

Branch

CHEMICAL

Semester

6

Course Code

Course Name

Chemical Reaction Engineering

Course Outcome 1	Student will be able to Classify the various types of reaction and identify the variables affecting the rate of reaction.	Teach Hrs	Marks
Learning Outcome 1	Student will be able to Classify various types of reaction.	6	15
Contents	Kinetics of Reaction: Introduction, Chemical Kinetics, , theories to explain to chemical reactions: Collision Theory, and Activated complex Theory, Classification of reactions: Homogeneous and heterogeneous reactions with suitable examples, Chain Reactions: definitions and various steps of chain reactions, Catalytic Reactions: different types of catalytic reactions with suitable examples, Autocatalytic reactions , parallel and series reactions,		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	Student will be able to Identify variables affecting the reaction	10	15
Contents	Kinetics of Homogeneous Reactions: Definition and units of reaction rate Variables affecting the rate of reaction, Kinetics of Homogeneous Reactions, Concentration dependent term of a Rate equation, Elementary and Non elementary reaction, Molecularity and Order of reaction, Rate constant K, Representation of a reaction rate, Effect of temperature on rate constant from Arrhenius theory, From Thermodynamic, From Collision theory, and From transition state theory, Comparison of theories, Calculation of Activation energy and frequency factor using Arrhenius theory.		
Method of Assesment	Theory Exam(external)		
Course Outcome 2	Student will be able to Apply various methods to determine the rate expression of different simple reactions.		
Learning Outcome 1	Student will be able to Recognize order of reaction.	12	15
Contents	Reaction rate Mechanism: , Order of reaction: Zero order reaction, First order reaction, Second order reaction, nth order reaction,		

	Methods for determining rate expression: Differential rate expression, Integral rate expression Half life period.		
Method of Assessment	Theory Exam(external)		
Course Outcome 3	Analyze data for Batch reactor with the help of different methods.		
Learning Outcome 1	Calculate and analyze data by different methods under the constant volume condition.	12	15
Contents	Analysis of Batch Reactor Data: Constant volume batch reactor. Differential method of analysis of data, Integral method of analysis data, determination of order of reaction and reaction rate constant for batch reactor data. Numerical problems.		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	Calculate and analysis data by different methods under the variable volume condition	11	20
Contents	Variable volume batch reactor: Differential method of analysis data, Integral method of analysis data, Total Pressure Method of analysis of reactor data, Partial Pressure Method of analysis of reactor data.		
Method of Assessment	Theory Exam(external)		
Course Outcome 4	Develop skill for design and operation of reactors		
Learning Outcome 1	Determine the size for batch reactor, plug Flow reactor and CSTR	11	20
Contents	Introduction to Reactor Design: Ideal reactor, Concept of ideality, Types of chemical reactor, Configuration of reactor and design consideration, Comparison of batch and continuous operation, Concept of Space time Space velocity, holding time, residence time distribution and space volume of reactor Performance equation for batch reactor, Performance equation for CSTR, Performance equation for Plug Flow Reactor (PFR)s, Comparison of CSTR and PFR, Basic concept of Batch, CSTR and PFR for First order reaction, numerical problems on reactor design and comparison		
Method of Assessment	Theory Exam(external)		
Learning Outcome 2	Student will be able to understand concept of combined reactor system.	4	10
Contents	Combined reactor system: CSTR in series& parallel, PFR in series& parallel, CSTR and PFR in series, CSTR and PFR in parallel, numerical problems on combined reactor systems,		

Method of Assessment	Pen Paper test(internal)		
Learning Outcome 3	student will be able to operate different types of reactors.	4	10
Contents	Basic concept of thermal characteristics of reactors, isothermal operations, adiabatic and non adiabatic operations, temperature control in reactors, elementary concept of homogeneous and heterogeneous fixed bed, moving bed and fluidized bed reactors, catalytic and non catalytic reactors.		
Method of Assessment	Pen Paper test(internal)		
Course Outcome 5	student will be able to Identify different types of Catalyst as per need of the reaction processes.		
Learning Outcome 1	student will be able to Identify different types of Catalyst as per need of the reaction processes.	8	15
Contents	Concept of Homogenous and Heterogeneous reaction, Nature , type and mechanism of catalytic reactions, Properties of solid catalyst, Surface Area . Void Volume , Density, Pore Volume Distribution, characteristics of catalysed reation, Catalyst Preparation, determination of catalyst properties, Catalyst ingredients: Catalyst promoter, accelerator, inhibitor and catalyst support, Catalyst deactivation, catalyst poisoning and regeneration		
Method of Assessment	Theory Exam(external)		
Course Outcome 5	student will be able to Identify different types of Catalyst as per need of the reaction processes.		
Learning Outcome 1	student will be able to Identify different types of Catalyst as per need of the reaction processes.	4	10
Content	Theories of catalysis-Adsorption, Intermediate compound formation theory, different steps of solid catalysed reaction and rate controlling step.		
Method of Assessment	Pen Paper test(internal)		

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		<i>C</i>	<i>0</i>	<i>2</i>				<i>1</i>	<i>1</i>	

COURSE NAME	CHEMICAL REACTION ENGINEERING
CO Description	Student will be able to Classify the various types of reaction and identify the variables affecting the rate of reaction.
LO Description	Student will be able to Classify various types of reaction.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Kinetics of Reaction: Introduction, Chemical Kinetics, , theories to explain to chemical reactions: Collision Theory, and Activated complex Theory, Classification of reactions: Homogeneous and heterogeneous reactions with suitable examples, Chain Reactions: definitions and various steps of chain reactions, Catalytic Reactions: different types of catalytic reactions with suitable examples, Autocatalytic reactions , parallel and series reactions	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	5	1	Suggested text book handouts power point	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Theory question related to the learned content will be asked in the exam	15	Question Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				1	2	

COURSE NAME	CHEMICAL REACTION ENGINEERING
CO Description	Student will be able to Classify the various types of reaction and identify the variables affecting the rate of reaction.
LO Description	Student will be able to Identify variables affecting the reaction.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Kinetics of Homogeneous Reactions: Definition and units of reaction rate Variables affecting the rate of reaction, Kinetics of Homogeneous Reactions, Concentration dependent term of a Rate equation, Elementary and Non elementary reaction, Molecularity and Order of reaction, Rate constant K, Representation of a reaction rate, Effect of temperature on rate constant from Arrhenius theory, From Thermodynamic, From Collision theory, and From transition state theory, Comparison of theories, Calculation of Activation energy and frequency factor using Arrhenius theory	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	7	3	Suggested text book handouts power point	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
1	Theory Exam	Theory question related to the learned content will be asked in the test paper	15	Question Paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				2	1	

COURSE NAME	CHEMICAL REACTION ENGINEERING
CO Description	Student will be able to Apply various methods to determine the rate expression of different simple reactions.
LO Description	Student will be able to Recognize order of reaction.

SCHEME OF STUDY

S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Reaction rate Mechanism: , Order of reaction: Zero order reaction, First order reaction, Second order reaction, nth order reaction, Methods for determining rate expression: Differential rate expression, Integral rate expression Half life period.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	9	3	Suggested text book handouts power point	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Theory question (including simple numerical problem) related to the learned content will be asked in the test paper	15	question paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code	Course Code	CO Code	LO Code	Format No. 4
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RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	C	0	2				3	1	Format No. 4
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COURSE NAME	CHEMICAL REACTION ENGINEERING
CO Description	Analyze data for Batch reactor with the help of different methods
LO Description	Calculate and analyze data by different methods under the constant volume condition.

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Analysis of Batch Reactor Data: Constant volume batch reactor. Differential method of analysis of data, Integral method of analysis data, determination of order of reaction and reaction rate constant for batch reactor data. Numerical problems	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	9	3	Suggested text book handouts power point	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Theory exam	Theory question (including simple numerical problem) related to the learned content will be asked in the test paper	20	question paper	External

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				3	2	
COURSE NAME		CHEMICAL REACTION ENGINEERING										
CO Description		Analyze data for Batch reactor with the help of different methods										
LO Description		Calculate and analysis data by different methods under the variable volume condition										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Variable volume batch reactor: Differential method of analysis data, Integral method of analysis data, Total Pressure Method of analysis of reactor data, Partial Pressure Method of analysis of reactor data.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	8	3	Suggested text book handouts power point						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Theory exam	Theory question (including simple numerical problem) related to the learned content will be asked in the test paper	20	question paper			External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					C	0	2				4	1	
COURSE NAME		CHEMICAL REACTION ENGINEERING											
CO Description		Develop skill for design and operation of reactors											
LO Description		Determine the size for batch reactor, plug Flow reactor and CSTR											
SCHEME OF STUDY													
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
1	Introduction to Reactor Design: Ideal reactor, Concept of ideality, Types of chemical reactor, Configuration of reactor and design consideration, Comparison of batch and continuous operation, Concept of Space time Space velocity, holding time, residence time distribution and space volume of reactor Performance equation for batch reactor, Performance equation for CSTR, Performance equation for Plug Flow Reactor (PFR), Comparison of CSTR and PFR, Basic concept of Batch , CSTR and PFR for First order reaction, numerical problems on reactor design and comparison	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	8	3	Suggested text book handouts powerpoint							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal						
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	20	Question paper			External						
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													
Nil													

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME			Branch Code			Course Code			CO Code	LO Code	Format No. 4
					C	0	2				4	2	
COURSE NAME		CHEMICAL REACTION ENGINEERING											
CO Description		Develop skill for design and operation of reactors											
LO Description		Student will be able to understand concept of combined reactor system											
SCHEME OF STUDY													
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks						
1	Combined reactor system: CSTR in series& parallel, PFR in series& parallel, CSTR and PFR in series, CSTR and PFR in parallel, numerical problems on combined reactor systems	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point							
SCHEME OF ASSESSMENT													
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal						
	Paper Pen Test	Theory question related to the learned content will be asked in the test paper	10	Test Paper + Rating Scale			Internal						
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)													
Nil													

RGPV (Diploma Wing) Bhopal	SCHEME FOR LEARNING OUTCOME	Branch Code			Course Code			CO Code	LO Code	Format No. 4
		C	0	2				4	3	

COURSE NAME	CHEMICAL REACTION ENGINEERING
CO Description	Develop skill for design and operation of reactors
LO Description	student will be able to operate different types of reactors

SCHEME OF STUDY

S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks
1	Basic concept of thermal characteristics of reactors, isothermal operations, adiabatic and non adiabatic operations, temperature control in reactors, elementary concept of homogeneous and heterogeneous fixed bed, moving bed and fluidized bed reactors, catalytic and non catalytic reactors.	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point	

SCHEME OF ASSESSMENT

S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required	External / Internal
	Paper Pen Test	Theory question related to the learned content will be asked in the test paper	10	Test Paper + Rating Scale	Internal

ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)

Nil

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				5	1	
COURSE NAME		CHEMICAL REACTION ENGINEERING										
CO Description		student will be able to Identify different types of Catalyst as per need of the reaction processes.										
LO Description		The students will be able Identify the nature and properties of catalytic reactions.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching –Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Extraction: Definition, Difference between leaching & extraction, Comparison with distillation as a separation operation, Fields of application of extraction, Desirable characteristics of solvent for extraction, Selectivity and distribution coefficient with respect to extraction, Representation of ternary system on triangular diagram	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	5	2	Suggested text book handouts power point						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Theory Exam	Theory questions related to the learned content will be asked in the university question paper	10	Question paper			External					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												

RGPV (Diploma Wing) Bhopal		SCHEME FOR LEARNING OUTCOME		Branch Code			Course Code			CO Code	LO Code	Format No. 4
				C	0	2				5	2	
COURSE NAME		CHEMICAL REACTION ENGINEERING										
CO Description		student will be able to Identify different types of Catalyst as per need of the reaction processes.										
LO Description		The students will be able apply the mechanism of catalytic reaction for maximum production.										
SCHEME OF STUDY												
S. No.	Learning Content	Teaching – Learning Method	Description of T-L Process	Teach Hrs.	Pract. /Tut Hrs.	LRs Required	Remarks					
1	Theories of catalysis-Adsorption, Intermediate compound formation theory, different steps of solid catalysed reaction and rate controlling step	Traditional Lecture Method	Faculty will explain learning content. To identify students weakness assignment will be given and accordingly remedial and tutorials will be taken.	3	1	Suggested text book handouts power point						
SCHEME OF ASSESSMENT												
S. No.	Method of Assessment	Description of Assessment	Maximum Marks	Resources Required			External / Internal					
	Pen Paper test	Theory questions related to the learned content will be asked in the test paper	10	Test paper+ rating scale			internal					
ADDITIONAL INSTRUCTIONS FOR THE HOD/ FACULTY (IF ANY)												
Nil												