

STUDENT HAND BOOK

2017



*Department of Chemical and Process Engineering
University of Moratuwa*

Student Handbook -2017

**DEPARTMENT OF CHEMICAL & PROCESS
ENGINEERING
UNIVERSITY OF MORATUWA**

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THE DEPARTMENT OF CHEMICAL & PROCESS ENGINEERING

The Department of Chemical and Process Engineering at University of Moratuwa is one of the premier engineering departments in the country. Being operated with a vision to standardize, optimize and scale up the production processes in a commercially viable manner through sustainable utilization of raw materials, the department has its unique mission to satisfy its objectives.

Vision

Delivering Chemical and Process Engineering knowledge, skills and innovation for a sustainable tomorrow

The department offers the honours degree in Bachelor of Science of Engineering in the field of Chemical and Process Engineering for the undergraduates in fields of minor specialization in Environmental and Energy Engineering, Food and Biochemical

Engineering, Polymer Engineering, and Petroleum Engineering while it also offers programmes for the postgraduates. The M.Sc./ PG Dip. in Polymer Technology and M.Sc./ PG Dip. in Sustainable Process Development are two taught Master's programmes available at the department and it also conducts Research programmes leading to M.Sc., M.Phil., and Ph.D. degrees. The competency and friendliness of academic and academic support staff members, the stimulating atmosphere of the department with well-equipped laboratory facilities and many valuable resources provided for the students, offer the students with a better learning environment to equip students with necessary knowledge and skills required for Chemical and Process Engineering graduates.

Being established in 1972 only with 8 undergraduates, the department proudly demonstrates much evidence for its immense growth during its journey through the years. The number of undergraduate student intake has been increased up to 80 students per batch, and at present the student



body of the Department of Chemical and Process Engineering is consisted with about 320 undergraduates studying at various levels of their Bachelor's degree program, 3 Masters students, 6 M.Phil. students and 9 Ph.D. students.

Research, being an integral part of the curriculum of undergraduate and postgraduate studies, not only boosts the research potential of the students but also benefits the field of Chemical and Process Engineering through the flow of huge contribution of better solutions and innovative ideas into it. The availability of well-functioning laboratory facilities with the well-guided supervision enhances the value of the research activities.

The collaboration of the Department of Chemical and Process Engineering with the industry is also huge. The industry facilitates the department with internship opportunities for the undergraduates, with competent and well-experienced mentors for the mentoring programmes that are being conducted by the department, and to organize field visits for the students in order to enhance the competencies of the undergraduates. The close relationship with the industry facilitates the prospective fresh graduates from the department to find career opportunities with ease. The Department Industry Consultancy Board strengthens the bond between the department and industry while improving the value of the degree programme to mould the proficiency of the future-graduates to fulfill the industrial requirements.

The strong affiliation between the department and industry is beneficial for the industry too. The department offers consultancy services for the industry through various industrial projects and

researches to grant the industry with many valuable innovations and better solutions for the sustainable development of the industry and the country.

Mission

The Department of Chemical and Process Engineering will strive to educate, conduct research and offer consulting services with dedication, devotion and commitment and aim to be a place of excellence through internationally recognized programs for the benefit of the society

The DSI incubator provides proof for the strong bond between the department and the industry. The industry and academic institutes also provide the prospective students of Department of Chemical and Process Engineering with many academic awards and scholarship positions in recognition for their competencies.

The department not only encourages and promotes the students to associate with professional institutes and various societies and associations but also it encourages and facilitates many extra-curricular activities and sports activities, in order to enhance their knowledge and soft-skills as a prospective professional.

The time at the department under the wings of well-qualified and well-experienced academic staff, in a well-established and well-maintained stimulating environment is definitely a career developing and an

exciting experience that every student should encompass.

The Department of Chemical and Process Engineering at University of Moratuwa is a blessing to every aspect as it always strives

to deliver chemical and process engineering knowledge, skills and innovation for a sustainable tomorrow through education, research and consultancy services with dedication, devotion and commitment.

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‘DEAR STUDENTS, WELCOME TO THE CPE FAMILY...’



It is a great pleasure to welcome you to the Department of Chemical and Process Engineering at the University of Moratuwa.

The Department was first established in the Faculty of Applied Sciences at Katubedda campus of University of Ceylon with only 8 students. At the inception great support has been received from the University of Leeds UK under the Moratuwa-Leeds link program and the curricula were developed in line with UK curricula. Later in 1981 the Department has been moved to the Faculty of Engineering with the abolition of the Faculty of Applied Sciences. In 1998 to more accurately reflect the scope of activities and degree offerings, the Department officially changed its name to Chemical and Process Engineering.

Department staff is fully committed for excellence and consists of 23 full-time faculty staff including 4 Professors, 10 Senior Lecturers and 21 non-academic staff members. Present student population at the department is around 400 that include 340 undergraduates, 37 Master

degree (taught) students, 9 PhD, 6 MPhil and 3 MSc research students.

We are very proud of our track record of excellence in teaching and research and offer students extensive hands-on learning, industrial training and research opportunities to enhance and complement our classroom teaching. We regard ourselves as the premier Departments of Chemical and Process Engineering in the country. Up to now department has produced 993 graduates who are employed in local and foreign industries. Many of them are holding esteemed positions. Department has a very close collaboration with local process industries and two industry sponsored incubators have been established to provide research and development facilities. Our staff also provides technical support to the industries in project basis or as consultancies. In addition, department has strong partnerships with foreign universities; has offered undergraduate credit transfer programs, student exchange programs

and jointly offered modules in postgraduate programs.

Our alumni and industrial partners contribute and support for our academic mission. Department-industry consultative board constantly provides valuable advice and insightful recommendations on how best to prepare our students for industrial practice.

Our curriculum has been reviewed several times to be in par with any international degree in Chemical and Process Engineering and also to meet the standards of International accreditation bodies such as Washington Accord and Institute of Chemical Engineers UK. Always our target has been to be nationally relevance and to be globally focused.

Students join the department after following common modules during the first semester. During the second and third semesters students are exposed to fundamental sciences and mathematics underpinning a wide range of process engineering concepts, such as mass and energy balances, thermodynamics, fluid mechanics, heat transfer and materials science. Students are able to learn specialized subjects in Chemical Engineering in semester 4 and 5 before they undergo Industrial Training for about 22 weeks. Analysis, Design applications are the key areas that are covered in semesters 6, 7 & 8.

Process and Plant Design is an important part of any chemical engineering degree and the students are trained over all the semesters to design a detailed Chemical process plant. In the module, Comprehensive Design Project students are entrusted to design a detailed chemical plant in a small group under the close supervision of an academic staff member and this module runs through semester 7 & 8. Further, students are exposed to research environment in the module, Industrial Research

Project which also runs through last two semesters. Both these modules provide plenty of opportunities for the student to put that knowledge gathered in the previous semesters into practice in process plant design and laboratory experimental work.

Students at DCPE have the advantage of studying additional modules to gain deeper knowledge in four focus areas; Food and Biochemical Engineering, Polymer Engineering, Energy and Environmental Engineering or Petroleum Engineering in addition to the option of getting minor specialization in Entrepreneurship.

Students of our department are heavily involved in extracurricular activities and the Chemical Engineering Students Society provides them a platform to improve and showcase their hidden talents. A number of annual events are organized by the society and the student participation in those social and entertainment activities is commendable. Many of our students are involved in sports, have represented University in local and international tournaments bringing glory to the University and becoming University Colours men/women.

We always strive to provide each and every student a very friendly and conducive environment to spend a memorable stay at the department. If you are motivated, target oriented and want to follow an interesting, satisfying and highly rewarding career in engineering, then you are at the right place. While inviting you all to explore the opportunities ahead of you I wish you all the best for your future endeavours in Chemical and Process Engineering.

Dr. (Mrs.) S. H. P. Gunawardena
Head of the Department

WHAT IS CHEMICAL AND PROCESS ENGINEERING?

Chemical and Process Engineering is the profession in which knowledge of Mathematics, Chemistry, Physics, Biology and other Natural Sciences gained by study, experience and practice is applied with judgment to develop economical ways of using materials and energy for the benefit of mankind.

More typically, they turn raw materials into valuable products. The necessary skills encompass all aspects of design, testing, scale-up, operation, control, and optimization. Hence this requires a detailed understanding of the various "unit operations", such as distillation, mixing, evaporation, crystallization and biological processes that make these conversions possible.

It's true that Chemical Engineers are comfortable with Chemistry, but they do much more with this knowledge than just mix and make chemicals. For each and every Chemical and Process Engineering affairs the knowledge of Mathematics, Physics,

Chemistry and Biology are greatly utilizing and these majors are the foundations for Chemical and Process Engineering upturns.

Resting on the above foundations the Chemical and Process Engineering sciences sprout higher and higher utilizing mass, momentum and energy transfers hand railing with Thermodynamics and Chemical Kinetics.

It would be correct to say that the term Chemical in Chemical and Process Engineering refers more towards the knowledge and experience in terms of the applied sciences whereas Process Engineering comprises of the designing, operating, maintaining and optimising of the processes that convert raw materials into finished goods.

The breadth of scientific and technical knowledge inherent in this profession has caused world scientists to describe the Chemical and Process Engineer as the "Universal Engineer".



WHY STUDY CHEMICAL AND PROCESS ENGINEERING?

You should consider a Chemical engineering degree if you want,

- A “Career progression” along with a “Growing global profession”
- To make “Money” from your own passion of engineering, technological or management.
- To “Make a difference” not only on your economical, mental and career satisfaction but to satisfy the society’s aspires and necessities
- A large manifold of “Occupations” with a “Diverse” professional experiences in a “Highly rated working environments”
- To “Travel the world” to “Express your lifestyle”
- To “Proof over recessions”



CAREER OPPORTUNITIES FOR CHEMICAL AND PROCESS ENGINEERING GRADUATES

There are a countless number of industries where Chemical and Process Engineering is used in. As examples petroleum and petrochemical industries, mineral processing, advanced materials, food and beverage processing, pharmaceutical, biotechnological industries, polymer industries, ceramic industries, electronic base industries and much more. Chemical and Process engineering works hold in hands with fellow engineering disciplines such as mechanical, electrical and electronics, civil and material science.

The broad basis of their scientific, engineering, technological and management education upgrade the applications of the Chemical and Process Engineering skills in any other sister fields such as business, supply chain, process analysis, health and safety and etc. which are not seem like a trafficator of chemical and Process Engineering evolution.

Chemical Engineers might expect to work in,

- **Chemical, petroleum and petrochemical industries**
- **Environmental protection and Natural resource utilization**
- **Renewable Energy Engineering**
- **Food and beverage processing**
- **Biochemical and biomedical engineering**
- **Processing of electronic and photonic devices**
- **Polymer Engineering**
- **Computer aided process and Control Engineering**
- **Advanced materials manufacturing industries**
- **Ceramic Industries**
- **Textile industries & etc.**

THE JOURNEY OF DCPE

The Department of Chemical Engineering, being established by gazette notification on 15th February 1972 at Katubedda Campus of University of Ceylon, had its roots in the Junior Technical Officer's course conducted by the Maradana Technical College. Initially the degree programme was termed as Chemical Engineering and Fuel Science offering the undergraduates with the degree of Bachelor of Applied Science (B. A. Sc.), which altered into Bachelor of Science of Engineering in 1980.

Being initiated with only 8 students per batch, at present the Department of Chemical and Process Engineering has been progressed to offer the students with the undergraduate degree programme in Chemical and Process Engineering for 90 students per batch of each intake to the University of Moratuwa.

Currently, the undergraduate course curriculum has expanded with several minor specialization fields for Environmental and Energy Engineering, Food and Biochemical Engineering, Polymer Engineering and

Petrochemical Engineering in order to equip the students with necessary knowledge required for a prospective professional to understand and appreciate the role of a Chemical and Process Engineer in an economy for the sustainable growth.

The continuous growth of well-qualified human resource factor, well-structured course curriculum, well-equipped and well-functioning laboratory facilities, and other supporting resources ensures the improving standard of the internationally recognized programmes delivering best professionals.

The department is also improving the bond with the industry during its journey. The internships offered for the undergraduates, the huge career opportunities available for the fresh graduates, the abundance of resource persons for mentoring programmes, the facilitators for field visits, the established incubators at the department by the pillars in the industry, and the huge amount of consultancy services required from the department stand proof for the success of the department.

1972	<ul style="list-style-type: none"> ▪ Establishment of the Department of Chemical Engineering at the Katubedda Campus of University of Ceylon ▪ Inauguration of the Department of Chemical Engineering under the Applied Science Faculty offering the Degree of Bachelor of Applied Science (B.A.Sc.) 8 students per batch only were offered with the Degree
1976	<ul style="list-style-type: none"> ▪ Graduation of the 1st batch of students from the department
1981	<ul style="list-style-type: none"> ▪ Introduction of the Bachelor of Science of Engineering (B.Sc. Engineering) Degree

	<ul style="list-style-type: none"> ▪ The students under E II category were given the opportunity to select Chemical, Material or Mining Engineering fields depending on their 1st year performance in which common subjects were offered to all Engineering disciplines
1986	<ul style="list-style-type: none"> ▪ Introduction of M.Sc. course in Polymer Technology as a full-time course
1990	<ul style="list-style-type: none"> ▪ Introduction of Polymer Engineering subject to the Chemical Engineering undergraduate curriculum for Final Part III
1991	<ul style="list-style-type: none"> ▪ Increment of the student intake up to 15 students per batch ▪ Introduction of the subject 'Unit Operation' to the Part I Chemical Engineering Curriculum
1992	<ul style="list-style-type: none"> ▪ Inauguration of Chemical Engineering Society
1993	<ul style="list-style-type: none"> ▪ Conducting the three-day open day programme "Making the future happen" at department premises and the first issue of 'Chemunique' magazine ▪ Conversion of the fulltime M. Sc. Course in Polymer Technology to a part time course
1994	<ul style="list-style-type: none"> ▪ Introduction of the optional subjects Environmental Engineering, Biochemical Engineering and Food Process Engineering to the Chemical Engineering curriculum ▪ Increment of the student intake up to 20 students per batch
1998	<ul style="list-style-type: none"> ▪ Alteration of the title of the Chemical Engineering Department to Department of Chemical and Process Engineering
1999	<ul style="list-style-type: none"> ▪ Increment of the student intake up to 30 students per batch
2000	<ul style="list-style-type: none"> ▪ Initiation of student intake under a common 'Engineering' category Eliminating the E II stream ▪ Conversion of the course curriculum to semester system from session examinations systems ▪ Offering of specialization in the field of Chemical and Process Engineering for chosen undergraduates by their Level I academic performance ▪ Introduction of four fields of minor specialization namely, Food & Biochemical Engineering, Environmental Engineering, Energy Engineering and Polymer Engineering ▪ Increment of the student intake up to 50 students per batch
2001	<ul style="list-style-type: none"> ▪ Initiation of Masters programme in Chemical and Process Engineering with a first batch of 09 students
2004	<ul style="list-style-type: none"> ▪ Inauguration of Chemical Engineering Student Society (ChESS) ▪ Revision of the course curriculum
2005	<ul style="list-style-type: none"> ▪ Re-establishment of the Prof. Hubert Silva Memorial Resource Centre ▪ Receive of the IRQUE fund ▪ Agreement with Hayleys Group to sponsor the annual Gold medal for the best Chemical and Process Engineering Student
2006	<ul style="list-style-type: none"> ▪ Foundation stone was laid for the new Chemical Engineering Centre ▪ Obtaining new equipment under IRQUE grants
2007	<ul style="list-style-type: none"> ▪ Initiation of Masters programme in Chemical and Process Engineering with a first batch of 12 students in collaboration with Telemark University College, Norway

	<ul style="list-style-type: none"> ▪ Initiation of offering of M.Sc. scholarships for Chemical & Process Engineering students
2008	<ul style="list-style-type: none"> ▪ Graduation of first Ph.D. holder ▪ Signing of agreements with NCPC & Cargills ▪ Declaring of Opening of Chemical and Process Engineering Centre ▪ Inauguration of Scholarships Programme in Chemical and Process Engineering for students who have economic difficulties
2009	<ul style="list-style-type: none"> ▪ Establishment of first food and process development incubator in Sri Lanka ▪ Establishment of a partnership with Polip to Company – petrol from waste plastics
2010	<ul style="list-style-type: none"> ▪ Increment of the student intake further up to 80 students per batch ▪ Chosen undergraduates were offered with field specialization in Chemical and Process Engineering from Semester II onwards ▪ Combination of minor specializations of Energy Engineering and Environmental Engineering reducing the minor specializations down to three ▪ Receive of accreditation by the IChemE for the undergraduate degree programme ▪ Receive of accreditation by the IESL for the undergraduate degree programme
2011	<ul style="list-style-type: none"> ▪ Establishment of SIL-UOM Rubber Products and Process Development Incubator at the Department
2014	<ul style="list-style-type: none"> ▪ Initial credit student transfer of 5 undergraduate students from Telemark University College, Norway

ACADEMIC STAFF MEMBERS

The well-qualified and dynamic group of academic staff of the department is the foremost treasure of the department who builds the professionals from the undergraduate's ready for challenges beyond university life. They provide the students with theoretical, technological and industrial strengths supporting the students' outlook towards industry. The academic staff members of the Department of Chemical and Process Engineering always

strive to develop the department as a place of excellence for the students.

Having a high recognition among the academic community for their contributions towards the betterment of the field, as educators of the chemical and process engineering discipline, the staff members are easily approachable and are ever willing to address student issues, whatever they may be.

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Mr. Dammika Wijesinghe
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UNDERGRADUATE DEGREE PROGRAM

Graduate Program Outcomes Profile

1. **Engineering Knowledge:** Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
3. **Design/ development of solutions:** Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4. **Investigation:** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5. **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.
6. **The Engineer and Society:** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
7. **Environment and Sustainability:** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.
9. **Individual and Team work:** Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10. **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.
11. **Project Management and Finance:** Demonstrate knowledge and understanding of 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.

- 12. Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadcast context of technological change.

Program Educational Objectives

1. To produce graduates who pursue challenging careers, with skills to analyze and provide solutions in energy, environmental, food, polymer and other related industries and emerging areas with an appreciation of the role of Chemical Engineering in the society.
2. To produce graduates who pursue advanced studies in Chemical Engineering and related disciplines.
3. To create engineering leaders with a global focus, displaying entrepreneurship skills.

Students are selected to follow the B.Sc. in Chemical and Process Engineering (CPE) course based on their performance in semester I examination and their individual preferences. Until 2009, student intake was restricted to 50, which has been increased to 80 in 2010. This was further expanded to 90 in 2013. Currently the department of Chemical and Process Engineering offers four minor specialization streams after completion of their sixth semester, namely;

- Energy and Environmental Engineering
- Food and Biochemical Engineering
- Polymer Engineering
- Petroleum Engineering

Students have the option of following the Chemical and Process Engineering degree program by selecting subjects without any minor stream specialization.

The Department degree program is regularly being revised and renovated under collaborative effort by the academic and industrial personal with the objective of creating highly skilled graduates who meet the needs and demands in both the industry and the academia. Students have the liberty of approaching the department professionals at any time for acquiring necessary knowledge and skills during their stay in the department.

Graduation Credit Requirement

Semester	GPA Credits Normal	Non-GPA Credits
Semester 1	15	1
Semester 2	21.5	-
Semester 3	18.5	-
Semester 4	21	-
Semester 5	19	-
Industrial Training	-	6
Semester 6	5	5
Semester 7	18	-
Semester 8	17	1

Normal Minimum Credit Requirement

* Total of 2 credits to be taken from optional modules in any semester.

Overall GPA credits	135
Overall Non-GPA credits	13

Semester Coordinators

Academic level	Coordinator
Semester 1 (Dept. Coordinator)	Dr. (Mrs.) H. L. T. U. Ariyadasa
Semester 2	Dr. A.D.U.S. Amarasinghe
Semester 3	Dr. (Mrs.) S.H.P. Gunawardena
Semester 4	Dr. P.G. Rathnasiri
Semester 5	Dr. (Mrs.) S.M. Egodage
Industrial Training & Semester 6	Mr. T. Dodangoda & Mrs. J.D. Wagaarachchige
Semester 7	Dr. S. Walpalage
Semester 8	Dr. M. Narayana

Teaching and Learning

The knowledge is transferred to the students through a range of learning and teaching activities to fulfil the course objectives. Clearly defined assessment methods are used to measure student's success in meeting course objectives. Course outline consisting Subject Coordinator, Lecturers, Pre-requisites, Course Objective, Learning Outcome, Tentative Course Outline, Method of Grading, Recommended Text Books and Selected References for each module is distributed for students at the first lecture of the module.

With the recently established outcome based education system (OBE), traditional lecture based teaching and learning system have been diverted to a more student-centred system. Modules are taught through a combination of lectures, practical classes, tutorials, discussions, question and answer sessions, quizzes and take-home assignments. These methods are clearly defined for each module with the learning outcomes of the individual subjects and have been modified such that the student is in an active learning process with more classroom interactions. Subject specific theories, fundamentals and concepts are delivered through lectures, aided by one or combination of; black/white board, overhead projector, multimedia, printed lecture notes and many other learning activities. Students learn by listening, seeing, taking down notes and by discussion. Lecture notes and additional resources are uploaded in Learning Management System (LMS), which is the latest IT based learning environment in University of Moratuwa. Students can access LMS through the following web address.

URL: www.online.mrt.ac.lk

Use of mobile phones is not allowed within the lectures.

Practical classes carried out in groups, 2-5 students per group, under the guidance of a

lecturer and/or an instructor to develop data recording, calculation, analysis and interpretation skills. Tutorials encourage student centred learning towards application of theories to solve chemical engineering problems. Model answers for the tutorials are provided for self-learning.

Assignments, case studies and literature surveys develop a range of skills such as information gathering, identifying lessons and time management. Group or individual activities are introduced to enhance the student interaction with the classroom while maintaining a lively learning process. Group or individual presentations at the end of selected assignments are a means of developing presentation skills from the lecturer's and the colleagues' feedback.

Industrial visits are arranged to enunciate the practical applications of theories that are taught during the degree program.

The engineering product design experience is a vital element in engineering education. Students are encouraged to develop a prototype of the designed product, enhancing group learning and innovation. Final year design project allows students to apply their gathered knowledge during first three years in the university to conceptually design a process plant. A group consisting of 4-5 students, works collectively to design the flow sheet, material and energy balances, etc. for the plant encouraging development of skills in teamwork and leadership while the individual design promotes self-design capabilities.

Six months industrial training period at the end Semester 5 enables students to experience in-plant work in an area of their

preference within the CPE programme. The students develop management skills in addition to the chemical engineering disciplines. Continuous assessment of the training progress is done under the guidance of the Director of the Department of Industrial Training. A student guide for training and training report preparation is available for the student. An E-portal containing information for students which can be accessed through Departmental intranet is in operation. This facility is expected to enhance student's self-learning abilities.

Examination and Assessment Strategy

The performance of each student is evaluated by continuous assessments and end of semester examinations.

Continuous Assessment:

Semester 1 – Minimum 20%

Semester 2 onwards – Minimum 30% and not more than 60%

(Course work, Assignments, Term paper, Quizzes, Viva and Mid-Semester exams)
Examinations:

Semester 1 – Maximum 80%

Semester 2 onwards – Maximum 70%

All candidates should obtain at least 35% of the continuous assessment and the written examination at all levels to pass a module. This is a University requirement applicable for all modules.

The completed assignments must be submitted to the lecturer on the dates of submission as detailed in the assignments. Late submissions will be compensated with reduction of marks.

Students having prolonged illnesses may provide medical reports through the Medical Officer of the university or an equally qualified doctor. Arrangements can be made through negotiation with the lecturer in person to submit assignments. Students having disabilities are encouraged to discuss with the semester coordinates and subject coordinators to make necessary arrangements.

Industrial Training is coordinated and assessed jointly by the DCPE, Industrial training division of UOM and NAITA. The students are partly assessed while undergoing training and any improvement needed to obtain a better training is encouraged at this instance. The student is assessed based on the report submitted at the end, the diary maintained during the training period and a viva assessment.

The final year Comprehensive Design Project is assessed by the report submitted by the group on the collective design and the individual design by each student.

The marks are displayed on the notice board and the students are given a chance to apply for re-correction. The re-correction application is also allowed for continuous assessment results displayed on the notice board before the end of the semester.

Depending on the credits earned by the student for each module, an Overall Grade Point Average (GPA) is calculated. Each student is awarded a class at the completion of all the graduation requirements within five academic years. A documentation manual consists of curriculum and syllabi, assessment methods and other relevant information on UG programme is available in the Department.

Curriculum

The following description is followed.

- C - Core Modules
E - Elective Modules
O - Optional Modules

Module Code	Module Name	Category	Lectures hrs/week	Lab/Assignments hrs/weeks	Credits		Norm		Evaluation	
					GPA	NGPA	GPA	NGPA	CA%	WE%
Semester 1										
MA1013	Mathematics	C	3.0	1/1	3.0	-	15.0	1.0	20	80
CS1032	Programming Fundamentals	C	2.0	3/1	3.0	-			20	80
ME1032	Mechanics	C	2.0	3/4	2.0	-			20	80
MT1022	Properties of Materials	C	2.0	3/4	2.0	-			20	80
CE1022	Fluid Mechanics	C	2.0	3/4	2.0	-			20	80
EE1012	Electrical Engineering	C	2.0	3/4	2.0	-			20	80
EL1012	Language Skill Enhancement I	C	-	3/1	1.0	-			20	80
MN1012	Engineering in Context	C	1.0	-	-	1.0			30	70
Total for Semester 1							15.0	1.0		
Semester 2										
CH1070	Chemistry for Engineers	C	2.0	3/2	2.5		19.5	-	30	70
CH1060	Process Engineering Fundamentals	C	2.0	3/1	3.0				40	60
CH1050	Fundamentals of Engineering Thermodynamics	C	2.0	3/2	2.5				30	70
MT2802	Material Science	C	2.0	3/2	2.5				30	70
ME1090	Engineering Drawing & Computer Aided Modelling	C	2.0	3/1	3.0				100	-
MA1023	Methods of Mathematics	C	3.0	1/1	3.0				30	70
EN1802	Basic Electronics	C	2.0	3/4	2.0				30	70
EL1022	Language Skill Enhancement II	C	-	3/1	1.0				30	70
DE2xxx	Humanities Elective I	E	-	-	2.0		2.0	-		
MN1030	Entrepreneurship Skill Development (continuing)	O	0.5	3/2	-	1.0	-	1.0	70	30
Total for Semester 2							21.5			

*Total of 2 credits to be taken from optional modules in any semester

Module Code	Module Name	Category	Lectures hrs/week	Lab/Assignments hrs/weeks	Credits		Norm		Evaluation	
					GPA	NGPA	GPA	NGPA	CA%	WE%
Semester 3										
CH2100	Fluid Dynamics	C	2.5	3/1	3.5		18.5		40	60
CH2090	Chemical Kinetics and Thermodynamics	C	3.0	3/2	3.5				30	70
CH2120	Biological Science Fundamentals	C	2.0	3/2	2.5				30	70
CH2130	Polymer Science and Technology	C	2.0	3/2	2.5				30	70
CH2140	Environmental Science and Technology	C	2.0	3/2	2.5				30	70
MA2013	Differential Equations	C	2.0	-	2.0				30	70
MA2023	Calculus	C	2.0	-	2.0				30	70
MN1030	Entrepreneurship Skill Development (continuing from S2)	O	0.5	3/2	-	1.0	-	1.0	70	30
Total for Semester 3					18.5		18.5			
Semester 4										
CH2024	Unit Operations I	C	3.0	3/1	4.0		19.0		40	60
CH2150	Particle Technology	C	3.0	3/2	3.5				40	60
CH2014	Heat and Mass Transfer	C	3.0	3/1	4.0				40	60
CH2110	Fuel Science and Combustion Technology	C	3.0	3/2	3.5				40	60
MA2033	Linear Algebra	C	2.0	-	2.0				30	70
MA3023	Numerical Methods	C	2.0	-	2.0				30	70
DE2XXX	Humanities Elective II	E	-	-	2.0		2.0			
MN 2010	Entrepreneurial Leadership	O	1.5	3/2	2.0				50	50
Total for Semester 4							21.0	0.0		

*Total of 2 credits to be taken from optional modules in any semester

Module Code	Module Name	Category	Lectures hrs/week	Lab/ Assignments hrs/weeks	Credits		Norm		Evaluation	
					GPA	NGPA	GPA	NGPA	CA %	WE %
Semester 5										
CH3143	Reactor Engineering	C	3.0	3/2	3.5		19.0		40	60
CH3060	Plant and Equipment Design I	C	4.0	3/2	4.5				40	60
CH3054	Energy Efficiency and Conservation	C	2.0	3/2	2.5				40	60
CH3044	Plant Safety and Loss Prevention	C	2.0	3/2	2.5				40	60
MN3052	Industrial Management & Marketing	C	2.5	3/2	3.0				30	70
MN3042	Business Economics & Financial Accounting	C	3.0	-	3.0				30	70
MA3013	Applied Statistics	O	2.0	-	2.0				30	70
MN3010	Multidisciplinary Design, Innovation and Venture Creation	O	1.5	3/2	2.0				50	50
Total for Semester 5							19.0	0.0		
Industrial Training										
CH3993	Industrial Training	C	-	-		6.0		6.0		
Total for Industrial Training								6.0		
Semester 6										
CH3070	Plant and Equipment Design II	C	1	3/1	2.0		5.0		40	60
CH3080	Computer Aided Chemical Engineering	C	1	6/1	3.0				100	
CH3950	Technical Report Writing and Presentation Skills	C	1	6/1		3.0		5.0	100	
CH3900	Research Methodology	C	1	3/1		2.0			100	
Total for Semester 6							5.0	5.0		

**Total of 2 credits to be taken from optional modules in any semester*

Module Code	Module Name	Category	Lectures hrs/week	Lab/ Assignments hrs/weeks	Credits		Norm		Evaluation	
					GPA	NGPA	GPA	NGPA	CA %	WE %
Semester 7										
CH4015	Comprehensive Design Project I	C	1.0	6/1	3.0		17.0		100	
CH4025	Process Modelling & Simulation	C	1.5	3/1	2.5				40	60
CH4050	Unit Operations II	C	3.0	3/2	3.5				40	60
MN4022	Engineering Economics	C	2.0	-	2.0				30	70
CH4214	Environmental Engineering and Management	E	3.0	3/1	4.0		4.0		40	60
CH4224	Food and Bio Processing	E	3.0	3/1	4.0				40	60
CH4234	Polymer Processing Operations	E	3.0	3/1	4.0				40	60
ER4810	Petroleum Geology	E	1.5	3/2	2.0				30	70
CH4350	Upstream Processing of Crude Petroleum	E	1.5	3/2	2.0				30	70
CH4330	Process Design and Integration	E	1.5	3/2	4.0				40	60
CH4730	Research Project** (continued in S8)	O	-	6/1	-				-	-
MN4062	Organization Behaviour & Management	O	2.0	-	2.0				30	70
MA4023	Operational Research	O	3.0	-	3.0				30	70
MN4030	Strategic Enterprise Management	O	1.5	3/2	2.0				40	60
MN3020	Entrepreneurship Business Basics	O	2.0	3/1	3.0				50	50
MN 4150	Project Management	O	2.0	-	2.0				50	50
Total for Semester 7							18.0	0.0		

Module Code	Module Name	Category	Lectures hrs/week	Lab/ Assignments	Credits		Norm		Evaluation	
					GPA	NGPA	GPA	NGPA	CA%	WE%
Semester 8										
CH4034	Comprehensive Design Project II	C	1.0	12/1	5.0		9.0		100	
CH4044	Process Dynamics and Control	C	3.0	3/1	4.0				40	60
MN4900	Professional Ethics	C	1.0	-		1.0		1.0	100	0
CH4244	Clean Technology	E	3.0	3/1	4.0		8.0		40	60
CH4254	Renewable Energy Engineering	E	3.0	3/1	4.0				40	60
CH4264	Polymer Engineering and Mould Design	E	3.0	3/1	4.0				40	60
CH4274	Design of Polymer Products	E	3.0	3/1	4.0				40	60
CH4284	Food Engineering and Hygienic Plant Design	E	3.0	3/1	4.0				40	60
CH4390	Biochemical Engineering	E	3.0	3/1	4.0				40	60
CH4340	Natural Resource Process Engineering	E	3.0	3/1	4.0				40	60
CH4360	Downstream Processing of Oil, Gas & Petrochemicals	E	3.0	3/1	4.0				30	70
CH4370	Petroleum Process Operations, Economics, and Law	E	3.0	3/1	4.0				30	70
CH4730	Research Project** (continuing from S7)	O	-	6/1	2.0					
MN4122	Human Resource Management and Industrial Relations	O	2.0	-	2.0		30	70		
MN4042	Technology Management	O	2.0	-	2.0		30	70		
MN4112	Production and Operations Management	O	2.0	-	2.0		30	70		
MN4072	Small Business Management & Entrepreneurship	O	2.0	-	2.0		30	70		
MN4170	Global Entrepreneurship	O	1.5	3/2	2.0		40	60		
MN4010	Business Plan Development	O	1.5	3/2	2.0		70	30		
MA4013	Linear Models and Multivariate Statistics	O	3.0	-	3.0		30	70		
MN4800	Supply Chain Management	O	2.0	-	2.0		40	60		
Total for Semester 8							0.0	17.0	1.0	
To be taken from Optional Modules (Any Semester)								2.0		
Minimum Requirement for Graduation (Total of 150 credits)								135.0	13.0	

Requirements for Focus Areas

Focus Area	Subject Code	Name	Credits
Energy and Environmental Engineering	CH4214	Environmental Engineering and Management	4
	CH4244	Clean Technology	4
	CH4254	Renewable Energy Engineering	4
Food and Biochemical Engineering	CH4224	Food and Bio Processing	4
	CH4284	Food Engineering and Hygienic Plant Design	4
	CH4390	Biochemical Engineering	4
Polymer Engineering	CH4234	Polymer Processing Operations	4
	CH4264	Polymer Engineering and Mould Design	4
	CH4274	Design of Polymer Products	4
Petroleum Engineering	ER4810	Petroleum Geology	2
	CH4350	Upstream Processing of Crude Petroleum	2
	CH4360	Downstream Processing of Oil, Gas & Petrochemicals	4
	CH4370	Petroleum Process Operations, Economics, and Law	4

Requirements for Entrepreneurship Minor

Students following the Chemical and Process Engineering program can obtain a minor in entrepreneurship by fulfilling following subject requirements.

Module Code	Module Name	Category	Lectures hrs./week	Lab/ Assignments hrs./weeks	Credits		Norm		Evaluation (%)	
					GPA	NGPA	GPA	NGPA	CA %	WE%
MN1030	Entrepreneurship Skill Development	C	1.0	3/1		2.0		2.0	70	30
MN2010	Entrepreneurial Leadership	C	1.5	3/2	2.0		2.0		50	50
MN3010	Multidisciplinary Design, Innovation and Venture creation	C	1.5	3/2	2.0		2.0		50	50
MN3020	Entrepreneurship Business Basics	C	2.0	3/1	3.0		3.0		50	50
MN4010	Business Plan Development	C	1.5	3/2	2.0		2.0		70	30
MN4022	Engineering economics	E	2.0	-	2.0				30	70
MN4030	Strategic Enterprise Management	E	1.5	3/2	2.0		2.0		40	60
MN4042	Technology Management	E	2.0	-	2.0				30	70
MN4112	Production and Operations Management	E	2.0	-	2.0				30	70
MN4170	Global Entrepreneurship	E	1.5	3/2	2.0				40	60

Modules Offered to Other Fields of Specialization

Module Code	Module Name	Category	Lectures hrs./week	Lab/ Assignments hrs./weeks	Credits		Evaluation (%)		
					GPA	NGPA	CA%	WE%	
Semester 4									
CH2803	Process Engineering	E	1.5	3/2	2.0		30	70	
Semester 8									
CH4350	Petroleum Refining and Petrochemical Industry	E	1.5	3/2	2.0		30	70	

Modules

Semester II

Module Code	CH1070	Module Title	Chemistry for Engineers			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u> After completing this module, the students should be able to; <ul style="list-style-type: none">• LO1 - <i>Identify</i> fundamentals of chemistry including atomic structure, chemical bonding and chemical & physical properties of substance• LO2 - <i>Describe</i> principles of electrochemistry to evaluate the interaction between electrical energy and chemical charge• LO3 - <i>Describe</i> concepts of organic chemistry to identify different organic reaction mechanisms• <i>Describe</i> principles of natural product chemistry for manufacturing key industrial chemicals• LO4 -<i>Apply</i> analytical chemistry knowledge in chemical compounds' quantitative analysis• LO5 - <i>Identify</i> properties of solutions and calculate the solubility product constant• LO6 - <i>Apply</i> fundamentals of chemical equilibria for predicting the spontaneity of reactions						
<u>Outline Syllabus</u> <ul style="list-style-type: none">• Atomic Structure and Chemical bonding: Atomic structure, Chemical Structure, Shapes of molecules• Properties of Solids and Liquids: Intermolecular and intra-molecular interactions, Physical Properties• Properties of Gases: Gas laws, Ideal gas equations, Gas mixtures and partial pressures, Kinetic molecular theory, Molecular effusion and diffusion, Real gases• Phase Equilibria: Definitions of phase, Component and degrees of freedom, Phase rule and its Derivations, Definition of phase diagram, Phase equilibria for one component system Liquid vapor equilibrium for two component systems, Three component systems• Properties of Solutions: Factors affecting solubility, solubility constant• Chemical Equilibria: Criteria of thermodynamic equilibrium, Exoergic and endoergic reactions, Equilibrium constants and their quantitative dependence on temperature, Pressure and concentration, Free energy of mixing and spontaneity, Relations of various equilibrium constants• Acid base Equilibria: Strengths of acids and bases, Ionization of weak acids and bases, Ionization constants, Ionic product of water• Electrochemistry: Quantitative aspects of Faraday's laws of electrolysis, Rules of oxidation/reduction of ions based on half-cell potentials, Chemical cells, Nernst equation; Standard electrode potential• Applied Organic Chemistry and Reaction Mechanisms: Organic Compounds, Types of organic reactions and their mechanisms, The use of organic reaction mechanisms in industrial applications• Analytical Chemistry: Quantitative and qualitative analysis, Sampling, Sample preparation and choice of analytical method, Chromatographic techniques; GC, HPLC, Spectrometric methods; IR, UV/visible• Natural Products and Industrial Applications: Classification of natural products on the basis of chemical structure and their applications						

Module Code	CH1060	Module Title	Process Engineering Fundamentals			
Credits	3.0	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Select unit operations necessary for a given process• LO2 - Identify resources required for a process based on internal and external constraints• LO3 - Select the best solving method of material balance for a given subsystem• LO4 - Estimate resource requirements and process parameters using material and energy balance• LO5 - Explain the importance of the steps associated with the process scaling up applying to the chemical and process industry• LO6 - Choose the appropriate utility type for a given process.• LO7 - Develop a process flow sheet						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Process Engineering• Natural resources: Sources of materials; materials from geosphere, hydrosphere atmosphere and biosphere; Sources of energy- renewable and nonrenewable• Process Development: Concept of process development, design constraints, steps involved in process design• Unit Operations: Definitions and applications of different unit operations• Flow sheeting: types of diagrams, instrument identification• Material Balance: Balances for non-reacting systems and reacting systems with single and multiple reactions• Energy Balance: Balances for non-reacting systems and reacting systems with single and multiple reactions• Utilities and instrumentation: Steam production and distribution, types of boilers and steam traps, cooling water and tower, air compressors, positive displacement and dynamic pumps, types of valves, pipes and piping						

Module Code	CH1050	Module Title	Fundamentals of Engineering Thermodynamics			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 - Describe first and second laws of Thermodynamics
- LO2 - Recognize connections between thermodynamics tools and process engineering
- LO3 - Explain the concept of thermodynamic process and describe the different types of processes
- LO4 - Estimate heat and work quantities and thermal efficiency and the difference between various forms of energy
- LO5 - Evaluate and distinguish thermal energy conversion in engineering cycles and devices
- LO6 - Apply thermodynamics for energy balance and designing of processes

Outline Syllabus

- **Introduction to Engineering Thermodynamics:** The anatomy of thermodynamics, Thermodynamic equilibrium and equilibrium state, Reversible processes
- **The First Law of Thermodynamics:** Internal energy, Enthalpy, Heat capacity, Application of first law for open systems
- **Behavior of Fluids:** PVT behavior of fluids, Ideal gas, Compressibility factor
- **The Second Law of Thermodynamics:** Heat engines and Carnot cycle, Ideal gas Carnot cycle, Absolute temperature scale, Entropy function, Entropy and spontaneity of natural processes, Entropy change, Introduction to open systems, Applications of second law, The third law of thermodynamics
- **The Thermodynamic Network:** Free energy functions, Clausius inequality and the fundamental equation, Thermodynamic network, Measurable quantities, Calculation of Enthalpy (H) and Entropy (S) as functions of P and T
- **Heat Effects:** Computational path, Heat effect due to change of Temperature and Pressure, Heat effect due to change of Phase, Mixing heat effect, Enthalpy concentration diagrams, Heat of formation in solution
- **Thermodynamics of Pure Substances:** Phase diagram, Solid liquid equilibrium, Liquid vapor equilibrium, Thermodynamic property data,
- **Refrigeration Cycle:** Thermodynamic approach towards refrigeration

Semester III

Module Code	CH2120	Module Title	Biological Science Fundamentals			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 - Describe major areas and applications in biotechnology
- LO2 - Describe major metabolic pathways and identify the properties of macro/micro molecules in food chemistry
- LO3 - Describe main classification, structures and functions of microorganisms and their applications in biotechnology
- LO4 - Describe growth requirements and methods of measuring microbial growth
- LO5 - Identify basic techniques in microbiology/food chemistry
- LO6 - Identify microbial food spoilage methods and apply appropriate control techniques
- LO7 - Describe applications of microbes in process industries

Outline Syllabus

- Introduction to Biotechnology: Definitions, Major areas and Applications
- Techniques in microbiology/food chemistry: Sterile techniques, Culture media, Methods of obtaining pure cultures, Equipment and Instruments
- Food chemistry and metabolic pathways
 - Carbohydrates: Classification, Structure and Function of carbohydrates
 - Proteins: Classification, Structure and Function of proteins
 - Lipids: Classification, Structure and Function of lipids
 - Vitamins & Minerals: Classification, Structure and Functions
 - Enzymes: Classification, Structure, Mechanism of action
- Microbial classification: Naming and Classification of microorganisms
- Structure of microorganisms I: Characteristics and Structure of bacteria, Characteristics and Structure of fungi
- Structure of microorganisms II: General characteristics of virus, Viral structure, Viroid, Prions
- Microbial growth: Growth requirements, Bacterial division, Generation time, Phases of growth, Measurement of growth
- Microbial food spoilage and control methods: Factors influencing growth of microorganisms in food, Food borne diseases, Food preservation
- Application of microbes in process industries I: Fermentation technology, Industrial products- Vitamin production, Enzyme production, Food and beverage production, Antibiotics production, Organic acids production, Amino acids production, Production of single cell proteins
- Application of microbes in process industries II: Biosensors, Bioethanol, Biodiesel, Microbial fuel cells, Bioremediation, Soil microbiology and biogeochemical cycles, Bio pesticides, Biofertilizers, Biofilms, Bio- preservation, Bioterrorism, Bioleaching

Module Code	CH2130	Module Title	Polymer Science and Technology			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 - Define the basic parameters of polymer science
- LO2 - Categorize polymers into elastomers thermoplastics, thermosets and further into types to homopolymers and copolymers
- LO3 - Describe a suitable polymerization mechanism for synthesis of a given polymer
- LO4 - Identify the most suitable polymer/s for a given application
- LO5 - Distinguish the type of latex using their characteristics
- LO6 - Match the product specifications by selecting correct loading of compounding ingredient/s
- LO7 - Prepare a rubber compound for a given formulation
- LO8 - Explain the importance of using polymer blends and composites over a single polymer for specific applications

Outline Syllabus

- Classification of polymers
- Polymerization
- Coordination polymerization, ring opening polymerization, polymerization with special catalysts (metallocene)
- Polymerization processes
- Polymer Types
- General characteristics of polymers
- Degradation and stabilization of polymers
- Latex technology
- Structure and property relationships of rubbers
- Rubber Compounding
- Plastic technology
- Surface coatings and adhesives
- Polymer blends and composites

Module Code	CH2090	Module Title	Chemical Kinetics and Thermodynamics			
Credits	3.5	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 - Explain basic principles of chemical thermodynamics and chemical processes
- LO2 - Describe and understand the chemical equilibrium
- LO3 - Describe and use the concepts of free energy and chemical potential
- LO4 - Understand the application of partial molar quantities
- LO5 - Analyze chemical equilibrium in ideal and non-ideal systems
- LO6 - Apply chemical engineering thermodynamics to chemical engineering unit operations

Outline Syllabus

- Introduction to Chemical Thermodynamics
- The First Law of Thermodynamics
- Thermodynamics Analysis of Process
- Principles of Phase Equilibrium
- Phase Equilibrium
- Properties of Solutions
- Fugacity
- Chemical Reaction Equilibrium

Module Code	CH2100	Module Title	Fluid Dynamics			
Credits	3.5	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Understand the general concepts of a fluid• LO2 - Recognize different flow patterns• LO3 - Explain the fundamentals of fluid flow, different systems of units, dimensional consistence, and hydrodynamic flow meters• LO4 - Apply mass, momentum and energy balances• LO5 - Analyze and solve problems in both compressible and incompressible fluid flow						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Fluid Dynamics• Mass, Energy, and Momentum Balances• Fluid Friction in Pipes• Flow in Chemical Engineering Equipment• Boundary Layer Theory• Turbulent Flow• Introduction to CFD						

Module Code	CH2140	Module Title	Environmental Science and Technology			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Identify how environment gets polluted.• LO2 - Describe basic processes used in wastewater treatment and in air pollution control in the industry.• LO3 - Describe basics of solid and hazardous waste management techniques• LO4 - Identify role of authorities and the industry requirements with respect to discharge and emission of pollutants in Sri Lanka.• LO5 - Apply the environmental monitoring systems to understand the environmental performance.• LO6 - Analyze reasons behind environmental pollution related problems						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Water Pollution and Wastewater Characteristics• Wastewater related environmental problems• Introduction to wastewater treatment processes• Air Pollution and Atmospheric Pollutants• Air pollution related environmental problems• Introduction to Air pollution control equipment• Basics of Solid and hazardous waste management• Environmental Monitoring• National environmental protection regulations						

Semester IV

Module Code	CH2014	Module Title	Heat and Mass Transfer			
Credits	4.0	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Recognize the heat and mass transfer related problems in the process industry• LO2 - Describe basic principles of heat conduction, convection, radiation and heat transfer with phase change• LO3 - Describe basic principles of mass transfer• LO4 - Demonstrate the ability to design heat exchangers• LO5 - Demonstrate the ability understand the concepts related to mass exchanger design• LO6 - Apply mass conservation equation to analyze mass transfer problems• LO7 - Analyze heat transfer problems using conservation equations						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Heat Conduction• Steady State Heat Conduction• Transient Heat Conduction• Heat Convection• Force Convection• Natural Convection• Heat Transfer with Phase Change• Thermal Radiation• Design of Heat Exchangers• Mass Transfer• Molecular Mass Transfer• Convective Mass Transfer• Design concepts of Mass Exchangers						

Module Code	CH2024	Module Title	Unit Operations I			
Credits	4.0	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Identify different methods of binary distillation.• LO2 - Summarize basic principles of liquid-liquid extraction, leaching, modes of operation and selection of solvents.• LO3 - Apply material and energy balance to binary distillation, absorption, stripping and extraction applications.• LO4 - Select suitable equipment for mixing and determine power consumption and carry out scale up calculations.• LO5 - Evaluate number of theoretical stages in binary distillation, adsorption, stripping and extraction.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Mass Transfer Operations – Vapor-liquid Equilibrium• Introduction to Binary Distillation Methods• Multistage Batch Distillation• Continuous Distillation with Reflux• Number of Theoretical Stages for Separation• Advanced Binary Distillation• Distillation Analysis by Non-Constant Molar Overflow Methods• Introduction to Gas Absorption & Stripping• Determination of Number of Ideal Stages• Introduction to Solvent Extraction• Liquid-Liquid Extraction• Leaching (Solid-Liquid Extraction)• Super Critical Extraction• Classification of Mixing Operation• Liquid Mixing Equipment• Mechanically Agitated Vessels						

Module Code	CH2150	Module Title	Particle Technology			
Credits	3.5	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Derive governing equations for the motion of particle/s in a fluid.• LO2 - Calculate and Analyze size, shape, size distribution of a particle system.• LO3 - Develop equations to determine characteristics of fluid flow in packed beds and fluidized beds.• LO4 - Design equipment for classification of particles, Solid/Liquid separation and gas cleaning through the knowledge of particle motion and flow through packed beds.• LO5 - Describe basic fundamentals of Nano-technology and its applications.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Particle Dynamics• Particle Statistics• Flow of fluids through porous solid beds• Fluidization• Solid Liquid Separation• Filtration• Centrifugation• Dust and Mist Separation from Gas Streams• Nano Technology						

Module Code	CH2110	Module Title	Fuel Science and Combustion Technology			
Credits	3.5	Hours/Week	Lectures	3.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Select the required refining processes for specified fuel specifications• LO2 - Analyze the quality of a given petroleum fraction• LO3 - Describe basics and principles associated with nuclear energy in nuclear reactors• LO4 - Identify suitable lubricant properties required for different lubrication application conditions• LO5 - Identify characteristics of solid fuels• LO6 - Apply combustion theories to calculate energy production by combustion of fuels in thermal energy producing units.• LO7 - Design of burners and furnaces						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Properties of fuels• Petroleum science• Refinery processes• Major refinery products• Solid Fuels• Nuclear Energy• Lubrication• Combustion						

Semester V

Module Code	CH3054	Module Title	Energy Efficiency and Conservation			
Credits	2.5	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 - Evaluate energy projects in the process industry.• LO2 - Describe methods of energy conversion in the process industry.• LO3 - Analyze energy systems by performing energy audits.• LO4 - Identify Energy losses in different energy systems.• LO5 - Apply the energy recovery methods to maximize energy efficiency of a process.• LO6 - Utilize the energy management practices in the process industry.• LO7 - Derive Environment friendly and sustainable Energy approaches for processes.• LO8 - Criticize on possible solutions to the existing energy crisis in a constructive way.• LO9 - Calculate the energy efficiencies and parameters of Energy Systems by applying the governing equations for energy engineering, Thermodynamic principles and chemical aspects.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction – Energy Problem• Economics of energy saving schemes• Energy Conversion• Energy Recovery• Energy in buildings• Combined Heat and Power• Energy Management Practices						

Industrial Training

Module Code	CH3993	Module Title	Industrial Training		
Credits	6.0	Hours/Week	-	Pre – requisites	None
GPA/NGPA	NGPA				

Aim:
To apply theoretical knowledge satisfactorily to industrial environment, improve practical skills and learn good practices in industry

Learning Outcomes
After completing this module, the students should be able to;

- LO1 – *Apply* knowledge and principles of chemical and process engineering
- LO2 – *Understand* administration and management functions in an organization
- LO3 – *Demonstrate* self-learning ability to identify and solve industrial related problems with self-confidence
- LO4 – *Develop* engineering skills and improve soft skills used in team work, communication, time management, and leadership
- LO5 – *Obtain* awareness on ethics and the professional work culture in a multicultural environment with proper attitudes
- LO6 – *Understand* Responsibilities and Accountability of a Professional Engineer

Outline syllabus

- Organizational structure and management, personal relations
- Process Flow sheeting
- Instrumentation, plant maintenance and trouble shooting
- Safety and environmental aspects
- Energy efficiency and conservation
- Quality control and other analytical testing

Semester VI

Module Code	CH3070	Module Title	Plant and Equipment design II			
Credits	2.0	Hours/Week	Lectures	1	Pre – requisites	CH3060
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Describe* Piping Engineering Fundamentals
- LO2 – *Use* Piping code for economical and safe design of piping system and its components
- LO2 – *Relate* the knowledge in Principals of Fluid Dynamics and Thermodynamics for designing of turbines and compressors for transmission and power generation.
- LO 4 – *Recognize* characteristics, capabilities and limitations of heat exchangers
- LO 5 – *Select* suitable heat exchangers for specified applications
- LO6 – *Design* heat exchangers of improved quality and profitability operation

Outline Syllabus

- Piping Engineering and role of Piping engineer in various field
- Turbo Machines
- Gas Turbine Compressors
- Heat Exchangers

Module Code	CH3900	Module Title	Research Methodology			
Credits	2.0	Hours/Week	Lectures	1	Pre – requisites	None
GPA/NGPA	NGPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Understand* research experimentation and measurement systems
- LO2 – *Use* computerized Data-acquisition systems
- LO3 – *Apply* different sampling and statistical methods
- LO4 – *Analyze* and interpret data
- LO5 – *Plan* and *document* Experiments

Outline Syllabus

- Introduction to research experimentation
- General characteristics of measurement systems
- Computerized Data-Acquisition systems
- Sampling methods and Statistical analysis of experimental data
- Guidelines for planning and documenting experiments

Module Code	CH3080	Module Title	Computer Aided Chemical Engineering			
Credits	3.0	Hours/ Week	Lectures	1	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	6/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Identify</i> limitation of analytical methods for solving chemical and process engineering problems• LO2 – <i>Recognize</i> potential of using numerical methods for chemical and process engineering applications• LO3 – <i>Recognize</i> suitable software tools for chemical and process engineering applications• LO4 – <i>Describe</i> the concept of numerical modeling• LO5 – <i>Rearrange</i> a process model into a computer model• LO6 – <i>Apply</i> software tools to analyze chemical and process engineering applications						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• SCI LAB Introduction to use open source software to solve Chemical Engineering problems. Introduction to SCILAB software and basic operations, Polynomials and Curve fitting, Solving of differential equations, Simulation tool box• ASPEN PLUS Introduction to the software, Mass Balance on a mixing unit, Material Balance, Modeling and Simulation of a Distillation Column, Modeling and Simulation of a Reactor, Process Economic Analysis, Introduction to Aspen Plus Dynamics						

Module Code	CH3950	Module Title	Technical Report Writing and Presentation Skills			
Credits	3.0	Hours/Week	Lectures	1	Pre – requisites	None
GPA/NGPA	NGPA		Lab/Assignments	6/1		
Learning Outcomes						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – Describe the mechanism of an operation / process• LO2 – Distinguish on informal and formal report writing• LO3 – Develop informal and formal laboratory reports for an experiment/ research work• LO4 – Develop feasibility reports based on the data available• LO5 – Develop progress reports for a project describing its status• LO6 – Summarize the content of a technical report to the audience						
Outline Syllabus						
<ul style="list-style-type: none">• Definition - Synonym, formal definitions, classifying the item, differentiating the item• Describing Mechanisms - Outline for description of a mechanism, definition and purpose, overall appearance, identification of main parts• Mechanisms in Operation - Outline for describing a mechanism in operation, definition of function, explanation of operating principle• Describing Processes - Outline for describing a process, description of sequences of action• Informal Reports and Memoranda - Types of informal reports, informal recommendation reports• Formal Reports - Outline and the structure of a formal report• Informal Laboratory Reports - Outline and the structure of an informal laboratory report• Formal Laboratory Reports - Outline and the structure of a formal laboratory report• Design Reports - Design reports versus lab reports, design report outline• Technical Proposals - Technical report structure• Feasibility Reports - Selecting criteria, feasibility report structure, presenting and interpreting data• Progress Reports - Progress report structure• Non – Technical Proposals - Non – technical proposal structure• Non-Technical Reports - Non – technical report structure• Oral Reports - Oral and written reports						

Semester VII

Module Code	CH4015	Module Title	Comprehensive Design Project I			
Credits	5.0	Hours/	Lectures	1	Pre –	-
GPA/NGPA	GPA	Week	Lab/Assignments	6/1	requisites	

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Develop*, complex design problem-solving skills
- LO2- *Conduct* a design project with a significant degree of engineering competence
- LO 3- *Conduct* a process feasibility study based on a project brief.
- LO 4 – *Apply* mass balance, energy balance to a process plant and *Prepare* flow sheets and process flow diagram for the design
- LO5 – *Develop* technical report writing and presentation skills
- LO 6 – *Develop* skills on working in design teams

Outline Syllabus

Students will work in a group to perform following for the process plant studied under the CH3200 module.

- Feasibility study- Economic, risk, safety, health and environmental feasibilities of the selected design
- Site selection and Plant layout
- Material balance calculation for each unit and the complete plant
- Development of the Material flow sheet
- Energy balance calculation
- Development of Energy flow sheets

Module Code	CH4070	Module Title	Research Project			
Credits	2.0	Hours/Week	Lectures	-	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	6/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Review</i> literature critically and identify research gaps/problem• LO2 – <i>Develop</i> new experimental set ups/ models/strategies• LO3 – <i>Construct</i> new ideas or approaches independently• LO4 – <i>Develop</i> self-integrity under challenging environment• LO5 – <i>Analyze</i> data obtained from experiment or modelling and drawn conclusions• LO6 – <i>Evaluate</i> results in the context of related literature• LO7 – <i>Produce</i> research findings as a published material						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to research methodologies• Literature review• Problem identification and finding alternative solutions• Methodology development with developing an experimental rig, demonstration models and/ or mathematical models• Results analysis						

Module Code	CH4025	Module Title	Process Modelling and Simulation			
Credits	3.0	Hours/Week	Lectures	2.0	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Describe</i> systems and models, main elements of dynamic modelling.• LO2 – <i>Identify</i> process parameters to develop a mathematical model of a system.• LO3 – <i>Construct</i> state space models and <i>linearize</i> non-linear systems.• LO4 – <i>Develop</i> numerical models of a process and <i>build up</i> computer models for simulations by using computer aided tools (MATLAB/SIMULINK).• LO5 – <i>Evaluate</i> dynamics of the systems and processes• LO6 – <i>Analyze</i> and <i>optimize</i> processes by using simulation studies.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• System and Model• Energy balance• Spatial description and the mass balance• Species and substances• The momentum balances• The energy balances• Temperature profile from the energy balance• Energy balance for a CSTR• Energy balance for a gas storage and transportation.• Comparison of energy forms• Laplace transformation, Transfer function• Solution of linear models• Analysis of models• Numerical methods						

Module Code	CH4050	Module Title	Unit Operations II			
Credits	4.0	Hours/Week	Lectures	3	Pre –	CH2024
GPA/NGPA	GPA		Lab/Assignments	3/1	requisites	
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Describe</i> principles in Unit operations (multi-component distillation, humidification, crystallization, adsorption, evaporation and drying)• LO2 – <i>Select</i> suitable mode of operation and equipment for a given separation process covered under the module• LO3 – <i>Apply</i> material and energy balance to the process equipment• LO4 – <i>Analyze</i> a given separation process and perform chemical engineering design calculations• LO5 – <i>Design</i> tray and packed distillation columns and column internals						
<u>Outline Syllabus</u>						
Distillation: Multi-component Distillation Bubble point and dew point calculations of multi-component mixture, Multi-component flash Distillation., Column Distillation, Key components, Fenske equation, Underwood equation, Approximate short cut methods and exact calculation procedures, Design of tray and packed distillation columns and column internals. Azeotropic and extractive distillation principles, application and solvent selection.						
Evaporation: Single and Multiple effect evaporators, area calculations, Heat and mass balance, Evaporation equipment, Vapor recompression in multiple effect evaporators.						
Adsorption: Types of adsorbents, Adsorption equilibrium, modes of adsorption, single stage, cross flow, countercurrent and fixed adsorption unit design calculations, Breakthrough curves, adsorption regeneration						
Humidification Operations: Mechanism for Humidification operations, Simultaneous heat and mass transfer, Adiabatic and non-adiabatic operations. Equipment used for the operation and size calculations.						
Crystallization: Principles of crystallization, Nucleation, Kinetics of crystallization, Heat and mass balance, yield, equipment and design calculations						
Drying: Psychrometry - Use of psychrometric charts. Vapor - gas mixtures and their properties, Principles of drying, Rate of drying, Constant rate period, critical moisture content and falling rate period Mechanism of drying processes, Heat and Mass transfer in drying processes, Batch and continuous drying, Equipment sizing and selection						

Module Code	CH4214	Module Title	Environmental Engineering and Management			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	CH2083
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Discuss* environmental management systems
- LO2 – *Describe* international protocols related to global environmental problems
- LO3 – *Apply* environmental accounting in project analysis
- LO4 – *Formulate* solid and hazardous waste management strategies for given cases
- LO5 – *Assess* environmental impacts
- LO6 – *Select* suitable pollution control techniques for a pollution control system
- LO7 – *Design* environmental pollution control equipment to meet discharge standards

Outline Syllabus

- Wastewater Engineering
- Air Pollution Control
- Solid Waste Management and Engineering
- Hazardous Waste Management
- History of Environmental Management and Development of Quality Management
- Greening of the supply chain
- Environmental impact assessment principles and process;
- Methods of assessing environmental impacts
- Basics of Environmental Accounting
- Environmental Management Systems
- International protocols related to global environmental problems

Module Code	CH4224	Module Title	Food and Bio Processing			
Credits	4.0	Hours/	Lectures	3	Pre – requisites	CH2120
GPA/NGPA	GPA	Week	Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Evaluate* food processing techniques and preservation methods.
- LO2 – *Calculate* and *Model* temperature, time, nutrients level, microbial destruction in different thermal technologies.
- LO3 – *Derive* equations on microbial and enzyme kinetics
- LO4 – *Design* biological reactors and processes through the knowledge of microbial kinetics.
- LO5 – *Describe* the use and the applications of enzymes in the industry.

Outline Syllabus

- Introduction to Food and Bio Processing
- Food Preservation and Shelf Life
- Thermal Processing of Food
- Thermal Process Calculations
- Thermal Process Methods
- Low Temperature Operations
- Food Packaging
- Introduction to Bioprocess Engineering
- Microbial Growth Kinetics
- Fermentation Systems
- Enzyme Kinetics
- Bio Hazards and Bio-safety

Module Code	CH4234	Module Title	Polymer Processing Operations			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO 1 – *Identify and describe* the polymer processing operations related to latex, rubber and plastic processing
- LO 2– *Discuss* the influence and importance of processing parameters on polymer operations
- LO 3 – *Apply* rheological and heat transfer principles to optimize the polymer processing operations
- LO 4 – *Recognize* the machineries used for polymer processing
- LO 5–*Analyze* products defects that can be appeared during respective polymer processing operations
- LO 6 –*Demonstrate* the ability to select the most appropriate processing technique(s) for a newly design polymer product to manufacture

Outline Syllabus

- Heat transfer ion polymer systems
 - Rubber Processing Techniques - Mastication, mixing, cross-linking, forming/ shaping; extrusion, calendaring and moulding
 - Determination of processing characteristic and rheological properties
 - Plastic Processing Techniques- Moulding, Extrusion, Calendaring, Casting and forming
 - Latex processing techniques- Dipping, Foaming, Casting and thread manufacturing
- Basic calculations of selected polymer processing equipment

Module Code	CH4350	Module Title	Upstream Processing of Crude Petroleum			
Credits	2.0	Hours/Week	Lectures	1.5	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/2		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Explain* Formation, Composition and Characterization of Crude Petroleum
- LO2 – *Describe* Separation of Product Fluids
- LO3 – *Explain* Treatment of Produced Fluids
- LO4 – *Describe* Field Processing and Treatment of Natural Gas

Outline Syllabus

Analysis of Crude Petroleum

- Oil and Gas: From Formation to Production
- Composition and Characteristics of Crude Petroleum

Separation of Produced Fluids

- Two-Phase Gas–Oil Separation
- Three-Phase Oil–Water–Gas Separation

Treatment of Produced Fluids:

- Emulsion Treatment and Dehydration of Crude Oil
- Desalting of Crude Oil
- Crude Oil Stabilization and Sweetening
- Storage Tanks and Other Field Facilities
- Produced Water Treatment

Field Processing and Treatment of Natural Gas

- Overview of Gas Field Processing
- Sour Gas Treating
- Gas Dehydration
- Separation, and Fractionation of
- Natural Gas Liquids

Module Code	CH4330	Module Title	Process Design and Integration			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 –<i>Describe</i> and <i>Distinguish</i> process design methods.• LO2 – <i>Conduct</i> process economics when selecting utilities and infrastructures.• LO3 – <i>Apply</i> Pinch analysis to optimize heat recovery in a process.• LO4 – <i>Evaluate</i> Utility Systems.• LO5 – <i>Design</i> Heat Exchanger networks.• LO6 – <i>Perform</i> pinch analysis for Reactors, Distillation Columns and Evaporators.• LO7 – <i>Demonstrate</i> the ability to use software tools to design processes.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Process Design and Integration• Introduction to Pinch Analysis• Pinch Analysis Calculations I• Pinch Analysis Calculations II• Pinch analysis and Heat recovery• Heat Exchanger Network Design I• Heat Exchanger Network Design II• Heat Exchanger Network Design III• Combined Heat and Power generations• Heat Integration of reactors• Heat Integration of Separators• Process Economics• Introduction to Simulation• Tools for Process Design						

Semester VIII

Module Code	CH4034	Module Title	Comprehensive Design Project II			
Credits	5.0	Hours/Week	Lectures	1	Pre – requisites	CH4214
GPA/NGPA	GPA		Lab/Assignments	12/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Appraise* key decisions to be made and relevant assessment criteria for equipment selection
- LO 2 – *Design* a selected process equipment in detail, including chemical, mechanical and operational aspects
- LO3 – *Identify* the type of material and method of fabrication suitable for the equipment
- LO4 – *Select* control schemes and instrumentation
- LO5 – *Describe* the startup, shut down, operational, and maintenance procedure
- LO6 – *Analyze* safety and economic aspects of the equipment
- LO7 – *Develop* technical report writing and drawing skills

Outline Syllabus

Students will work individually to perform detail design of a selected process equipment in the plant studied under CH3200 and CH4203 modules.

- Selection of appropriate equipment
- Revisit Mass Balance and Energy Balance
- Calculation of dimensions of the unit
- Mechanical design
- Selection of material
- Thickness calculation
- Internals, supports and others
- Description of fabrication
- Mechanical drawings
- Piping and Instrumentation
- Startup- Shut down
- Safety and Control
- Others- Economic aspects etc.

Module Code	CH4044	Module Title	Process Dynamics and Control			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Describe</i> the behavior of 1st, 2nd and higher order dynamical systems.• LO2 – <i>Analyze</i> linear dynamical systems using mathematical tools such as Laplace transforms etc.• LO3 – <i>Set up</i> simple feedback loops using PID controllers and development of control modules• LO4 – <i>Implement</i> various PID tuning methods for controllers• LO5 – <i>Design and Develop</i> feedback and feed-forward controllers and obtain a hands-on experience in doing this via simulation and experimentally on lab scale apparatus by using LabView.						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Process Dynamics & Control• Dynamic Behavior and Linear State Space Models• Transfer Functions and Empirical Models• Introduction to Feedback Control• PID Controller Tuning• Auto-tuning Techniques• Controller equipment• Frequency-Response Analysis• Various control methods and control structures• Cascade and Feed-Forward Control• Control-Loop Interaction• Plant wide Control• Fuzzy logic control system						

Module Code	CH4244	Module Title	Clean Technology			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Identify</i> resource recovery techniques for waste• LO2 – <i>Describe</i> recycling techniques• LO3 – <i>Apply</i> source reduction, waste minimization, energy efficient improvements and process integration solutions for pollution prevention or minimization in industry.• LO4 – <i>Apply</i> clean technologies in the process industry.• LO5 – <i>Select</i> environmentally friendly processes and technologies.• LO6 – <i>Analyze</i> environmentally friendly product and process designs• LO7 – <i>Assess</i> cleaner production in the process industry						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction to Clean Technology• Energy Efficiency Improvements• Introduction to the Concept of Cleaner Production• Cleaner Production Assessment• Eco design• Source Reduction and Waste Minimization• Resource recovery from waste; recycling techniques• Process integration solutions for waste avoidance• Life Cycle Assessment (LCA)• Process and technology selection• Carbon foot print and water foot print• GHG emission reduction or removal enhancement• Good manufacturing practices, Eco efficiency• Clean Technology Case Studies						

Module Code	CH4254	Module Title	Renewable Energy Engineering			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Recognize</i> renewable resources in Sri Lanka• LO2 – <i>Describe</i> applications of renewable energy.• LO3 – <i>Demonstrate</i> the ability to design renewable energy system for practical applications• LO4 – <i>Understand</i> optimization of renewable energy utilizations with the available energy resources• LO5 – <i>Analyze</i> viability of renewable energy systems• LO6 – <i>Design</i> and implement of a renewable energy system						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Introduction of Biomass and biofuels• Power from the wind• Solar Energy• Hydro-power• Energy systems, storage and transmission						

Module Code	CH 4264	Module Title	Polymer Engineering & Mould Design			
Credits	4.0	Hours/ Week	Lectures	3	Pre – requisites	CH2130
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO 1 – *Identify* and *describe* the important engineering principles applicable to polymers.
- LO 2 – *Discuss* the influence and importance of engineering properties on physical testing of polymers.
- LO 3 – *Apply* knowledge gains on polymer engineering to optimize the manufacture of polymer products.
- LO 4 – *Recognize* the software used for design and fabrication of moulds for polymer products
- LO 5 – *Demonstrate* the ability to design simple mould/die to manufacture polymer product
- LO 6 – *Design* a mould and die for a defined product

Outline Syllabus

- Rubber-like elasticity
- Polymer Rheology
- Viscoelastic properties of polymers
- Fracture Mechanics of polymers
- Design of moulds for polymer products
- Design of extruder dies
- Computer Aided Design Analysis and Fabrication of Moulds

Module Code	CH4274	Module Title	Design of Polymer Products			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	CH2130 CH4234
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Apply* the knowledge on the various properties of polymers in selecting suitable polymers.
- LO2 – *Analyze* the processing characteristics and optimize the required properties for polymer products
- LO3 – *Select* the suitable processing conditions to manufacture defect-free products
- LO4 – *Identify* failure mechanisms of polymer products used under different service environments.
- LO5 – *Describe* assembly techniques required for designing and manufacturing of polymer products
- LO6 – *Design* of simple engineering polymer products

Outline Syllabus

- Basic design concepts
- Features and assemblies of commodity and engineering rubber products
- Modes of deformation (compression, shear and bending) Failure mechanics
- Basic calculation on designing of simple engineering products
- Design of plastic products
- Determination of average molar mass and molar mass distribution
- Solution properties of polymers
- Analysis of polymers by chromatography and spectroscopy
- Mechanical properties of polymers
- Determination of thermal properties of polymers
- Processing characteristics of polymers
- Surface properties and morphology of polymers
- Determination of electrical properties of polymers

Module Code	CH4284	Module Title	Food Engineering and Hygienic Plant Design			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	CH2120 CH4224
GPA/NGPA	GPA		Lab/Assi gnments	3/1		
<u>Learning Outcomes</u>						
After completing this module, the students should be able to;						
<ul style="list-style-type: none">• LO1 – <i>Demonstrate</i> knowledge on common food processing and preservation techniques for safe and quality food production• LO2 – <i>Develop</i> an awareness on the modern food chain (supply chain process, food legislation, and various tech-economic issues)• LO3 – <i>Develop</i> simple understanding on nutrition and dietetics• LO4 – <i>Design</i> plant and equipment which is in agreement with standards and guidelines for hygienic design• LO5 – <i>Apply</i> hygienic standards in operations and maintenance						
<u>Outline Syllabus</u>						
<ul style="list-style-type: none">• Basic principles of human nutrition• Food engineering operations• Food plant operations and supply chain issues• Future trends in food processing• Hygienic practices• Hygienic plant design• Hygienic equipment design• Verification and certification of hygienic food processing plants						

Module Code	CH4390	Module Title	Biochemical Engineering			
Credits	4	Hours/ Week	Lectures	3	Pre – requisites	CH2120
GPA/NGPA	GPA		Lab/Assignments	3/1		CH4224

Learning Outcomes

After completing this module, the students should be able to;

- LO1– *Explain* techniques used for generating genetically modified microorganisms to *synthesize* bio-based products
- LO 2 – *Evaluate* different cell cultivation methods, bioreactors and modes of operation.
- LO 3 – *Estimate* the sterilization requirement of media and equipment.
- LO 4 – *Design* suitable reactors for cell culture with mixing and determine power consumption and carry out scale up calculations.
- LO 5 – *Select* appropriate instrumentation and controls in cell culture
- LO 6 – *Evaluate* separation techniques used in bio-industry

Outline Syllabus

- Isolation of industrially important microorganisms
- Gene expression and protein synthesis in microorganisms
- Genetically modified/engineered micro organisms
- Industrial applications of genetically engineered organisms
- Medium Formulation, cell nutrients
- Stoichiometry of microbial growth and product formation
- Sterilization of fermentation media and air
- Sterilization kinetics
- Cell cultivation
- Bioreactors – modes of operation, types of reactors, design of agitated bioreactors, design of agitated bioreactors, measurements, instrumentation and control, aeration and agitation in bioreactors, scale-up criteria for bioreactors
- Recovery and purification of bio-products
- Fermentation economics

Module Code	CH4340	Module Title	Natural Resource Process Engineering			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	None
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Understand* the availability of natural resources for industrial use
- LO2 – *Explain* currently available processes to convert natural resources to value added products
- LO3 – *Develop* processes to add value to natural resources available in Sri Lanka
- LO4 – *Develop* Socio, Economic, Technical and Financial Evaluation of Industrial Processes
- LO5 – *Identify* safety, health and environmental aspects of industrial processes

Outline Syllabus

- Introduction to natural resources
- Value added products
- Value addition processes
- Safety- Health and Environmental Impact
- Process feasibility
- Socio-economic impacts
- Value addition for waste by products

Module Code	CH4360	Module Title	Downstream Processing of Oil, Gas & Petrochemicals			
Credits	4.0	Hours/Week	Lectures	3	Pre – requisites	CH2110
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Select* suitable hydrocarbon fuels for different applications
- LO2 – *Describe* functionalities of Production Processes and Technologies to produce hydrocarbon fuels based on their applications
- LO3 – *Describe* production routes & processes for the synthesis of petrochemicals and their derivatives.
- LO4 – *Perform* material and energy balance calculations for the production processes.

Outline Syllabus

Idealization of Petroleum products

- Automotive Fuels - Volatilities, combustion characteristics
- Fuels for Power Generation - Combustion characteristics, handling properties
- Solvents – Volatilities, Characterization
- Lubrication Oils – Characterization and Applications
- Waxes and bitumen - Types properties and uses

Liquid Fuel Processing

- Petroleum Refining - Refinery Processes and Processing [Distillation – Atmospheric & vacuum, Thermal Processing, Catalytic Processing],
- Conditioning & Polishing Processes,
- Product Handling, Utilities Management,
- HSE Management Systems

Gaseous Fuel Processing

- Principles of Gas conditioning and Processing
- Transport Processes and Separation Process
- Cryogenic & Compression Operations in Gas Processing.
- Storage and Product Handling.

Petrochemical Processing

- Classes of Petrochemicals and their Production Processes
- Petrochemicals and their derivatives; Polymers, Base Chemicals and Fertilizers

Module Code	CH4370	Module Title	Petroleum Process Operations, Economics, and Law			
Credits	4.0	Hours/ Week	Lectures	3	Pre – requisites	CH4193 CH3044
GPA/NGPA	GPA		Lab/Assignments	3/1		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Evaluate* current trends in oil and gas industry
- LO2 – *Analyze* economics of Petroleum Processing
- LO3 – *Describe* Laws pertaining to Petroleum Operations
- LO4 – *Design* Procedures for Safe Operation of Petroleum Processing facilities

Outline Syllabus

Trends in Petroleum Industry

- National legal instruments related to petroleum oil and gas industry;
- International standards, guidelines and directives related to oil and gas industry, Exploration & Production,
- Effects of Regional Politics and Activities towards Petroleum Industry

Economics of Petroleum Processing

- Trends in Petroleum Industry-
- Financial instruments,
- Commercial Operations in Petroleum Industry

Petroleum Law

- Local Laws Pertaining to Petroleum Industry
- International Laws Pertaining to Petroleum Industry
- Case Studies

Safe Operation of Petroleum Facilities

- Introduction to Process Safety in oil & gas facilities,
- Safety Instrumented systems (SIS),
- Emergency shutdown (ESD) systems,
- Design of Systems for Safe Operations

Module Code	CH4350	Module Title	Petroleum Refining and Petrochemical Industry			
Credits	2.0	Hours/ Week	Lectures	1.5	Pre – requisites	-
GPA/NGPA	GPA		Lab/Assignments	1.5		

Learning Outcomes

After completing this module, the students should be able to;

- LO1 – *Describe* production processes for petrochemicals
- LO2 – *Select* required refining processes for specified fuel specifications
- LO3 – *Select* suitable fuels for specific applications

Outline Syllabus

Petroleum Refining

- Refinery Configurations;
- Thermal & Catalytic Processes
- Refinery Offsite Facilities
- Refining economics

Petroleum Product Characterization

- Liquid Fuel Characterization
- Gaseous Fuel Characterization,
- Transportation and Storage of Fuels

Petrochemical Processing

- Classes of Petrochemicals and their Production Processes
- Petrochemicals and their derivatives; Polymers, Base Chemicals and Fertilizers

Note: Offered to ER students

Comprehensive Design Project

CH4015, CH4034 – Comprehensive Design Project is the ultimate course for the B.Sc. Chemical Engineering Degree. It will allow the students to bring together much of their previously learnt engineering knowledge on a real, practical problem. It contributes 10 credits gained in semesters 6, 7 and 8.

The project is also quite different from the majority of the subjects that the students will be doing in the initial semester. It is a team effort and an open-ended project, where student get the opportunity to work as a team on open-ended projects with real industrial complications. Communication amongst members is vital. There is no ‘right’ solution! - Just the “best” solution in the time available.

One of the goals of this subject is to introduce students to an industrial periphery where real life processes and problems will have to be addressed. The academic staff will endeavour to give advice and support as the student proceed in the project. The group will be managed by its members. There needs to be a leader who co-ordinates activities. It is the responsibility of the group members to

ensure that the project progresses at an appropriate rate. Good communication within the group is essential and this will be reflected in your final report. It will show the students’ effort at teamwork and communication ability. As a UGC accredited B.Sc. Chemical Engineering degree program, DCPE places a high priority on this subject as part of your entry into the profession.

- In this unit, student will be encouraged and facilitated to develop the ability and desire to: Work as a team on open ended problems within tight time constraints in such a way that all members contribute individually as well as collectively with proper communication
- Apply fundamental chemical and environmental engineering principles and available data from literature to design and analyse chemical processes
- Make critical design decisions in a safe, creative, practical and cost-effective manner
- Report the work in formal, concise, and in an organized manner

Industrial Training

As a partial fulfillment of the B. Sc. in Chemical and Process Engineering degree program, at the end of semester 5 it is compulsory for students to register for the Industrial Training Module during the 6th Semester. Under this Module students are placed in a real industrial environment for 24 weeks period of time. Industrial Training module has been designed to provide industrial experience for the students. This is the first and the last opportunity given for working in an industry as a budding Chemical and Process Engineer before the student gets their degree qualifications.

In order to have background knowledge about Industrial Training and to make Industrial Training more fruitful, a series of presentations are arranged in Semester 5. In these presentations invited experts from industry address the students on the topic "How to get the maximum benefit of Industrial Training with the intention for having a successful future carrier." In addition, senior Process Senior engineering students who have been to Industrial Training also make presentations and share their industrial experience with. Further, the Industrial Training Coordinator of the Department facilitates the students in industrial training placement process.

In the Industrial Training program, the student is supposed to use the theoretical and experimental knowledge gained as an undergraduate in the industrial environment

and to improve the practical skills, management skills and interpersonal skills. Development of these skills is highly important to become a qualified engineer. Further, the student is educated about important areas such as product manufacturing processes, treatment processes, process design, process modification, process optimization, problem identification and problem solving.

During the stay in an industry the student is supposed to manage a technical diary and a handbook covering the engineering, technical and managerial matters. Student's performance on Industrial Training is closely monitored and examined by a member of the academic staff, Industrial Training Division and NAITA, by visiting the relevant industry. After successful completion of the training program, students are supposed to submit a technical report on their training to the Industrial Training Division and the same to the DCPE. In line with that, students have to present their training experience before a panel of academic staff at the DCPE. There, students' level of knowledge and experience on industrial training are evaluated. Finally, progress in industrial training is evaluated through a viva voce & a presentation (individual) by a panel comprising a member of academic staff of DCPE, a member of Industrial Training Division and a member of NAITA.

Awards Available for DCPE Students**Thusitha Senevirathne Memorial Scholarship**

Awarded for the CPE undergraduate who has obtained the highest GPA in the first attempt in Level 3 Semester 1 Examinations, provided that the student obtains an Overall GPA of 3.7 or above.

Thusitha Senevirathne Memorial Award

Awarded for the CPE undergraduate who is specializing in the field of Environmental Engineering and has obtained the highest GPA in Level 3 and Level 4 at the first attempt, provided that the student obtains an Overall GPA of 3.7 or above

Unilever Award

The CPE undergraduate who obtains the highest marks for the Final Year Comprehensive Design Project, provided that he obtains a grade A receives this award.

Gold Medal awarded by the Hayleys Group

Awarded to the undergraduate of the DCPE who obtains the highest Overall GPA at the BSc. Engineering Degree Examination provided that the student obtains an Overall GPA of 3.8 or above.

Vidya Jyothi Professor Dayantha S. Wijeyesekera Award

This prestigious awarded is presented to the most outstanding graduate of the year of the University of Moratuwa and is awarded at the General Convocation. The awardee is expected to displaying an exceptional academic standing with a GPA exceeding 3.7; First Class Honors, also demonstrating excellent leadership qualities, and also a person who has made a significant contribution through participation and service to the university and community.

INDUSTRY COLLABORATION

Mentoring

Mentoring is to support and encourage students to manage their own learning and behavioural while maximizing and enhancing their potential, soft-skills, performance, and becoming a competent and a self-confident person. Unique and distinguished industrial personals from related industries are connected with students through the department in order for the students to get an intimate experience in the industry surroundings. During a period of 13 weeks in semester IV, each group of students are assigned a mentor and students travel to the mentor's organization. Some of the key elements focused by the mentors are leadership skills, communication skills, teamwork, attitude, etiquette, and personal grooming. This course provides the students a virtuous opportunity to extend themselves as a well-rounded person who are well equipped for the future.

Department Industry Consultative Board Meeting (DICB)

Department Industry Consultative Board (DICB) Meeting aids the department to meet industry representatives from several recognized industries. This has benefits for both parties. While the department seeks industry expertise to revise and renew its curriculum to meet the dynamic demand in the field, industry get the assistance of the department to address their various problematic situations.

Consultancy Services

The department is at all times approached by the industry to seek solutions for their problems and to assist in enhancing their performance. Department might act like a third party in assisting them while sometimes directly engaged in the research and development work under a contract with the interested party. Students who are enthusiastic in engaging in these works might have a chance to work with the academic staff and gain an invaluable knowledge and experience.

Field Visits

The department arranges field visits for their students to visit the industries and get an insight of the processes, working environment and the knowledge. This allows the students to expand their knowledge and experience which otherwise be limited to lectures and books

Incubators

SIL-UOM Rubber Products and Process Development Incubator

Samson's Compounds and Samson sons International PLC, sister companies of the DSI Samson Group of companies has jointly set up a Research and Development unit, SIL-UoM Rubber Production & Process Development Incubator for Rubber based Products and Process development with the Department of Chemical and Process Engineering. The objective of this unit is to conduct research and develop new processes to maintain the

competitiveness and quality of the local rubber production techniques.

Samson International PLC has many skillful engineers at their disposal. The department undergraduates provide them talented carefree minds with an ability to look at something in a whole new angle. These are fresh minds unburdened by the strain of continuous work, minds unhindered by the expectations & deadlines that have been set in view of marketing objectives. They are also able to carry out detailed & analytical literature surveys which the company might find too time consuming to conduct, while living up to their global obligations.

The SIL-UOM incubator deals with providing professional expertise on certain projects & designs carried out by Samson International. The department provides the much-valued intellectual input into certain projects carried out by Samson International PLC that requires a strong theoretical background in return for



Samson International to provide their undergraduates access to their facilities & their latest technologies. There are many benefits the university reaped from this program. The main benefit is that it provides the department undergraduates with an invaluable industrial exposure prior to their entrance into it. Also, the company steps in to fund any upgrading or renovation of any facility in the department, if their use is required in a project, which of course will enable students to take use of them. Plans are in motion to upgrade the Polymer Processing Lab of the department, both of which will bring long term benefits to the undergraduates

SPECIAL EVENTS AND PROGRAMS

Annual General Meeting

Annual gathering of Chemical and Process Engineers of University of Moratuwa is organized by the ChESS with the participation of department's undergraduate, graduates, academic staff and the representatives from the industries. Most recently, the 2015 event was held at Grand Oriental Hotel. The night with magnanimous meetings with industrial leading characters passed out from University of Moratuwa was a precious occasion for chemical and Process Undergraduates to meet their role models who can back for each of fresh future willingness's.



Yaye Padura

An evening with glorious musical spills over the "Yaye Pedura" which is another foremost event annually functioning at the Chemical and Process Engineering department court yard, organized by the fresh siblings of the department family in order to facilitate the interaction between undergraduate students of the Department as well as to make a stage to proffer

instrumental, vocal and dancing talents of department students and staff.



'EXORIOR'

This is the activity day organized by the Level 03 batch of the Department under the theme, 'Awaken the leader within you'. The program is held with the presence of undergraduates of Level 02, 03 and 04, post graduate students, non-academic staff and the academic staff. The agenda consists of various activities, which help each and every participant to improve his/her abilities and skills in areas of team work and personality development. All the participants irrespective of their age or level spend a day full of friendship and life and are able to gain a glimpse of experiences and strengthen their bonds.



CPE Sports Fiesta

Another annual interactive event organizing by the Level 02 students of the department of Chemical and Process Engineering is CPE Sports Fiesta. This is a sports day that brings all the joys, bonds, freedom and an inestimable change from the impassable academic matters for all students, Academic and Non-academic staff family members of DCPE.



'COMPASS 16'

This was the Industrial day organized by the 2012 batch of the Department in parallel to the AGM of the Department. The program was held under the theme 'Leap towards effective processing' with the aim of emphasizing the importance of Chemical and Process Engineering in the path of country's development. The agenda consisted of Guest speeches by reputed personalities from both academic and industrial background, to share their expertise with the audience. The gathered audience of undergraduates from UOM and UOP, academic staff and professionals from industry added more color to the event.

SOCIETIES

Chemical Engineering Society (ChES)



The Chemical Engineering Society was formed in 1993 with the objective of increasing awareness of Chemical Engineering in the country. It is hence dedicated in promoting more collaborative work with local industries. The Society was registered as a specially authorized society under Societies Ordinance on 22nd September 1995 (Reg. S. 4822). Its membership consists of 259 members including present and past chemical engineering students, employed in both local and international institutions and industries.

Specific objectives other than this primary objective of the society includes,

- To provide opportunities for the dissemination and exchange of knowledge and experience primarily among professionals of Chemical and Process Engineering and also, among the industrialists, the public and society at large
- To promote the rational and economic development of Chemical Engineering science and technology in the country so

as to ensure the best interests of the community as a whole

- To encourage research, development and training in Chemical and Process Engineering
- To promote among its members high standards of technical proficiency, professional expertise and professional ethics so as to enhance in turn the profession of Chemical and Process Engineering
- To collaborate with other organizations: national and international, in activities relating to furtherance of the ChES objectives

Chemical Engineering Student Society (ChESS)



The Chemical Engineering Student Society was formed in year 2004. It is dedicated to building a responsibility among undergraduates to integrate social concerns into their academic lives. Through a variety of interdisciplinary activities, focusing on leadership development and interactive learning, ChESS at UoM strives to work together with industrial, social and student communities.

Specific objectives of the ChESS include,

- Enhancing the involvement of the Chemical and Process Engineering students in industry related activities and projects
- Improving the interaction with the society through socially beneficial activities
- Sharing knowledge with school children through interactive activities and projects

Activities

- Organizing the Annual General Meeting, of DCPE, providing a great opportunity for the members of the CPE family to interact with each other. At the AGM undergraduates and postgraduates have

the opportunity to meet each other as well as their dearest academic staff.

- Annually publication of the magazine "Chemunique" which has a wide circulation.

Alumni Association

The Alumni Association of the DCPE is the hub that reconnects all passed out graduates of the department, young and old. Its prime objective is to enhance a continuing relationship between the department and its older generations. Alumni membership is open to all graduates from the department.

LABORATORY FACILITIES AND RESOURCES

Laboratory Facilities

The Department of Chemical and Process Engineering is proud to have a well-equipped and well-functioning set of laboratories which facilitate both undergraduates and postgraduate students with their experimental work and research. At present, the department is in the process of establishing new laboratory facilities for petrochemical engineering with modern state of art technologies. The assistance of the competent and the well-qualified technical officers and the technical assistance staff members for the experimental work and research activities is also significant.

Unit Operations/ Pilot Plant Laboratory

Lecturer in Charge: Prof. (Mrs.) B. M. W.

P. K. Amarasinghe

Technical Officer: Mr. B. H. P. Mahendra

Boiler Operator: Mr B. A. R. D.

Abeywardena

Lab Attendant: Mr. A.G. V. K. Somarathna

Unit operations are the basic physical operations of Chemical Engineering. The Unit Operations Laboratory of the department is well-equipped to conduct both laboratory scale and pilot scale experiments, allowing students to gain hands-on experience with the fundamental principles and practical applications of chemical engineering. The apparatus for distillation, evaporation, crystallisation, heat transfer, retort processing and reactor engineering are

few of the outstanding equipment in the laboratory.



Latex Technology Laboratory

Lecturer in Charge: Dr. S. Walpalage

Technical Officer: Mrs. W. S. M. De Silva

Lab Attendant: Mr. D. S. Dayananda

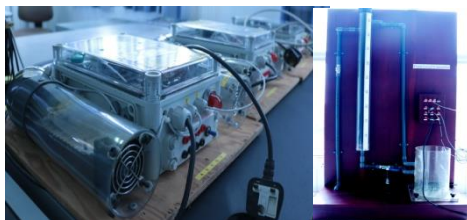
The Latex Technology Laboratory of the department is equipped with latex characterization instruments for latex product manufacture while it is also equipped with several instruments to measure chemical properties of polymer.



Process Instrumentation and Control Laboratory

Lecturer in Charge: Dr. M. Narayana
Technical Officer: Mr. D. N. S. Epa
Lab Attendant: Mr. D. S. Dayananda

Designing and operation of processes that are safe, meet the production requirements with high quality with profit are the premier objectives of a Chemical and Process Engineer. Therefore, the process instrumentation and control are vital aspects to be mastered by the students. The Process Instrumentation and Control Laboratory of the department is equipped with various process modelling and simulation facilities such as process simulator, numerical control, process feedback control study unit to enhance the student competencies.



Industrial Chemistry Laboratory

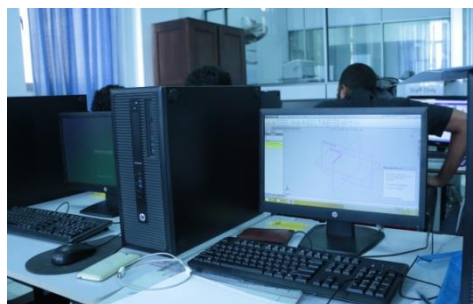
Lecturer in Charge: Prof. B. A. J. K. Premachandra
Technical Officer: Mrs. I. K. Athukorala
Lab Attendant: Mr. H. L. G. S. Peiris

The Industrial Chemistry Laboratory supports many course modules for both undergraduate and postgraduate studies through several experimental setups and by facilitating research activities.

CAPD /CAM Centre

Lecturer in Charge: Dr. M. Narayana
System Analyst : Mr. N. A. C. Narangoda
Technical Officer: Mr. D. N. S. Epa
Lab Attendant: Mr. M. P. A. J. Kumara

The centre facilitates the studies with experience on many process simulation applications. It is being used to offer many useful software packages such as AutoCAD, SolidWorks, LabVIEW, MATLAB and Simulink, SciLab, Aspen Plus and etc. which are particularly useful in the industry of Chemical and Process Engineering. The centre supports the academic activities also providing the internet access to gather necessary resources for their studies.

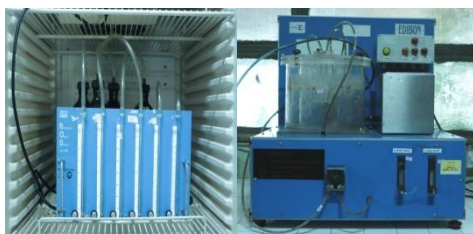


Environmental Engineering Laboratory

Lecturer in Charge: Dr. P. G. Ratnasiri
Technical Officer: Ms. P. D. M. Rodrigo
Lab Attendant: Mr. W. S. A.S. Fernando

The Environmental Engineering Laboratory facilitates necessary experience and knowledge in environmental engineering. It is equipped with lab scale and pilot scale equipment facilities related in wastewater and solid waste treatment. Facilities are available to determine key parameters

related in water/wastewater analysis. Pilot scale experimental setups are available to conduct experiments under aerobic and anaerobic waste treatment processes. Furthermore, online data acquisition and monitoring of anaerobic waste treatment processes are conducted using newly automated reactor systems.



- Equipment Test Bench to Study Analogy between fluid friction and heat transfer
- Apparatus for determining heat loss from bare and lagged pipes
- Computer controlled gaseous mass transfer and diffusion coefficient unit
- Computer controlled liquid mass transfer and diffusion coefficient unit



Transport Phenomena Laboratory

Lecturer in Charge: Dr. A. D. U. S. Amarasinghe

Technical Officer: Mr. B. H. P. Mahendra

Lab Attendant: Mr. A. G. V. K. Somarathna

Transport Phenomena Laboratory has been developed as an undergraduate teaching laboratory. Main focus is to demonstrate the fundamental concepts in heat, mass and momentum transport. Students are encouraged to learn through hands-on experiences. Rankine Cyclor is the latest arrival to the lab. Students are able to understand the fundamentals of steam power generation and to become familiar with the associated thermodynamic principles and efficiencies of the Rankine power cycle. The laboratory is further equipped with the following teaching units

- Flow measurement unit
- Centrifugal pump demonstration unit

Polymer Processing Laboratory

Lecturer in Charge: Dr. (Mrs.) S. M. Egodage

Technical Officer: Mr. C. L. Gunarathna

Lab Attendant: Mr. R. S. S. Ranaweera

The Polymer Processing Laboratory provides the students with the opportunity to gain experience in polymer processing techniques. This laboratory offers a wide range of pilot plant scale machinery for mixing and subsequent processing of both plastic and rubber, including an injection moulding machine (plastic), blow moulding machine (plastic), extruders with single and double screws (plastic), hot feed extruder (rubber), internal mixer, two-roll mill, plasticorder, presses and processability testing equipment.



Physical Testing Laboratory

Lecturer in Charge: Dr. (Mrs.) Olga Gunapala

Technical Officer: Mrs. H. B. R. Sajeewani

Lab Attendant: Mr. S. M. R. N. Dhammika

The Physical Testing Laboratory is equipped with instrumentation to analyse various properties of rubber and plastic such as physical, mechanical and thermal properties are available in this laboratory. The equipment is available to measure specific gravity, rebound resilience, tensile and compression, abrasion resistance, melt flow index and other.



Food Engineering Laboratory

Lecturer in Charge: Dr. (Mrs.) S. H. P. Gunawardena

Technical Officer: Mrs. W. K. I. Gayani

Lab Attendant: Mr. M. P. A. J. Kumara

Food Engineering Laboratory facilitates the students with experimental and research work on food-bio chemistry, and food process engineering. The laboratory is equipped with a freeze dryer, fruit juice extractor, dough mixer and other ancillary units required in food processing.



Micro-biology Laboratory

Lecturer in Charge: Dr. (Mrs.) H. L. T. U. Ariyadasa

Technical Officer: Mrs. I. K. Athukorala

Lab Attendant: Mr. B. Karunathilake

Microbiology Laboratory of DCPE is focused on understanding the diverse cellular and metabolic processes of microbes for the production of pharmaceuticals, chemicals and energy. The laboratory is equipped with Autoclave, Incubators, Incubator shakers, Centrifuges, Colony counter, Class II biosafety cabinet, -20°C Freezer and also state of the art equipment including PCR, horizontal Gel electrophoresis system, Gel documentation system and microscopy core facilities essential for the advance research in the area of Metabolic Engineering.



Process Instrument Centre

Lecturer in Charge: Prof. B. A. J. K. Premachandra

Technical Officer: Mr. C. L. Gunarathne

Lab Attendant: Mr. R. S. S. Ranaweera

Instrumentation is vital for proper measurement and controlling of processes. The Process Instrument Centre of the Department consists of advanced modern analytical measurements. The Gas Chromatograph, High Performance Liquid Chromatograph, Differential Scanning calorimeter, Particle Size Analyser and UV Spectrophotometer are among these instruments. This centre provides a combination of testing facilities for academia and industrial purposes.



Petroleum Engineering Laboratory

Lecturer in Charge: Prof. S. A. S. Perera & Mr. T. A. Dodangoda

Technical Officer: Mr. J. Wijesinghe

Lab Attendant: Mr. S. M. R. N. Dhammika

The Petroleum Engineering Laboratory is equipped with newest laboratory instruments to facilitate students with experimental work on petroleum engineering. The automated vacuum distillation unit, Sulphur analyzer, Octane analyser, Bomb calorimeter and Viscometer bath are only few experimental setups in the laboratory.



Reactor Engineering Laboratory

Lecturer in Charge: Dr. P. G. Ratnasiri

Technical Officer: Mr. B. H. P. Mahendra

Lab Attendant: Mr. A. G. V. K. Somarathna.

Reactor Engineering Laboratory is equipped with two major pilot scale reactors. Namely Continuously Stirred Tank Reactor (CSTR) and Batch Reactor. In addition, pilot scale unit operation facilities such as bubble cap, filter press, fluidized bed, mixing and centrifugation are available.

Energy Engineering Laboratory

Lecturer in Charge: Prof. S. A. S. Perera & Mr. T. A. Dodangoda

Technical Officer: Mr. J. Wijesinghe

Lab Attendant: Mr. S. M. R. N. Dhammika

Energy Engineering Laboratory is equipped with necessary apparatus to provide the student with knowledge and experience in Energy Engineering and Fuel Technology. The laboratory includes many apparatuses such as the soxhlet apparatus, Reidens specific surface apparatus, the Mohr westphal balance, the Pensky Martens closed cup and Cleveland open cup, Engler

viscometer and Saybolt universal viscometer, Penetrometer, Universal torsion viscometer, Pilot plant leaching unit etc

24-hour-Research Laboratory

Lecturer in Charge: Dr. A. D. U. S.

Amarasinghe

Technical Officer: Mrs. W. K. I. Gayani

Lab Attendant: Mr. B. Karunathilake

24 hours laboratory is a research laboratory providing facilities for research students to work around the clock. Department of Chemical and Process Engineering offers research programs leading to PhD, MPhil and MSc. Two separate laboratory units are currently available with basic facilities for the research students to set up their test rigs and other equipment required for their experimental work. Computer facilities are also provided with unlimited access. Undergraduate students with research projects involving longer time durations for their experimental work are also encouraged to use 24 hours laboratory.

Resources

Prof Hubert D J Silva Memorial Resource Centre

The Department of Chemical and Process Engineering offers the students with access to a valuable collection of literature, specialising in the Chemical and Process Engineering field. The Resource Centre is full of worthy reference material relevant to many branching of Chemical and Process Engineering, facilitating both the undergraduates and postgraduates with their academic and research activities.

Student Common Room

The Student Common Room is established to provide the undergraduates with an opportunity to socialize themselves.

Wi-Fi Access Facility

The students are provided with Wi-Fi facilities to acquire necessary knowledge and reference materials that are required for their academic studies and activities.

Study Zones

Spaces have been provided for the students with seating arrangements and Wi-Fi facilities to engage in academic activities and studies such as group activities and discussions.

Operational Hours and Access to Laboratory Facilities and Resources

Department of Chemical and Process Engineering is usually open for academic work from 8.00 a.m. to 4.15 p.m.

All laboratory Facilities in Department of Chemical Engineering are available for students strictly during the scheduled practical sessions, and students should not use and interfere with any equipment without the permission of the Lecturer in Charge or under the guidance of a Laboratory Instructor.

The CAPD/ CAM Centre is open from 8.00 a.m. to 8.00 p.m. on week days and from 8.00 a.m. to 4.00 p.m. on Saturdays.

At present all other facilities are available during working hours only.

OTHER INFORMATION

Getting Help and Advice

A professional full-time counsellor is employed by the University to provide professional counselling to the students who require special attention.

Career guidance unit of the UOM plays an important role in developing University Industry links and provide necessary guidance for the students to select their future career.

In order to address common student problems, the faculty of engineering has further appointed a Staff-Student Liaison Committee at faculty level which has representatives comprising senior academic staff members of the faculty and nominees from respective student groups. The department Staff-student liaison committee helps to solve issues related to academic work, facilities etc.

The office of the Director of Undergraduate Studies provides guidelines, performance criteria and registration procedures to students. The student performance records are also available at this office for their perusal, giving the opportunity for the students to plan the academic activities accordingly.

The DCPE staff was reported as one of the friendliest in the faculty (SWOT analysis report, IRQUE reviewers report). This encourages the students to approach the staff members about their problems to discuss at personal level.

The DCPE has appointed level coordinators for each level to guide the students on subject selection and other academic issues related to each level. The Department has also appointed Advisors for each student to provide guidance and necessary counseling on academic and personal problems during their stay at the University.

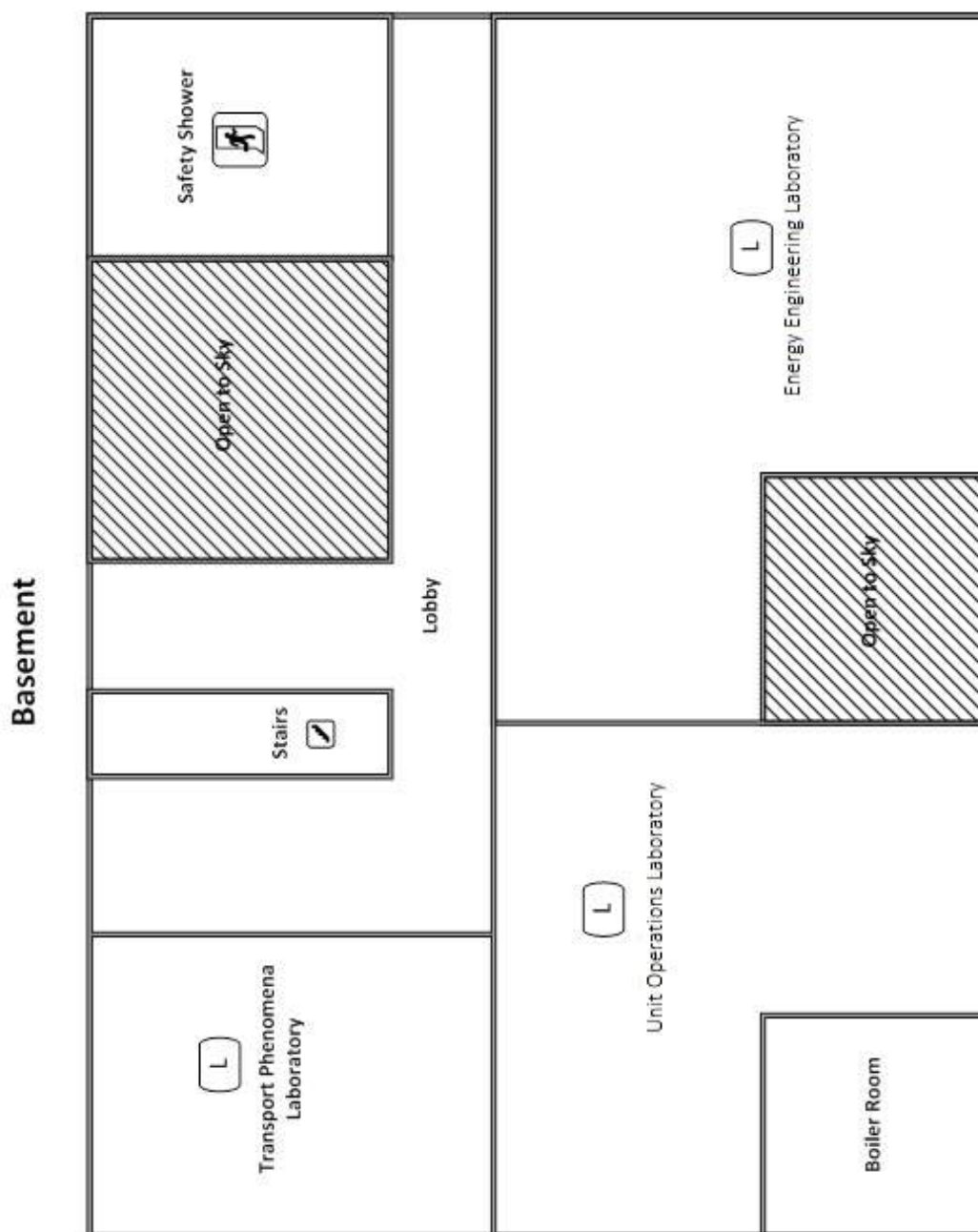
The students are given a course outline at the beginning of each semester for each subject. This gives the course objective, learning outcomes, subject coordinator, lecturers, module content, evaluation criteria and a list of references

The students are strongly encouraged to discuss the subject matter with respective subject coordinator or the lecturers.

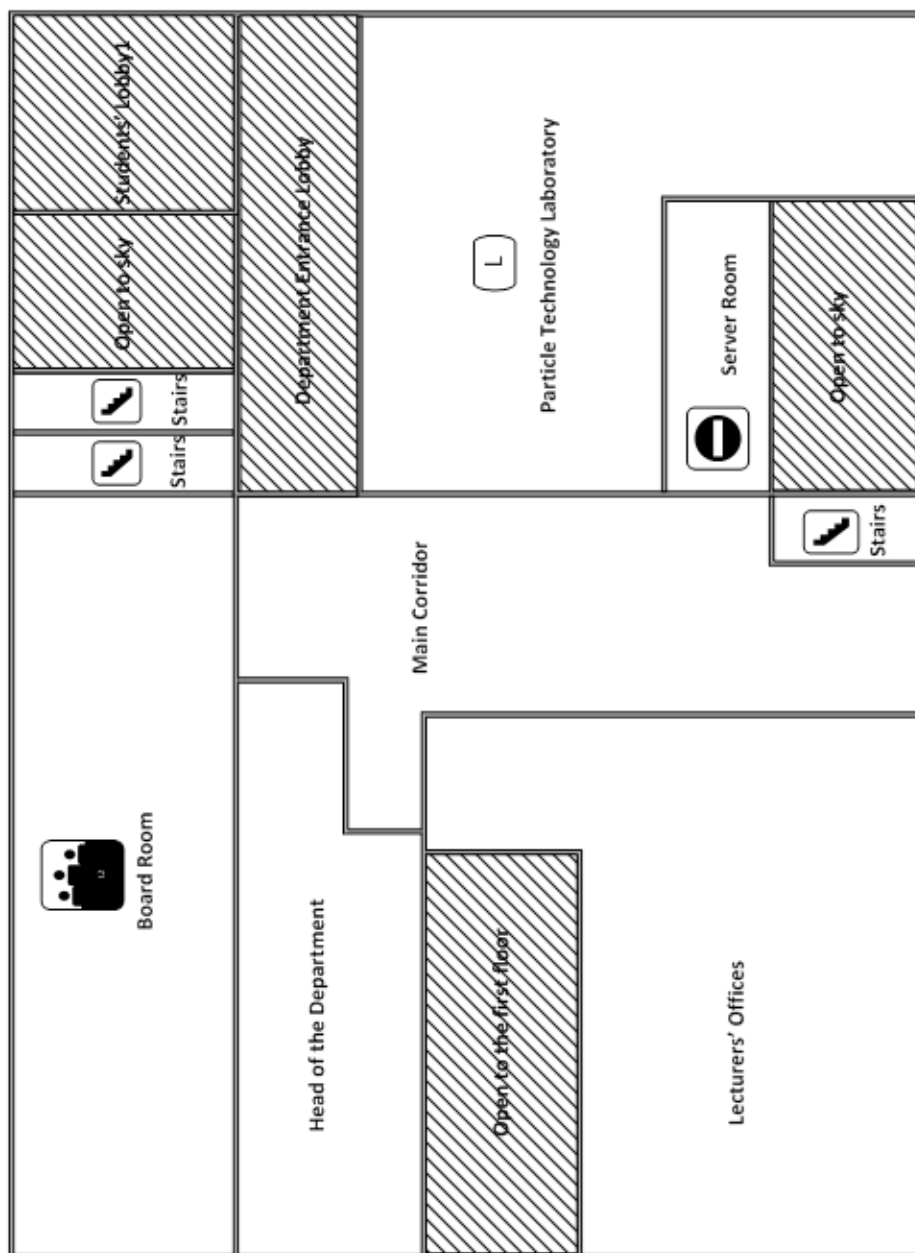
IESL Membership

The Institute of Engineers' is the premier engineering body of Sri Lanka. Members benefit by the development of individual's professional career and building network of technical and social contacts.

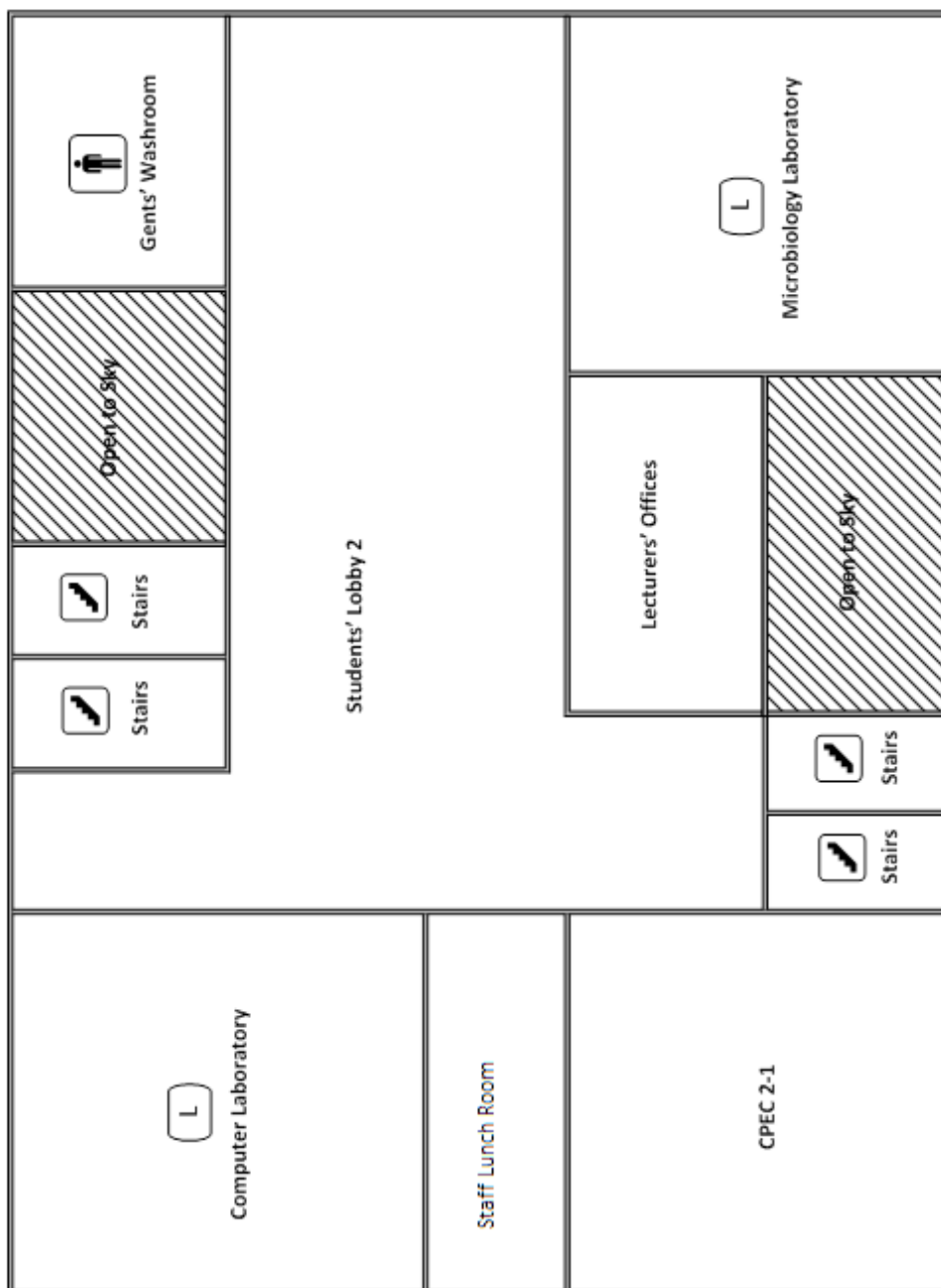
We encourage all CPE students to apply for the student membership category. For further information contact the Industrial Training Division, University of Moratuwa.

FLOOR PLAN OF DCPE

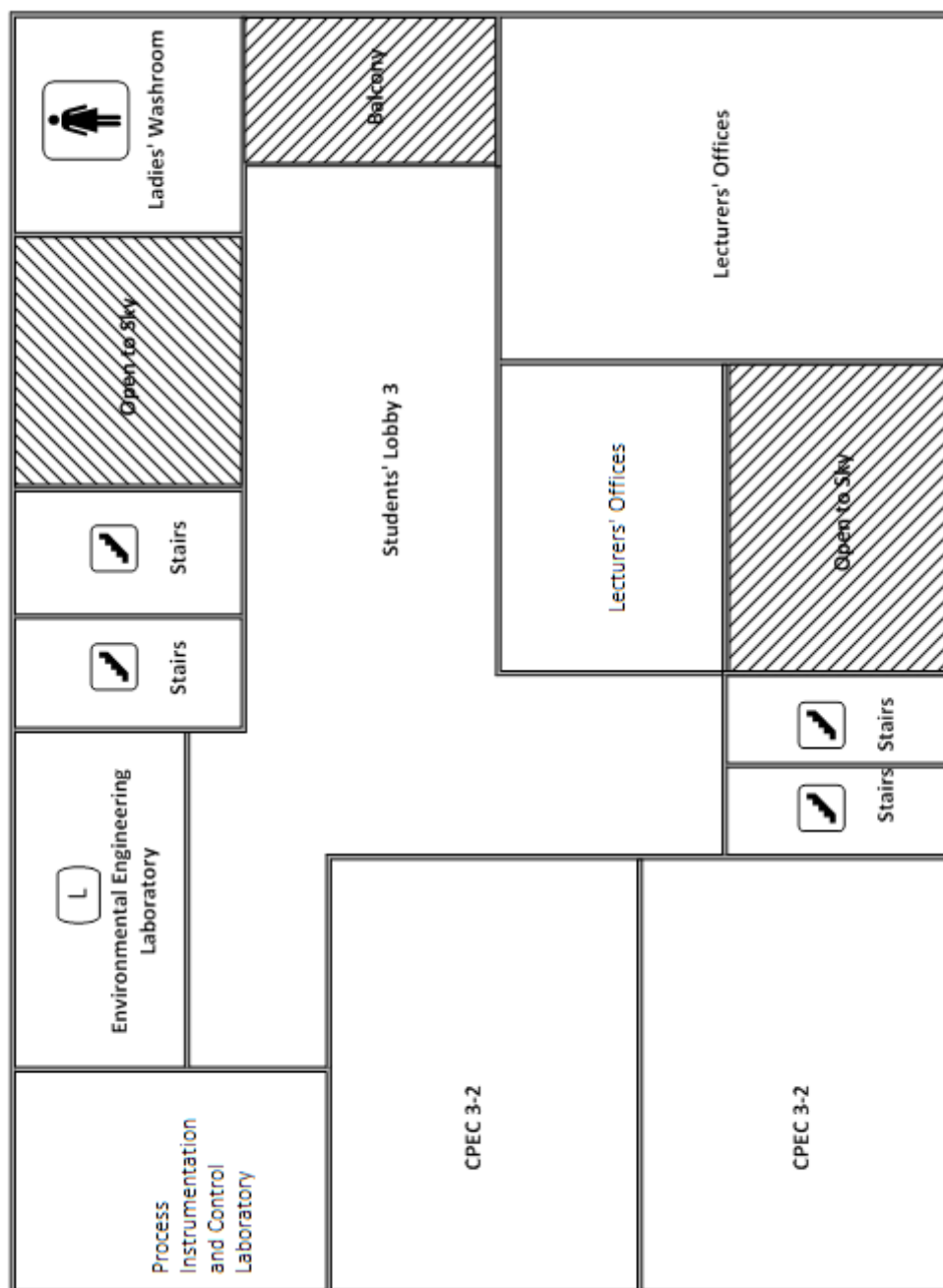
Ground Floor



First Floor



Second Floor





*Printed and published by
Department of Chemical and Process Engineering, University of Moratuwa.*