

Madhav Institute of Technology & Science, Gwalior										
(A Govt. Aided UGC Autonomous & NAAC accredited Institute Affiliated to RGPV, Bhopal)										
Chemical Engineering										
Course Outcome Attainment & Gap Analysis of July - Dec 2021 Semester										
Semester	S. No.	Name of the Course & Code	Course Outcomes		CO Attainment					Corrective Actions
					Direct attainment (%)	Indirect attainment (%)	Overall	Target	Gap	
Semester III	1	Organic Process Technology (170312)	CO1	Explain the processing of natural products	2.1	2.5	2.18	2	-0.18	Seminar Presentation to be taken
			CO2	Describe about microbial processes and edible oil refining process	2	2.3	2.06	2	-0.06	Assignments to be included
			CO3	Elaborate the processes for producing petrochemicals	2	2.5	2.1	2	-0.1	Mini project to be included
			CO4	Characterize polymers and elaborate its production processes.	2.2	1.9	2.14	2	-0.14	Questions with more difficulty level to be included
			CO5	Describe the production processes of fibers	2.3	2.5	2.34	2	-0.34	Quiz to be included
			CO6	Evaluate the different processes from economical aspects	2.1	1.9	2.06	2	-0.06	Case study can be given
	2	Fluid Mechanics (170311)	CO1	Explain the basic fundamentals of fluid statics & fluid flow.	3	2.9	2.98	2.5	-0.48	Application based tutorial to be given
			CO2	Estimate pressure drops, forces acting on bodies & power and head requirements of pumps.	2.8	2.7	2.78	2.5	-0.28	Numerical based tutorial to be given
			CO3	Apply equations of change to various fluid flow systems.	3	2.7	2.94	2.5	-0.44	Application based tutorial to be given
			CO4	Formulate the inter-dependency of various parameters using dimensional analysis.	3	2.9	2.98	2.5	-0.48	Explanation should be given with more illustrations
			CO5	Determine the flow rate through different flow measuring devices.	2.9	3	2.92	2.5	-0.42	Teaching along with experimentation
			CO6	Examine the losses due to friction in pipes and other fluid machinery.	2.6	2.9	2.66	2.5	-0.16	Mini project to be included
	3	Fluid Mechanics Lab (170311)	CO1	Analyze the effects of flow measurement by flow measuring devices.	2.4	1.8	2.28	2.2	-0.08	Skill based project to be given
			CO2	Calculate the degree of error in discharge rate of rotameter.	2.6	2.4	2.56	2.2	-0.36	Practical demonstrations to be given
			CO3	Calculate the coefficient of discharge for venturimeter and orifice meter.	2.4	1.8	2.28	2.2	-0.08	Skill based project to be given

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		CO4	Calculate the coefficient of discharge for rectangular notch.	2.8	1.8	2.6	2.2	-0.4	
		CO5	Calculate the coefficient of discharge for triangular notch.	2.3	1.8	2.2	2.2	0	
		CO6	Calibrate the flow measuring instruments.	2.2	1.8	2.12	2.2	0.08	Practical demonstrations to be given
4	Chemical Engineering Thermodynamics (170313)	CO1	Infer the fundamental concepts of thermodynamics to chemical engineering applications.	2.6	3	2.68	2.6	-0.08	Weekly quizzes to be conducted
		CO2	Explain the first and second laws of thermodynamics with their practical implications.	2.5	3	2.6	2.6	0	Tutorial to be given along with practice problems
		CO3	Analyze the processes involving refrigeration and compression.	2.4	2.8	2.48	2.6	0.12	Analysis based questions to be given
		CO4	Classify the thermodynamic properties of solutions with their relationships.	2.6	2.8	2.64	2.6	-0.04	Tutorial to be given along with practice problems
		CO5	Infer the detail of vapour liquid equilibria and its use in practical situations.	2.5	2	2.4	2.6	0.2	Analysis based questions to be given
		CO6	Analyze the chemical equilibrium with thermodynamics for predicting behavior of reacting systems.	2.4	2.2	2.36	2.6	0.24	Analysis based questions to be given
5	Fluid Particle Mechanics (170314)	CO1	Rephrase the application of Screen Analysis in Industry.	2.8	3	2.84	2.6	-0.24	Tutorial to be given along with practice problems
		CO2	Describe the various methods of size reduction and to list the various principles.	2.4	2.8	2.48	2.6	0.12	Case study can be given
		CO3	Explain the separation techniques and equipments.	2.8	2.8	2.8	2.6	-0.2	Seminar presentation to be included
		CO4	Illustrate the various process like sedimentation, filtration etc.	2.7	3	2.76	2.6	-0.16	Teaching along with experimentation
		CO5	Compare the various conveying devices.	1.9	3	2.12	2.6	0.48	Mini project work to be given
		CO6	Illustrate the fluidization and fluid catalytic process.	2.8	2.8	2.8	2.6	-0.2	Analysis based questions to be given
6	Fluid Particle Mechanics Lab (170314)	CO1	Analyse the effectiveness of a given screen.	3	1.6	2.72	2.2	-0.52	More sessions on virtual labs to be conducted
		CO2	Apply separation technique (sedimentation) to separate a mixture.	2.9	2.3	2.78	2.2	-0.58	More sessions on virtual labs to be conducted
		CO3	Design size reduction ratio, grindability index using ball mill and jaw crusher.	2.6	1.7	2.42	2.2	-0.22	More sessions on virtual labs to be conducted
		CO4	Compute Bond crushing laws using hammer mill.	3	1.8	2.76	2.2	-0.56	More sessions on virtual labs to be conducted

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Semester V	8	Chemical Synthesis Lab (170315)	CO5	Design the plate and frame filter press, and thickener.	2.8	2.2	2.68	2.2	-0.48	More sessions on virtual labs to be conducted	
			CO6	Solve mathematical descriptions of mixing processes.	2.9	1.9	2.7	2.2	-0.5	More sessions on virtual labs to be conducted	
			CO1	Research a specific compound, or a family of compounds, to propose a synthetic route for isolation of this compound.	2	1.1	1.82	2.2	0.38	Application based explanation to be given	
			CO2	Perform advanced manipulations of apparatus relevant to a synthetic chemistry laboratory, use a Schlenk line to synthesize oxygen- and moisture-sensitive products.	2.3	1.8	2.2	2.2	0	Practical demonstrations to be given	
			CO3	Characterize chemical compounds using modern spectroscopic techniques.	2.4	1.5	2.22	2.2	-0.02	Practical demonstrations to be given	
			CO4	Maintain a laboratory notebook following scientific best practices.	2.1	1.9	2.06	2.2	0.14	Practical demonstrations to be given	
			CO5	Communicate findings in a format consistent with the scholarly standards of the chemical sciences.	2.4	1.2	2.16	2.2	0.04	Practical demonstrations to be given	
		CO6	Articulate and follow ethical principles in a scientific context, including professional standards of laboratory practice, the communication of literature research without plagiarism, and the crediting of collaborators	2.4	1.6	2.24	2.2	-0.04	Practical demonstrations to be given		
		1	Chemical Engineering Thermodynamics (170501)	CO1	Infer the fundamental concepts of thermodynamics to chemical engineering applications.	2.6	3	2.68	2.5	-0.18	Tutorial to be given along with practice problems
				CO2	Explain the first and second laws of thermodynamics with their practical implications.	1.6	3	1.88	2.5	0.62	More practice numerical problems to be given
				CO3	Analyze the processes involving refrigeration and compression.	1.9	3	2.12	2.5	0.38	Analysis based questions to be given
				CO4	Classify the thermodynamic properties of solutions with their relationships.	3	3	3	2.5	-0.5	Analysis based questions to be given
				CO5	Infer the detail of vapour liquid equilibria and its use in practical situations.	3	3	3	2.5	-0.5	Analysis based questions to be given
	CO6			Analyze the chemical equilibrium with thermodynamics for predicting behavior of reacting systems.	3	2.6	2.92	2.5	-0.42	Application based tutorial to be given	
	2	Mass Transfer - II (170502)	CO1	Examine the basics of adsorption, leaching, distillation, liquid-liquid extraction & the principle of diffusion underlying them.	2.7	2.4	2.64	2.5	-0.14	Explanation should be given with more illustrations	

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		CO2	Infer the necessary information useful in design of mass transfer equipment.	3	2.4	2.88	2.5	-0.38	More practice numerical problems to be given
		CO3	Analyze the different contacting patterns & Analogies in transfer process.	2.4	2	2.32	2.5	0.18	Explanation should be given with more illustrations
		CO4	Apply the theoretical concepts for solving practical problems.	3	1.8	2.76	2.5	-0.26	Tutorial to be given along with practice problems
		CO5	Interpret the equilibrium data obtained in various mass transfer operations.	2.9	2	2.72	2.5	-0.22	Analysis based questions to be given
		CO6	Propose favourable conditions for a separation to be carried out.	2.5	1.7	2.34	2.5	0.16	Analysis based questions to be given
3	Mass Transfer - II Lab (170502)	CO1	Design calculation of distillation column	2.3	2.6	2.36	2.2	-0.16	More sessions on virtual labs to be conducted
		CO2	Estimation of number of theoretical stages and composition of each plate	1.5	2.2	1.64	2.2	0.56	More sessions on virtual labs to be conducted
		CO3	Analyze the separation by adsorption and design of adsorber	2.4	1.3	2.18	2.2	0.02	More sessions on virtual labs to be conducted
		CO4	Design the spray and packed tower separation by liquid liquid extraction	2.3	1.8	2.2	2.2	0	More sessions on virtual labs to be conducted
		CO5	Analyze the separation by leaching	2.5	1	2.2	2.2	0	More sessions on virtual labs to be conducted
		CO6	Analyze the industrial application of separation equipments in process plant	2.7	1.5	2.46	2.2	-0.26	More sessions on virtual labs to be conducted
4	Chemical Reaction Engineering - I (170503)	CO1	Apply the basic concepts in the analysis of homogenous system and deviation from ideal behavior.	2.5	2.7	2.54	2.5	-0.04	Assignment to be given
		CO2	Explain the different steps in reaction mechanisms and identify the Rate-determining step.	2.4	2.4	2.4	2.5	0.1	Explanation should be given with more illustrations
		CO3	Develop Batch, CSTR, and PFR performance equations from general material balances.	2.4	2.5	2.42	2.5	0.08	Application based tutorial to be given
		CO4	Analyze Non-Isothermal operation in industrial Reactors	1.3	2.8	1.6	2.5	0.9	Explanation should be given with more illustrations
		CO5	Determine conversion, selectivity & yield for Multiple chemical reactions.	2.4	2.9	2.5	2.5	0	More practice numerical problems to be given
		CO6	Discuss the Non-Ideal Behaviour for any flow reactor.	1.5	2.6	1.72	2.5	0.78	Explanation should be given with more illustrations
5	Chemical Reaction Engineering - I Lab (170503)	CO1	Analyze the chemical reactors and reaction systems	2.4	2.3	2.38	2.2	-0.18	More sessions on virtual labs to be conducted
		CO2	Examine the design of experiments	2.1	1.8	2.04	2.2	0.16	More sessions on virtual

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			involving chemical reactors						labs to be conducted
		CO3	Analyze non ideality in real reactors.	2.4	2.2	2.36	2.2	-0.16	More sessions on virtual labs to be conducted
		CO4	Examine the experimental analysis of batch reactor, plug flow reactor and CSTR.	2.4	1.5	2.22	2.22	0	More sessions on virtual labs to be conducted
		CO5	Examine the design and sizing of industrial scale reactor on the basis of kinetic data obtained at lab scale	2.5	1.5	2.3	2.2	-0.1	More sessions on virtual labs to be conducted
		CO6	Interpret the experimental data for useful purposes.	1.9	1.6	1.84	2.2	0.36	More sessions on virtual labs to be conducted
6	Computational Methods in Chemical Engineering (170504)	CO1	Explain mathematical problems as applied to Chemical Engineering.	1.9	2	1.92	2	0.08	Analysis based questions to be given
		CO2	Interpret the engineering data & the features of different numerical methods.	1.2	3	1.56	2	0.44	Tutorial to be given along with practice problems
		CO3	Illustrate the use of numerical methods in Chemical Engineering scenario.	2.7	2.3	2.62	2	-0.62	Tutorial to be given along with practice problems
		CO4	Outline the scope of optimization in chemical processes & use of numerical solution of the ODEs.	3	2.5	2.9	2.5	-0.4	Tutorial to be given along with practice problems
		CO5	Simplify the solution of engineering problems using PDEs & ODEs.	3	2.1	2.82	2.5	-0.32	Tutorial to be given along with practice problems
		CO6	Solve PDEs & ODEs in various physico-chemical systems.	2.6	2.4	2.56	2.5	-0.06	Tutorial to be given along with practice problems
7	Computational Methods in Chemical Engineering Lab (170504)	CO1	Choose between various computational methods to solve a process problem.	2.4	2.2	2.36	2.2	-0.16	More simulation exercises be given
		CO2	Present a contrast between analytical & numerical solutions.	1.3	1.9	1.42	2.2	0.78	More simulation exercises be given
		CO3	Construct functions & codes for different numerical methods.	3	1.7	2.74	2.2	-0.54	More simulation exercises be given
		CO4	Solve ordinary & partial differential equations using the solvers in MATLAB.	1.5	1.4	1.48	2.2	0.72	More simulation exercises be given
		CO5	Analyze the solution of engineering problems using ordinary differential equations.	2.8	2.1	2.66	2.2	-0.46	More simulation exercises be given
		CO6	Make use of numerical integration & interpolation while solving chemical engineering problems	2.3	2.1	2.26	2.2	-0.06	More simulation exercises be given
8	Inorganic Process Technology (170505)	CO1	Explain the basics of heavy and inorganic chemical industry	2.2	2	2.16	2.2	0.04	Explanation should be given with more

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Semester VII			CO2	Relate the importance of different unit operation and different unit processes involved in heavy and inorganic chemical industry	2.2	2.7	2.3	2.2	-0.1	industrial examples Explanation should be given with more industrial examples
			CO3	Develop process flow diagram	2	2.8	2.16	2.2	0.04	Explanation should be given with more industrial examples
			CO4	Analyze the major engineering problems involved in the process	2.9	2.9	2.9	2.2	-0.7	Explanation should be given with more industrial examples
			CO5	Evaluate different types of processes based on the conversion and yield of desirable products	3	3	3	2.2	-0.8	Explanation should be given with more industrial examples
			CO6	Analyze the importance of Fertilizer and cement technology	2.6	2.8	2.64	2.2	-0.44	Explanation should be given with more industrial examples
			CO1	Tell the basics of various unit operations & unit processes.	2.8	2.3	2.7	2.2	-0.5	Topic with practical relevance to be encouraged
	9	Minor Project - I (170506)	CO2	Outline the necessary features to be utilized in undergoing any project work.	2.9	1.5	2.62	2.2	-0.42	Outline of the work to be clearly specified
			CO3	Choose among experimental work, modeling & a combination of both for any problem statement.	2	1.7	1.94	2.2	0.26	Proper guidelines to be given
			CO4	Justify the background for selecting a suitable project title.	2.3	2.7	2.38	2.2	-0.18	Proper guidelines to be given
			CO5	Plan the work in phases for accomplishment of the project objective.	2.4	2.3	2.38	2.2	-0.18	Proper guidelines to be given
			CO1	Describe the industrial activities and fates of industrial contaminants.	3	2.3	2.86	2.5	-0.36	Case studies to be given
	1	Industrial Pollution Prevention & Control (170713)	CO2	Describe the concept of pollution prevention, control and sustainability development	2.7	2.8	2.72	2.5	-0.22	Mini project & presentation to be given
			CO3	Identify the laws and regulations pertained to pollution prevention and control	2.8	2	2.64	2.5	-0.14	Case studies to be given
			CO4	Analyze the significance of different industrial pollution	3	2.5	2.9	2.5	-0.4	Case studies to be given
			CO5	Identify the concepts of air pollution and methods	3	2.7	2.94	2.5	-0.44	Case studies to be given
CO6			Apply the principles of industrial water treatment methods	3	2.4	2.88	2.5	-0.38	Case studies to be given	
CO1			Identify the suitable feedstock and predict	2.9	2.5	2.82	2.5	-0.32	Explanation should be	
2	Petrochemical									

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Technology (170714)									correlated with industry
3	Petroleum Processing Technology (900211)	C02	Describe the various aspects of production of olefin containing gases	2.9	2.5	2.82	2.5	-0.32	Explanation should be correlated with industry
		C03	Identify the various aspects of important intermediate material for petrochemical industries	3	2.6	2.92	2.5	-0.42	Explanation should be correlated with industry
		C04	Analyze the various aspects of cracking and polymerization processes.	2.9	3	2.92	2.5	-0.42	Explanation should be correlated with industry
		C05	Identify the manufacturing methods of importance for petrochemical industries	2.7	3	2.76	2.5	-0.26	Explanation should be correlated with industry
		C06	Identify the concepts of quality and environmental pollution control in petrochemical industries	3	2.3	2.86	2.5	-0.36	Explanation should be correlated with industry
		C01	Explain the chemistry of petroleum and its characterization.	3	1.8	2.76	2.5	-0.26	More HOT questions to be included
		C02	Analyze the petroleum refining and petrochemical processing and current scenario.	3	2	2.8	2.5	-0.3	Relevant video clips can be shown
		C03	Analyze the improvement for the profitability of refining and petrochemical complexes.	3	1.7	2.74	2.5	-0.24	Case studies can be given
		C04	Evaluate the application of advance technologies for petroleum exploration, production and economics of energy sector.	2.7	3	2.76	2.5	-0.26	Analysis based questions to be given
		C05	Analyze the systems for ensuring safe, reliable design and operation of process unit.	2.5	3	2.6	2.5	-0.1	Analysis based questions to be given
		C06	Design the parameters for safe, healthy environment in petrochemical industries.	2.6	2.3	2.54	2.5	-0.04	Assignment to be given
		4	Industrial Safety & Hazards (900223)	C01	Analyze the origin of hazards and fundamental principles of safety	1.9	3	2.12	2
C02	Analyze the issues related to toxicants and minimize the toxicants dose			1.7	3	1.96	2	0.04	Case studies can be given
C03	Explain the fire & explosion hazard and the controlling measurement techniques used in chemical industries			2.9	3	2.92	2	-0.92	Practical illustrations with explanation to be given
C04	Evaluate the professional obligations related to the plant management and maintenance to reduce energy hazard			2.6	3	2.68	2	-0.68	Practical illustrations with explanation to be given
C05	Analyze the risk analysis and plant reliability to reduce the hazard			3	2.9	2.98	2	-0.98	Case studies can be given
C06	Formulate the HAZOP study, event tree analysis and fault tree analysis			2.6	3	2.68	2	-0.68	Assignment to be given

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5	Process Computation Lab (170706)	CO1	Operate and program in MS Excel	1.8	3	2.04	2	-0.04	More simulation exercises be given
		CO2	Construct the flowsheets of chemical process unit.	2.2	1.9	2.14	2	-0.14	More simulation exercises be given
		CO3	Apply mass balance for a process situation using excel.	1.5	2.3	1.66	2	0.34	More simulation exercises be given
		CO4	Apply energy balance for a process situation using excel.	1.5	2.4	1.68	2	0.32	More simulation exercises be given
		CO5	Construct various time changing plots for parameters involved in a process.	1.6	2.1	1.7	2	0.3	More simulation exercises be given
		CO6	Carry out data validation and consolidation in excel.	2	2.2	2.04	2	-0.04	More simulation exercises be given
6	Intellectual Property Rights (100008)	CO1	Imbibe the knowledge of Intellectual Property and its protection through various laws	2.9	2.7	2.86	2.5	-0.36	Practical oriented quizzes to be scheduled
		CO2	Apply the knowledge of IPR for professional development	2.9	3	2.92	2.5	-0.42	Practical oriented quizzes to be scheduled
		CO3	Develop a platform for protection and compliance of Intellectual Property Rights & knowledge	2.6	3	2.68	2.5	-0.18	Practical oriented quizzes to be scheduled
		CO4	Create awareness amidst academia and industry of IPR and Copyright compliance	2.2	2.3	2.22	2.5	0.28	Practical oriented quizzes to be scheduled
		CO5	Deliver the purpose and function of IPR and patenting.	2.2	2.8	2.32	2.5	0.18	Practical oriented quizzes to be scheduled
7	Creative Problem Solving (170708)	CO1	Interpret about contemporary issues in chemical engineering & its allied areas through literature survey.	2.5	2	2.4	2.5	0.1	Case studies can be given
		CO2	Distinguish state of art & relevance of the topic in national & international arena	3	2.5	2.9	2.5	-0.4	Assignment to be given
		CO3	Demonstrate written communication skills	3	2.7	2.94	2.5	-0.44	Case studies can be given
		CO4	Practice in lifelong learning	3	2.4	2.88	2.5	-0.38	Case studies can be given
		CO5	Simplify complex problems in Chemical Engineering	2.5	2.5	2.5	2.5	0	Case studies can be given
		CO6	Summarize different aspects involved in a particular field of study	2.8	2.8	2.8	2.5	-0.3	Case studies can be given

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