books: 1. 2. Reference Boo	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRG ks: Problem Solving in Chemical	Elsevi Compu C Press mical a	er, 20 itation s, Inc. and B	013. nal , 2018 ioche	with N 8. emical En	IATLAB,	Yeong Koo with POLYM	Yeo, ATH,
Text Books: 1. 2. Reference Boo	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRO ks:	Elsevi Compu C Press mical a	er, 20 itation s, Inc. and B	013. nal , 2018 ioche	with N 8. emical En	IATLAB,	Yeong Koo with POLYM	Yeo, ATH,
Text Books: 1. 2. Reference Boo	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRG ks: Problem Solving in Chemical	Elsevi Compu C Press mical a	er, 20 itation s, Inc. and B	013. nal , 2018 ioche	with N 8. emical En	IATLAB,	Yeong Koo with POLYM	Yeo, ATH,
Text Books: 1. 2. Reference Boo	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRG ks: Problem Solving in Chemical	Elsevi Compu C Press mical a	er, 20 itation s, Inc. and B	013. nal , 2018 ioche	with N 8. emical En	IATLAB,	Yeong Koo with POLYM	Yeo, ATH,
Text Books: 1. 2. Reference Boo	edition, Stormy Attaway, Chemical Engineering Hanyang University, CRG ks: Problem Solving in Chemical	Elsevi Compu C Press mical a	er, 20 itation s, Inc. and B	013. nal , 2018 ioche	with N 8. emical En	IATLAB, gineering Mordecha	Yeong Koo with POLYM	Yeo, ATH, 07.

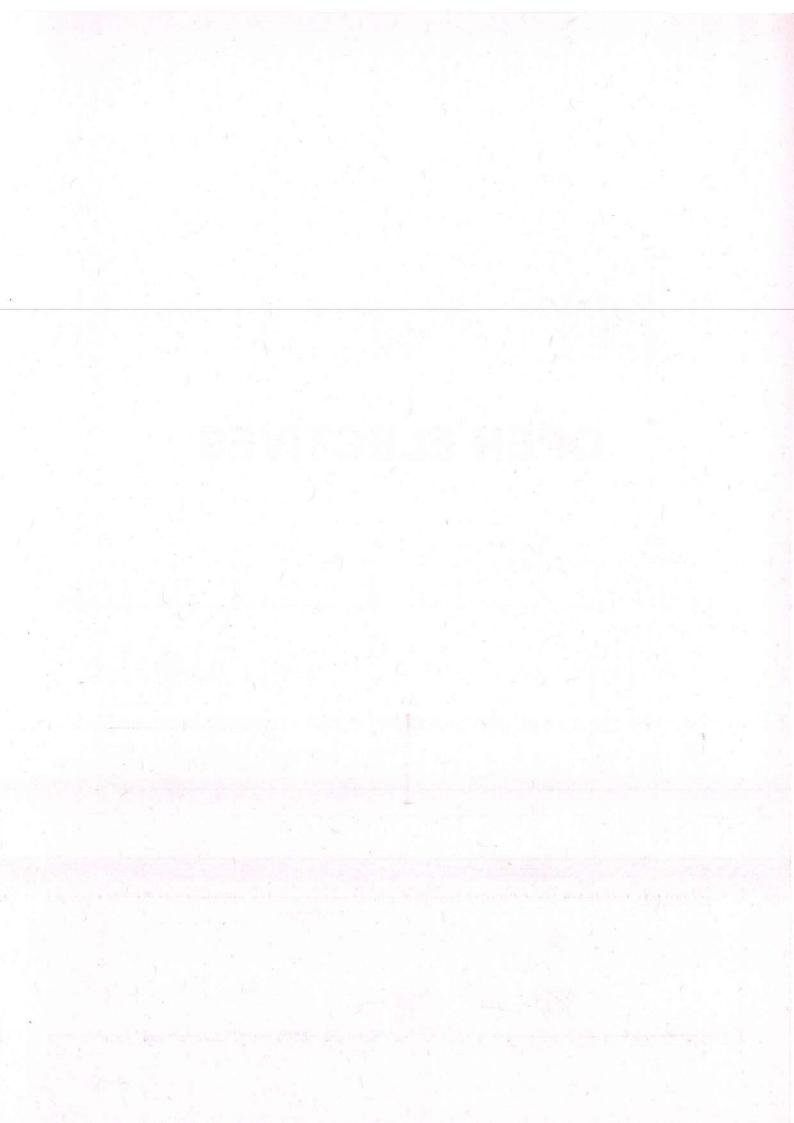
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# **OPEN ELECTIVES**

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Department	CHEMICAL EN	GIN	EER	ING		R2019	_	OE
Course	Course Name	the second second	irs/w	and the second se	Credit	Total	Ма	ximum Marks
Code	Course Name	L	Т	P	C	Hours	Ivia	ximum warks
19CHY01	ELECTROCHEMICAL ENGINEERING	3	0	0	3	45		100
	ctives: The purpose of learning							
<ul> <li>Impart</li> </ul>	knowledge on basic electroc	chemi	cal c	oncep	ots.			
<ul> <li>Impart</li> </ul>	knowledge on basic thermal	bala	nce.					
• Acquir	e knowledge on basic transp	ort pr	opert	ties &	z potential	l theory in	electroch	emical processes.
<b>Course Outco</b>	ome: By the end of the cours	e stud	lents	will	be able to			
Unders	stand the basic concepts invo	lved i	in ele	ctroc	hemical p	processes.		
• Learn	different types of electrodes	used f	for pr	oces	ses.			
Apply	the concepts of potential the	ory fo	or des	ign o	f advance	d electrode	es.	
	the concept of transport prop	5						
	different types of potential p							
Unit I	BASIC ELECTROCHEM			DNC	EPTS			9
	electrode potential - phase					nd electroc	hemical 1	
	iform concentration, transpo							
	otential-the electrostatic pote							
	lectrode, the electric potentia							
	s, electrical contribution to the							icients
Unit II	REFERENCE ELECTRO LAYER	DE A	AND	ELE	CTRICA	L DOUB	LE	9
Reference ele	ctrode-criteria of reference	electro	odes,	hyd	rogen ele	ctrode, the	calomel	electrode and other
	nercurous salt electrodes, sil				•			
	on, types of liquid junctions,							
	double layer- qualitative d							
	ation, the diffused part of t	he do	ouble	laye	r. Electro	de kinetic	s, electro	kinetic phenomena,
	ry phenomena.		ET O T	10.11			and the second	0
Unit III	INFINITELY DILUTE SO	JLUI	TION	S A	ND THE	RMAL		9
Infinitaly dilut	BALANCE e solutions-transport laws, co	nduo	+;,;;+		fucional n	atantial an	d transfor	ance numbers
	f charge, binary electrolyte,							
and the second se	field. Mobilities and diffusio	Contraction of the second stress	for the market of the	Warraw Constants	sectors of the sector of the sector of the sector of the	THE STREET COLORADO AND ADDRESS OF	the state of the state of the state of the state of	the second statement of the second of the second statement and the second s
	d junction potentials. Therma							
And a second sec	no galvanic cells.	0.000	And the second	Car and	and all the second of the second			And the second of the second sec
Unit IV	TRANSPORT PROPERT	IES		12-19-75	Service and the	an a carrier	State of the second	9
sectors of the Longer, they will be and the second state of the	perties- single and multicon	The second s	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	And the second se	the same water to be a set to be a set of a set of the set	STREET, STREET	NAME OF TAXABLE PARTY OF TAXABLE PARTY OF TAXABLE PARTY.	
	electrical forces. Transport							
Contraction of the state of	n, two dimensional diffusion	layer	in la	amina	ar force co	onvection,	axisymm	etric diffusion layers
in forced conv		1.11					*	
Unit V	POTENTIAL THEORY					4.:1	N	9 1 solution Effort of
	potential theory- primary a							
	limiting currents-Correction ectrolyte, limiting currents							
	oporting electrolyte. Currents						uon ove	i potential- officialy
Text Books:	v	0010	vv tric			<u></u>		`x
1.	Prentice. G, Electrochemica	1 Eno	ineer	ing P	rinciples	Englewoo	d Cliffs. I	Prentice Hall, NJ.
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	1986.
Reference	Books:
1.	1. Newman. J, Electrochemical Systems, Englewood Cliffs, Prentice Hall, NJ, 1991.
2.	Rousar. I, Micka, K and Kimla, A., Electrochemical Engineering, Vol. I & II, Elsevier, 1986

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Department	CHEMICAL	ENGI	NEE	RIN	G	R2019	OE
Course	Course Name	Hou	urs/w	eek	Credit	Total	Marinen Marke
Code	Course Ivame	L	Т	P	C	Hours	Maximum Marks
19CHY02	ADVANCES IN POLLUTION CONTROL	3	0	0	3	45	100
<b>Course Obje</b>	ctives: The purpose of I	earnin	g this	s cou	rse is to	1.	and the second second
Provic	le exposure to the pollu	tion co	ntrol	techi	niques.		
• Gener	ate awareness about the	enviro	onme	ntal p	ollution.		
	stand the concept of pol						
	stand about the clean te		<u> </u>				
	le knowledge on -which			the s	students t	o have a car	eer and professional
	plishment in the public					o nave a car	ter and professional
	ome: By the end of the	1.		- The second second		a ta	
	e of past, present and fut					e 10	
	stand the importance of				ering proc	cesses.	
	the concept of environment						
	stand the concepts behind					ontrol polluti	on.
	recycling concepts beh				vention.		
Unit I	ENVIRONMENT AV			82/20			9
	- friendly Chemical Pro					ysis; Enviro	nmental Audit.
Unit II	CHEMICAL ENGIN		Canal Constanting				9
		Abate	ment	of	water pol	lution; Curr	ent strategies to control air
Unit III	posal of solid wastes ADVANCED WAST	EW/A7	FFD	TDF	ATMEN	T	9
						and the second se	es Removal of Colloids and
							Filtration Absorption – Ion
	dvanced oxidation proc		Juina		nution	wiemorane	rituation resorption for
Unit IV	CLEAN TECHNOL		2	-	S-18 3	a second	9
Towards Eco	- friendly products of	chemi	ical i	indus	try. Har	dling emer	ging pollutants in industrial
effluents			-	ANT OF THE			
Unit V	<b>POLLUTION PREV</b>	And And I are a second s					9
							nplications of environmental
							npacts, Concept of common
	nent; Environmental leg	Islation	ns, Ro	ole of	Governm	nent and Indu	ustries
Text Books:	Des CCD	-1 D -11			1.7		
and the providence of the second of	Rao, C.S Environment	and the state of the state	San a star at the	Pol Con Miles	C. S. S. L. S. L. S. S. C.		and the second
2.					Technolo	ogious, Envi	ironmental Engineering, Mc
3.	Graw Hill Book Comp				···· " T-4- "	M.C. II'	
	the second s			_			l Publishing Co. Ltd.1989
4.	1982.	lore A.	J Aiı	poll	ution cont	rol equipme	nts. Prentice Hall Inc, NY.
<b>Reference</b> Bo				140	124 125		
<u>}</u> 1.	Coulson, J.M. Richard Press, 1989.	son, J.	Fanc	ł R.K	Sinnott,	Chemical E	ngineering Vol. 6, Pergomon
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2.	Gilbert M.Mastrs, Introduction to Environmental Engineering and Science, Prentice - Hall of India, New Delhi, 1994.
3. 3	Wahi S.K., Agnihotri A.K and Sharmma J.S (Editors) Environmental Management in Petroleum Industry, Wiley Eastern Ltd., New Delhi 1996.
4.	Smith, R., "Chemical Process Design", McGraw Hill, New York, 1995

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Department	CHEMICAL EN	GINE	ERIN	G		R2019	OE
Course	Course Name	Ho	ours/w		Credit	Total	Maximum
Code		L	Т	Р	C	Hours	Marks
19CHY03	INDUSTRIAL WASTEWATER TREATMENT	3	0	0	3	45	100
<b>Course Object</b>	tives: The purpose of learning this	course	e is to		Softer 18	n vî ne tên d	1.7
Focus	on the wastewater treatment.						
<ul> <li>Analyz</li> </ul>	the process.						
• Unders	stand the theory chemical unit proce	esses.					
	the biological treatment processes.						
<ul> <li>Provid</li> </ul>	e knowledge on advanced treatmen	t proce	esses.				
<b>Course Outco</b>	ome: At the end of this course, learn	ners wi	ill be al	ble to		E I	
	nowledge on physical/chemical/bio				CS.		
• Unders	stand the general treatment process.						
• Apply	the concepts of chemical unit proce	esses.					
	he biological treatment processes.						
	the knowledge on advanced treatme	ent pro	cesses.				
Unit I	Waste water treatment an overv	1.040		1	11111		9
	- Regulations – Health and Environ		Concern	ns in w	aste water m	anagement -	Constituents in
	organic - Organic and metallic con					J. J.	
Unit II	Process analysis and selection			1		Sector Sector	9
	f waste water flows - Analysis of I					ter treatment	<ul> <li>Mass Balance</li> </ul>
	deling of ideal and non ideal flow i	in Read	ctors –	Proces	s Selection.	ni	
Unit III	Chemical unit processes		1	1	CI 1		9
	ocesses in waste water treatment cl nce chemical oxidation –Neutraliza					recipitation f	or improved
Unit IV	Biological treatment		Chem	ical Sic	nage.		9
	iological Treatment – Microbial me	etaboli	sm – B	acteria	l growth and	energatus - A	25
	lation – Anaerobic fermentation and						
contractors - C	Combined aerobic processes - Activ	vated s	ludge f	ilm pao	cking.	the second an article and the second	
Unit V	Advanced waste water treatmen	STATISTICS STATISTICS		and the second second			9
	ised in advanced treatment - Class						
	oth Filtration – Surface Filtration –	Memb	rane Fi	ltratior	n Absorption	– Ion Exchar	ige – Advanced
oxidation proc Text Books:	ess.	ementer	Allenander	Their and the	STANKING MERCENSING	area and a second second	ing a state state of the state of the state
I CAT BOOKS.	Waste water Engineering Treatme	nt and	Reuser	NAr-Gi	aw Hill G I	chobanadan	c. In Riston
	2002.	in and	iteuse.		aw 1101, 0.1	chocanogiou	5, 11 1 10101011,
2.	Industrial Waste Water Manageme	ent Tre	atment	and Di	isposal by W	aste Water M	c Graw Hill III
a de la sectore	Edition 2008.						
<b>Reference Bo</b>			1.36		C. All yes	the state of the	
1.	Unit Operations of Chemical Engin	neering	g. Warr	en. L.,	McCabe, Ju	lian C.Smith.	Peter
2.	Separation Process Principles, J D						

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Department	CHEMICA	L ENGINI	EERING	1		R2019	OE
Course	Comme Name	Hou	rs/week	1	Credit	Total	Maximum
Code	Course Name	L	Т	P	С	Hours	Marks
19CHY04	TOTAL QUALITY MANAGEMENT	IANAGEMENT 3 0 0 3		3	45	100	
Course Obje	ctives: The purpose of learning	g this course	is to				
<ul> <li>Facilitate</li> </ul>	the basic concepts of TQM.						
• Understa	nd of TQM principles.				1 A A A		
	TQM tools.						
	nd the legislations and standard	de					
	and the second						
11	Quality Management principl		and the second second			1	
	ome: At the end of this course,	, learners wi	II be able	e to			
	e TQM concepts in industries.			20			
• Utilize th	e TQM tools.						
• Apply the	TQM techniques of quality n	nanagement					
• Apply the	e legislations and standards in	chemical pr	ocess ind	lustries			
	e quality systems in industry.						
		****		-		9	
Unit I	Introduction Need for quality - Evolution	of quality	Defini	tiona o	and a fill	-	of product on
	- Basic concepts of TQM –		ework -	Contrit	JULIONS OF D	eming, Julai	I and Closby
sarriers to 1		Customan 6	la aura				
	QM - Quality statements -						
Customer con	plaints, Customer retention - 0				er orientati	on, Custome	
Customer con Unit II	plaints, Customer retention - ( <b>TQM principles</b>	Costs of qua	lity.	Custom	er orientati	on, Custome 9	er satisfactior
Customer con Unit II Leadership -	nplaints, Customer retention - ( <b>TQM principles</b> Strategic quality planning	Costs of qua	llity. Councils	Custom	er orientati	on, Custome 9 avolvement	er satisfactior
Customer con Unit II Leadership - Empowermen	plaints, Customer retention - ( <b>TQM principles</b> Strategic quality planning t, Team and Teamwork, Qu	Costs of qua , Quality ality circles	llity. Councils s Recogn	Custom	er orientati mployee ir and Reward	on, Customo 9 avolvement I, Performan	er satisfactior - Motivatior ce appraisal
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Customer con Unit II Leadership - Empowermen Continuous p selection, Sup	Inplaints, Customer retention - OTQM principlesStrategic quality planningt, Team and Teamwork, Qurocess improvement - PDCAplier Rating.	Costs of qua , Quality ality circles cycle, 5S,	llity. Councils s Recogn	Custom	er orientati mployee ir and Reward lier partners	on, Customo 9 nvolvement I, Performan ship - Partne	er satisfactior - Motivatior ce appraisal
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COBORCE 16





Department	CHEMICAL EN				-	R2019	OE
Course Code	Course Name	Hou L	rs/wee T	k P	Credit C	Total Hours	Maximum Marks
19CHY05	NANO SCIENCE AND NANOTECHNOLOGY	3	0	0	3	45	100
<ul> <li>Under applic</li> <li>Get e</li> </ul>	ective(s): The purpose of learning to rstand the description of nanote eations. exposure to the general preparation preparation.	chnolog	gy, its	techno			
	tcome(s): At the end of this course	e, learne	ers will	be able	e to:		1
	and understand the purpose of Na						
• Under • Under	rstand application of carbon nanoturstanding different types of NEMS, rstand material aspects of NEMS, Network the principle and application	, MEMS MEMs a	S and 1 and the	earn pr ir appli	inciples of		
Unit I	Introduction					9	
Background	and Definition of Nanotechnology						
Approaches	to Nanostructured Materials, Mole	cular Sv	vitches	and Lo	ogic Gates,	Solid State	Devices
Unit II	Phase iagrams and phase transf	ormati	ons	in the		12	
Properties of Unit III	plications of Carbon Nanotubes, Nanowires, Applications Elastic behavior of materials pla ofabrication Techniques, MEMS	astic de	format	ion		8	
Stamping te Applications	echniques - High Resolution S	stamps,	Micro	contac	t Printing,	Nanotran	sfer Printing
Unit IV	Composite materials	in a transferration	asgina com	「小小学家への目)	and an	station and state	al and an original plant
Related III-V MEMS, RF 1	ects of NEMS and MEMS – Silico / Materials, MEMS Devices and MEMS, NEMS Devices and Applic	Applica cations,	ations ·	- Press	ure Sensor	, Inertial So	ensor, Optica
	Introduction to nanotechnology				10	8	·
	- Scanning Tunneling Microso FESEM, TEM, Principles of Nonc	-					
Text Books:		ontact	Rionne	Force	wheroscope	(INCAT IN)	• //
1.	B. Bhushan, (in Eds.) "Spring	er hand	lbook c	of nano	technology	" 3 <sup>rd</sup> Editio	n. Springer
	Verlag, 2010.	,			(Commono B)	,	
Reference B		1.22					
1.	Charles P. Poole; Frank K. J C and Sons, Inc, Publication 2003.	Owens,	"Introd	uction	to Nanotec	hnology", A	A John Wile
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Department	CHEMICAI	LENG	INEER	ING	1 A. C.	R2019	OE
Course	C N	Hour	s/week		Credit	Total	Maximu
Code	Course Name	L	Т	Р	С	Hours	m Marks
19CHY06	PIPING ENGINEERING	3	0	0	3	45	100
<b>Course Object</b>	ctives: The purpose of learning	ng this c	course is	to			
<ul> <li>Impart</li> </ul>	knowledge on piping techno	logy an	d instru	mentatic	on on pipeline	es.	
<b>Course Outco</b>	ome: At the end of this course	e, learn	ers will	be able t	0		
• Gain k	nowledge on fundamentals o	f piping	g engine	ering.			
• Unders	stand the concept of pipe hyd	raulics.	fit prijek				
• Conce	pts behind choosing the size.						
	the piping supports.						
1.000 A 200 A 2	stand the role of instrumentat	ion.					
Unit I	Fundamentals of piping en		ing			9	
	Piping Components their in			olication	s. Piping N	e	et Codes and
	prication and Installations of		, - <b>F</b> I				
Unit II	Pipe hydraulics and sizing					9	1
Pipe sizing bas	sed on velocity and pressure of	drop co	nsiderat	ion cost,	least annual	cost approa	ch, pipe
	s, development of piping gene	eral arra	angemen	nt drawin	ng, dimension	ns and draw	ing of piping.
Unit III	Plot plan					9	
	of plot plan for different typ			· · ·		1	
	layout. Stress analysis -Diffe		pes of	stresses	and its impa	et on pipin	g, methods o
	namic analysis, flexibility an	alysis.	VIEL				1
Unit IV	Piping support		1	1.0		9	
Unit V	s of support based on requirer Instrumentation	ment an	id its cal	culation		9	
VED REPORTED IN	Elements; measuring devices.	instru	nentatio	n symbo	le introducti	-	e flow
	) and piping & instrumentation			and the second second	ns muouucu	on to proces	3 110 W
Text Books:	) unu piping co mou unomune	in unug.	u (1 cc				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1.7.2.2.2	Piping Handbook, 6 th edition	on, M.L	. Nayya	r, P.E., N	Mc Graw-Hil	l, Inc.	a construction and
Reference Bo							
1.	Piping Design Handbook ed	ited by	Johan J	McKett	a. CRC Press	. 1992.	14
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Departme	partment CHEMICAL ENGINEERING			R 2019	OE			
Course Co	ode	Course Name		lour Wee T		Credit C	Total Hours	Maximum Marks
	201	NON CONVENTIONAL	L				1000	
19CHY0'	HY07 ENERGY SOURCES 3 0 0 3 45						100	
		The purpose of learning this cou						
		solar radiation and its environment						
		various collectors used for storing	-	lar er	nergy	y.		
		various applications in solar ener						
		out the wind energy and biomass a				-	ets.	
		about geothermal energy with oth						
		t the end of this course, learners v	vill ł	be ab	le to	:		
		ng the physics of solar radiation.	7120		-			
	ā	assify the solar energy collectors a			odol	ogies of s	storing so	lar energy.
	-	in applying solar energy in a usef			ст. 			
		wind energy and biomass with its				100 A		
		in capturing and applying other for	orms	ofe	nerg	y sources	s like win	d, biogas and
		nergies.			de.		- Studys	
		ES OF SOLAR RADIATION	1.1.5	6	d C			10
		ew and renewable source, the sol						
		in, the solar constant, extraterrest nents for measuring solar radiatic						
		ERGY COLLECTION	n ai	iu su	11 511	ine, solai	Taulation	8
		ting collectors, classification of c	once	entra	ting	collector	s. orientat	
nalysis, advanc			one	untit	ing	conceton	o, orrenta	
Unit				TIO	NG			0
III SOL	AK EN	ERGY STORAGE AND APPL	ICA	.110	GNI)	a star Veset, Pari	and the second	and 44.5. States
Different metho	ds, Sens	sible, latent heat and stratified sto	rage	, sola	ar po	nds. Sola	r Applica	ations- solar
eating/cooling	techniq	ue, solar distillation and drying, p	hoto	ovolta	aic e	nergy con	nversion.	
Unit IV WIN	Carl of the State State						The Property	10
		horizontal and vertical axis wir		~~~~~				
		of Bio-Conversion, Anaerobic/a			-			
Diversion of the second se	on char	acteristics of bio-gas, utilization	for	cook	cing,	IC engi	ne operat	ion and economic
spects.			+ Marcand					
antician para manjerane an	News and the		a deriva	an state	e au	Sten Standard	A Transform	ters the initial of the first free about the s
		MAL ENERGY						9
OTEC, Principle otential and co	es utiliz nversio	ells, methods of harnessing the exation, setting of OTEC plants, t n techniques, mini-hydel power p for DEC, Carnot cycle, limitations	hern plant	nody s, an	nam d th	ic cycles eir econo	. Tidal aı	nd wave energy:
REFERENCE(				-				1. 1
		Renewable energy resources", Na						18 Anna
2. hesh R & H	Kumar I	K.U, "Renewable Energy Technol	logie	es",N	ervo	osa Publis	shing Hot	ise, 2004.

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3.	tal K M, "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, New Delhi, 2003.
4.	hari D.P, Singhal., K.C., "Renewable energy sources and emerging technologies", P.H.I, New Delhi, 2010.

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Department	CHEMICAL I	ENGIN	EERI	NG		R2019	OE
Course Code	Course Name	Ho	urs/we	ek	Credit	Total	Maximum
		L	Τ	Р	C	Hours	Marks
19CHY08	FUEL AND COMBUSTION	3	0	0	3	45	100
Course Objections	TECHNOLOGIES			_	- L.		
	: The purpose of learning this co	ourse is	to				
and the second	ge on the fluid properties.						
	while static, during flow throug						
<ul> <li>Acquire knowl</li> </ul>	edge on several machineries use	ed to tra	ansport	the flui	id and their p	erformance	are assessed.
Course Outcome:	At the end of this course, learne	ers will	be able	e to			8
<ul> <li>Understand</li> </ul>	different characterization metho	ods of fi	uel.			8	
• Understand	classification and purification n	nethods	of sol	id and li	iquid fuels.		
	classification and purification m						
	he kinetics and mechanism of co						
	pment for combustion process.	omoust	ion pre				
			1			1	
Unit I	Characterization		CD		9	1 4 1 1	D
and Ultimate Anal Calorimetry - DuL Storage & Handling	Characteristics of Fuels - Detern lysis – Moisture Determinatio ong's Formula for CV Estimat g - Spontaneous Ignition Temper	on - Ca tion – I ratures.	alorific Flue ga	Value	- Gross & ysis - Orsat	Net Calori	ific Values -
Unit II	Solid Fuels and Liquid Fuels				9		
	- Coal Family - Properties - Ca						
	Apparent Density - Storage - W						
	Wood Waste - Agro Fuels - M						
	s - Classification - Refining - Pr			•			
	Cloud point, Pour Point & Smo	ske pom	ii - Oci	ane Nu	mber, Cetane	i Number etc	c, - Alcohols -
Unit III	efaction of Solid Fuels. Gaseous Fuels		- Andrewski - Andr	-	9	and the second s	1 . 7
and the second se	mposition & Properties - Estim	ation of	f Calor	ific Vo	The second second second	alorimeter E	ich & Lean
	- Natural Gas - Dry & Wet Nat						
	Producer Gas - Gasifiers - W			• •			
and the state where the state of the state o	hermal Route - Biogas - Digeste		Colombar and		and the second s		Gasineation
Unit IV	Combustion: Stoichiometry	ter	and the second second		9		
the second s	ass Basis & Volume Basis - E			Iculatio	n - Fuel &	Flue Gas Co	ompositions -
Calculations - Rapid - Submerged Comb	d Methods - Combustion Proces ustion - Pulsating & Slow Com	sses – S bustion	Station: Explo	ary Flar osive Co	ne - Surface	or Flameless fechanism of	s Combustion f Combustion
	n Energy - Spontaneous Combu						
	me Temperature - Theoretica	al, Adı	abatic	& Ac	tual - Ignit	ion Limits	- Limits of
Inflammability.							and the second second
Unit V	Combustion Equipments	1	P		9		1 0 D 1 1
	pments - Types - Pulverized Co		-				
<ul> <li>A state of the sta</li></ul>	ing - Spreader Stokers - Vibr						
	ers - Vaporizing Burners, At				1000		
	urners - Air Aspiration Gas Bur	ners – I	Burner	s Classi	incation acco	rung to Flat	me structures
Text Books:	Burners & Combustion.			a sector de la constante de la	- A A		10 M
TOAT DUENS.		(	The second second	-			5



1.	Samir Sarkar, Fuels & Combustion, 2nd Edition, Orient Longman, 1990
2.	Bhatt, Vora Stoichiometry, 2nd Edition, Tata Mcgraw Hill, 1984
3.	Blokh AG, Heat Transfer in Steam Boiler Furnace, Hemisphere Publishing Corpn, 1988
<b>Reference Book</b>	is:
1.	Civil Davies, Calculations in Furnace Technology, Pergamon Press, Oxford, 1966

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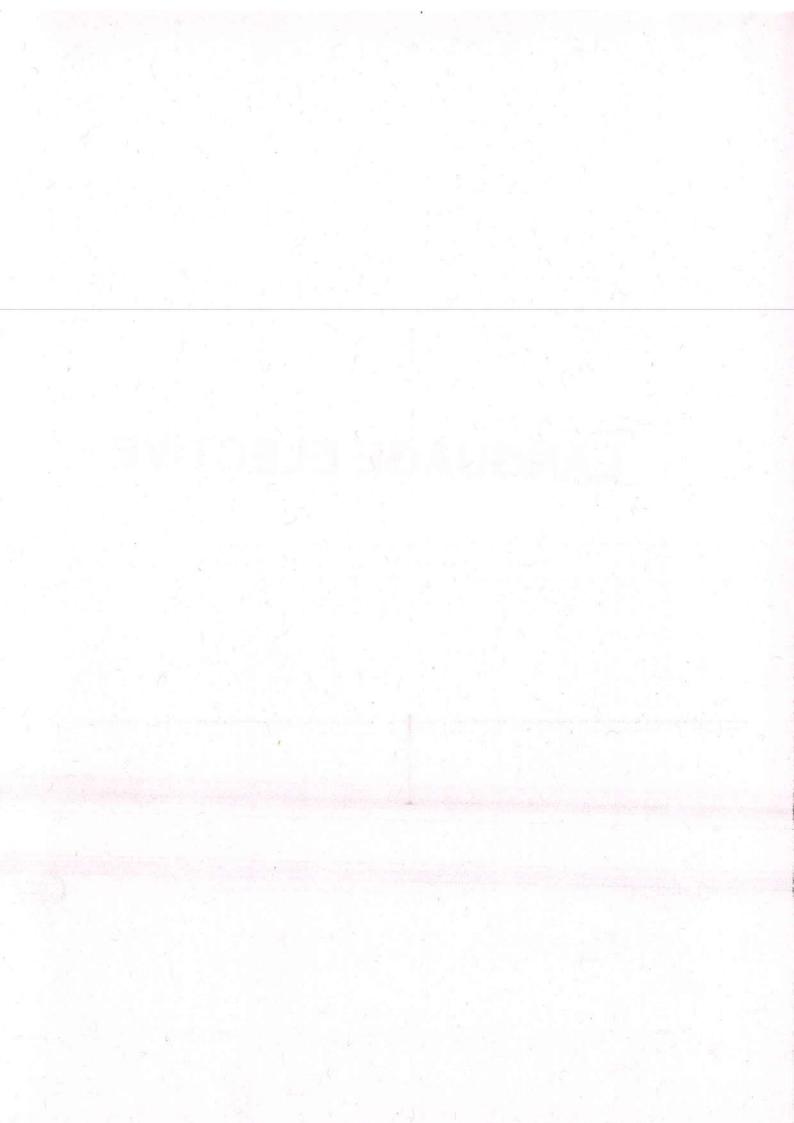
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# LANGUAGE ELECTIVE

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Course Code	Course Name		lour: Wee		Credit	Total Hours	Maximu Marks	
No. States		L	Т	Ρ	С			
19HX201	ENGLISH FOR ENGINEERS	3	0	0	3	45	100	
Course Objective	(s):							
<ul> <li>To acquire t</li> </ul>	he usage of grammar in English langua	ige.	_	-				
texts. <ul> <li>To enhance</li> </ul>	listening skills which will enable to lister the reading skill to comprehend techni- writing skills to express thoughts freely.	cal writ			omprehe	end differ	ent types of	
To develop	speaking skills to speak fluently in real	context	ts.					
Course Outcomes	: At the end of this course, learners will	be abl	e to:				1112	1
<ul> <li>Improve</li> </ul>	their language usage in LSRW skills.							
	listening skills to understand sentence			into	nations.	Υ.		
	the ability to understand different writte							
<ul> <li>Enhance</li> </ul>	e the writing skills to express the ideas of	of the le	earn	ers.	×			
	nicate fluently in pair /team.							
	AGE FOCUS			1				9
and the second	ive) - Reported speech - Conditionals -	Colloca	ation	IS - [	Discourse	e markers	s - One word	k
	I verbs - Error identification							•
	an a				stanation			9
	information – Identifying sentence stre	ss - Rn	yınır	1-1	ntonation			-
		Literat	<b>c</b>				da antona d'ana	9
he structure of a tex	charts - Skimming and scanning texts -	- Identi	tying	g top	ic senter	ices - Un	derstanding	
				1		11		9
		) on ort 1		- 10	acidont a		N/riting	9
JD ADDIIGAUOT, LEU	er and Resume - Recommendations - F wie) - Transcoding (interpreting charts &				iccident a	and surve	y) - writing	
		x ulagi	amo	/		1		9
eview (book and mo				Che los miles	PERSONAL ACCOUNTS	CONTRACTOR OF THE OWNER	and the second se	the state
eview (book and mo UNIT V SPEAKI	and a second state with the second state with a second state of the se	proprie	ately	1-N	egotiatio	- Eyche	anding -	and the second
eview (book and mo UNIT V SPEAKI Collaborative task - 1	furn taking (initiating and responding a	THE R. P. LEWIS CO., LANSING MICH.	ALC: NAMES OF A DESCRIPTION OF A DESCRIP	1-191 - 1-10 1-1	states of the second second in the second seco	and the second se	- Andrews and the state of the	nd
eview (book and mo UNIT V SPEAKI collaborative task - 7 anguage Functions	and a second state with the second state with a second state of the se	THE R. P. LEWIS CO., LANSING MICH.	ALC: NAMES OF A DESCRIPTION OF A DESCRIP	1-191 - 1-10 1-1	states of the second second in the second seco	and the second se	- Andrews and the state of the	d
eview (book and mo UNIT V SPEAKI Collaborative task - 7 anguage Functions Opinions	furn taking (initiating and responding a	THE R. P. LEWIS CO., LANSING MICH.	ALC: NAMES OF A DESCRIPTION OF A DESCRIP	1-191 - 1-10 1-1	states of the second second in the second seco	and the second se	- Andrews and the state of the	nd
eview (book and mo UNIT V SPEAKI collaborative task - 7 anguage Functions opinions TEXT BOOK(S):	Furn taking (initiating and responding an suggesting - comparing and contrasting -	ig -Exp	ress	ing	findine o	out lacts.	attitudes ar	And And And
eview (book and mo UNIT V SPEAKI Collaborative task - 7 anguage Functions Opinions TEXT BOOK(S): 1. Commun	furn taking (initiating and responding a	ig -Exp	ress	ing	findine o	out lacts.	attitudes ar	And And And
eview (book and mo UNIT V SPEAKI Collaborative task - 7 anguage Functions Opinions TEXT BOOK(S): 1. Commun	Furn taking (initiating and responding ap suggesting - comparing and contrastin nicative English , by KN Shoba, Lourd	ig -Exp	ress	ing	findine o	out lacts.	attitudes ar	And And And

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2	Eric H. Glendinning and Beverly Holmstrom, Study Reading: A Course In Reading for Academic Purposes. United Kingdom: Cambridge University Press, 2004.
3	Murphy, Raymond. English Grammar in Use – A Self-Study Reference and Practice Book forInter learners of English. Ived. United Kingdom: Cambridge University Press. 2012.
4	Seely, John. Oxford Guide to Effective Writing and Speaking. Indian ed. New Delhi: Oxford University Press. 2005.



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Depart	ment	CHEMICAL ENGINE	ERING				R 2019	Semester II	н
Course	Code	Course Name		lour: Wee		Credit	Total Hours	Maximu Marks	
Course	, oouc		L	т	Р	С	nours	Widths	
19HX20	2	HINDI	3	0	0	3	45	100	
		The purpose of learning this c	ourse is to	)			Sec.	distant.	
		acquire the basics of Hindi			1			- Arter and a second	
		to converse in Hindi on variou					n sydi-		
		uire the ability to understand a	Contraction of the second states and the			text in Hir	ndi		
		the end of this course, learner ectively with: (a) Improved flu				Clarity or	the heei	ia agunda of	th.
		) Proper vocabulary	lency in F	inar	(u)	Clarity Of	i the basi	ic sounds of	trie
Unit I	HINDI ALF								9
		eminine Nouns ending in a, e,i		0.011	ino	e Eominir	Do Bood	ing Evoraina	1.115
		sonants-Plosives-Fricatives-N							S.
		et -Vocabulary.	asaisound	13-00	Jwei	olghis-on	anuadin	uu	
Unit II	NOUNS IN		10.00		1				9
Genders (N		eminine Nouns ending in a ,e,	i. o. u.)- N	lasc	uline	& Femin	ine - Rea	dina Exercis	1.1
Unit III		NS AND TENSES	., _, _, .,						_
and a state of the		Personal Pronouns - Second	porcon (v	011.9	hor	orific) F	ofinito 8		9
		ouns - Present tense - Past te							
	- Interrogative		noc i utu		1130	7.000111	ic a nega	auve	
Unit IV	menoganie	Sentences							
Unitiv	CLASSIFI		- (F		111200		1		9
		ED VOCABULARY	aetables -	- Clo	thes	- Directio	ons-Seaso	ons -	9
Parts of boo	ly - Relatives		getables -	Clo	thes	- Directio	ons-Seaso	ons -	9
Parts of boo	ly - Relatives	ED VOCABULARY - Spices- Eatables- Fruit & Ve	getables -	Clo	thes	- Directio	ons-Seaso	ons -	9
Parts of boo Professions Unit V	dy - Relatives SPEAKING	ED VOCABULARY - Spices- Eatables- Fruit & Ve		Clo	thes	- Directic	ons-Seaso	ons -	
Parts of boo Professions <b>Unit V</b> Model Sente	y - Relatives SPEAKING ences - Speak	ED VOCABULARY - Spices- Eatables- Fruit & Ve G		· Clo	thes	- Directio	ons-Seaso	ons -	
Parts of boo Professions Unit V	y - Relatives SPEAKING ences - Speak	ED VOCABULARY - Spices- Eatables- Fruit & Ve G		Clo	thes	- Directio	ons-Seaso	ons -	
Parts of boo Professions Unit V Model Sente FEXT BOO	y - Relatives SPEAKING ences - Speal K(S):	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas	ions.		·				
Parts of boo Professions Unit V Model Senter TEXT BOO	y - Relatives SPEAKING ences - Speal K(S):	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas	ions.		·				
Parts of boo Professions Unit V Model Sente EXT BOO 1 Ele Pu	y - Relatives SPEAKING ences - Speak K(S): mentary Hind plication 2013	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas	ions. veryday S	ituati	ons	by Richa			
Parts of boo Professions Unit V Model Sente TEXT BOO 1 Ele Pui 2 Co	y - Relatives SPEAKING ences - Speak K(S): mentary Hind blication 2013 loquial Hindi:	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas	ions. veryday S	ituati	ons	by Richa			
Parts of boo Professions Unit V Model Sente TEXT BOO 1 Ele Pui 2 Co REFEREN 1 B.	y - Relatives SPEAKING ences - Speak K(S): mentary Hind blication 2013 loquial Hindi: CE(S):	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas i: Learn to Communicate in Ev The Complete Course for Beg self Hindi Teacher for Non-Hin	ions. veryday S ginners by	ituati Tej	ons K. B	by Richa hatia	rd Delacy	Tuttle	
Parts of boo Professions Unit V Model Sente TEXT BOO 1 Ele Pul 2 Co REFEREN 1 B. (P	y - Relatives SPEAKING ences - Speak K(S): mentary Hind blication 2013 loquial Hindi: CE(S): R. Kishore, S ) Ltd., New De	ED VOCABULARY - Spices- Eatables- Fruit & Ve G king practice for various occas i: Learn to Communicate in Ev The Complete Course for Beg self Hindi Teacher for Non-Hin	ions. veryday S jinners by di Speakir	ituati Tej ng Pi	ons K. B eopli	by Richa hatia e, Vec Ku	rd Delacy Imar Publ	Tuttle	

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Department	CHEMICAL EN	IGINEERI	NG			R 2019	Semester	HS
Course Code	Course Name		lour Wee		Credit	Total Hours	Maximun Marks	n
		L	т	Ρ	С	nours		
19HX203	JAPANESE	3	0	0	3	45	100	20
Course Objective (s)	: The purpose of learning this c	ourse is to	)		(A. 1-)		1.6.1.1.1.1.1	
•	cquire the basics of Japanese I							
	v to converse in Japanese in va							
	ents the Japanese cultural facet					<u></u>		
	t the end of this course, learner	s will be a	ble t	to co	mmunica	te effectiv	vely with	
<ol> <li>Improved fluence</li> </ol>								
and the second sec	asic sounds of the Japanese lar	nguage						
3. Proper vocabula		4	÷					1 -
UNIT I INTROD	UCTION						3-14	9
Vocabulary (25 Numbe	N2 ja arimasen - S ka - N1m rs) - Phonetic and semantic res					and the second second		
UNIT II VOCABU	JLARY AND GRAMMER							9
Introduction - Kore - So	re - are - Kono N1 - Sono N1 -	ano N1 - :	so d	es -	so ja arin	nasen - S	1 ka - S2 ka	- N'
	ko - soko - asoko - kochira - so							
N2 - Kanji-10 - imaji-	fun des - Introduction of verb -	- V mas -	Vn	nase	n - V ma	shitha-V	masendeshi	itha
N1(Time) ne V - N1 k	kara N2 des - N1 tho N2 / S	ne Kanji	i-10	- Te	echnical .	Japanese	Vocabulary	y (2!
Numbers) - Dictionary l	Jsage.							
	AND TYPES	1997 - N.S.	is cont.	3	a jedu u treka	e anger anger og en ger	a an grant a star	9
N1(Place) ye ikimas -	ki mas - kayerimasu - Dhoko	ye moikim	ase	n - i	kimasend	heshitha	- N1(vehicle	e) de
	erimasu - N1(Personal or Anim							
a long of and a set of manufacture where the set of the	asu ka - Nan & Nani - N1/Plac	and the second second second second	C CLEMEND AND A	Antis of Marine	No. of Concession, Name of Street, or other Designation, or other	LUCIONSCRETCH OTTALL PROVING	THE R. P. LEWIS CO., NAMES AND ADDRESS OF TAXABLE PARTY AND ADDRESS OF TAXABLE PARTY.	194 Hit + (1-1)   100 Hit

shimus - Nani wo shimasu ka - Nan & Nani - N1(Place) de V - V masen ka - V masho - Oo. Kanji-10, N1( tool - means ) de V - Word / Sentence wa go nan des ka - N1( Person ) ne agemus - N1( Person ) ne moraimus - mo V shimashitha - , Kanji-10 - Japanese Typewriting using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

### UNIT IV VOCABULARY AND GRAMMER

Introduction to Adjectives - N1wanaadj des. N1 wa ii adj des - naadjna N1 - ii adj ii N1 - Thothemo - amari -N1 wadho des ka - N1 wadhonna N2 des ka - S1 ka S2 - dhore - N1 gaarimasu - wakarimasu -N1gasukimasu-N1gakiraimasu-jozudes-hethades-dhonnaN1-Usagesofyoku-dhaithai-thakusan-sukoshiamari-zenzen-S1karaS2-dhoshithe,N1gaarimasu-imasuN1(Place)neN2



9

gaarimasu - iimasu - N1 wa N2(Place) ne arimasu - iimasu - N1(Person,Place,or Thing ) no N2 (Position)-N1 ya N2, Kanji-10 - Japanese Dictionary usage using JWPCE Software, Technical Japanese Vocabulary (25 Numbers).

## UNIT V ROOT WORD AND VOCABUALRY

9

Saying Numbers, Counter Suffixes, Usages of Quantifiers -Interrogatives - Dhonokurai - gurai - Quantifier-(Period) ne -.kai V - Quantifier dhake / N1 dhake Kanji - Past tense of Noun sentences and na Adjective sentences - Past tense of ii-adj sentences - N1 wa N2 yoriadj des - N1 tho N2 thoDhochiragaadj des ka and its answering method - N1 [ no naka ] de {nani/dhoko/dhare/ithsu} ga ichiban adj des ka - answering -N1 gahoshi des - V1 mas form dhake mas - N1 (Place) ye V masu form ne ikimasu/kimasu/kayerimasu - N1 ne V/N1 wo V - Dhokoka - Nanika - gojumo - Technical Japanese Vocabulary (25 Numbers).

TEX	FBOOK(S):
1.	Modern Japanese Vocabulary: A Guide for 21st Century Students   Edward P. Trimnell Publisher Beechmont Crest Publishing.
2	Japanese Verbs & Essentials of Grammar"   Rita Lampkin Passport Books , 2013
REF	ERENCE(S):
1	Japanese for Everyone: Elementary Main Textbook1-1, Goyal Publishers and Distributors Pvt. Ltd., Delhi, 2007.
2	Japanese for Everyone: Elementary Main Textbook 1-2, Goyal Publishers and Distributors Pvt. Ltd.,Delhi, 2007.

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Departme	ent	СН	EMICAL ENGINEE	RING	3		R 2019	Semester II	HS
Course Code		Course N	ame	1	urs eek	Credit	Total Hours	Maximu Marks	
1) ( 1 ( <u>1</u>	inen 🗄	<u></u>		L 7	P	С		alta si	
19HX204		FRENC		3 (	0	3	45	100	
<ul><li>Help</li><li>Teacl</li></ul>	studen h them	(s): The purpose of I is acquire the basics how to converse in F s: At the end of this co	of French language rench in various oc	casio					
		the basics of French				g in Frer	ch.		
UNIT I	Alpha	oet Français			12:00	hin start	Count her	1 although	6
émacédille - emaine (Da <b>UNIT II</b>		son nom dans le fran eweek).	çais (spellingone -s	name	e in Fi	rench) - I	es noms (	de jours de la	6
es noms de	mois	le l'année (Months) -	Numéro 1 à 100 (N	umbe	ers 1 t	o 100) G	RAMMAIF	RE :Conjugai	son
	1	2.94							
loyens de tr Nationalités couter et ré _ireles phras	s (Natio	t (Transport) - Noms nalities) ECOUTER : PARLER (Speaking) ples.	(Listening) Écouter	I - al	phabe	et associe	èà des pré	nomsfrançai	s -
Aoyens de tr Nationalités couter et ré ireles phras <b>UNIT IV</b> Pronoms (Pr rerbescomm ialogues LIF a professior	s (Natio pondre ses sim ronouns nuns (C RE : Lir	nalities) ECOUTER : PARLER (Speaking)	(Listening) Écouter Présntation - mêm asculins et de femr ER :couter et crier ursd'interlingua (alte	I - al e /Pr ne (C es pr er ego	ohabe ésente omme noms )PAR	et associe ez - Vous on masc - Obsen LER :Pa	èà des pré s (Introduc uline and l ver les des	nomsfrançai ingoneself)L Femininenou ssins et coute	ins) er le
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