INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**MASTER OF TECHNOLOGY in CHEMICAL ENGINEERING**
SEMESTER	**2**
COURSE TITLE	**ADVANCED CHEMICAL ENGINEERING LABORATORY**
COURSE CODE	**01CM0215**
COURSE CREDITS	**2**

Objective:

1 To explore advanced topics in chemical engineering through hands-on experiments

Course Outcomes: After completion of this course, student will be able to:

1 Develop hands-on skills in operating various chemical reactors, advanced analytical techniques, and separation systems

2 Apply sustainable practices such as waste valorization, CO2 capture, and photocatalytic degradation

3 Utilize cutting-edge tools such as spectroscopy, IoT-enabled sensors, AI, and CFD software

4 Enhance problem-solving capabilities by performing life cycle assessments, synthesizing nanomaterials, and evaluating hydrodynamic behaviors

Pre-requisite of course: To have the knowledge of theoretical concepts of chemical reaction engineering

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
0	0	4	0	0	0	50	50

Contents : Unit	Topics	Contact Hours
Total Hours		

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Experiment 1** To Study reaction kinetics using a fixed-bed reactor.	2
2	**Experiment 2** To Perform experiments in a Continuous Stirred Tank Reactor (CSTR) under non-isothermal conditions.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
3	**Experiment 3** To find the use UV-visible spectroscopy to monitor chemical reaction progress.	2
4	**Experiment 4** Explore photocatalytic degradation of pollutants	4
5	**Experiment 5** To Study mass transfer and heat transfer intensification using any chemical reactor process.	4
6	**Experiment 6** To perform experiment with reverse osmosis and pervaporation systems to determine its efficiency.	4
7	**Experiment 7** To Study hydrodynamic behavior in Fluidized bed reactor.	2
8	**Experiment 8** To Synthesize nanoparticles using sol-gel and hydrothermal methods.	2
9	**Experiment 9** To Adsorption Studies on Advanced Materials	2
10	**Experiment 10** To evaluate rheological behavior of polymer solutions.	2
11	**Experiment 11** To Assemble and operate a fuel cell.	2
12	**Experiment 12** To Perform CO2 adsorption experiments on amine-based materials.	4
13	**Experiment 13** To simulate chemical processes for optimization and scale-up.	2
14	**Experiment 14** To use CFD software to model flow and heat transfer in reactors and Validate models with experimental data	4
15	**Experiment 15** To perform FTIR and Raman spectroscopy for chemical analysis.	2
16	**Experiment 16** To convert waste materials into value-added products.	4
17	**Experiment 17** To Perform LCA on a chemical product or process and Evaluate environmental sustainability metrics.	4
Total Hours		**48**

Textbook :

1 Advances in chemical engineering., Drew, T. B., Cokelet, G. R., Hoopes, J. W., & Vermeulen, T., Academic Press, 1981

References:

1 Advances in chemical engineering., Advances in chemical engineering., Nawaz, Z., & Naveed, S., BoD–Books on Demand, 2012

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	30.00	30.00	10.00	0.00

Instructional Method:

1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and class-room

3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory

4 Students will use supplementary resources such as online videos, NPTEL videos, ecourses, Virtual Laboratory

Supplementary Resources:

1 https://archive.nptel.ac.in/courses/103/101/103101001/

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