SEMM 1921

Lecture 2.0

PROGRAMME STUDY

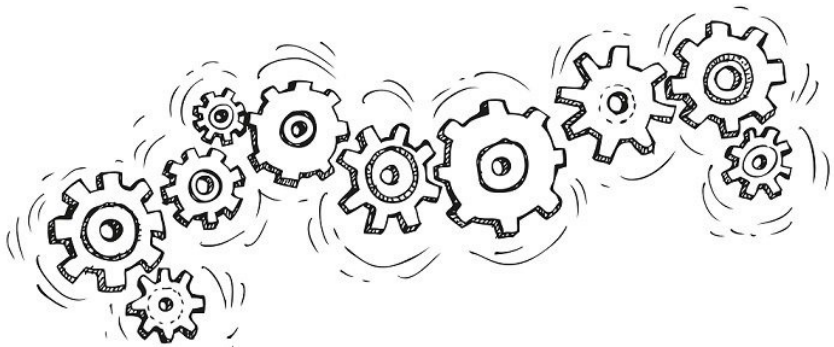
Learning Outcome

At the end of this chapter, students should be able to describe the

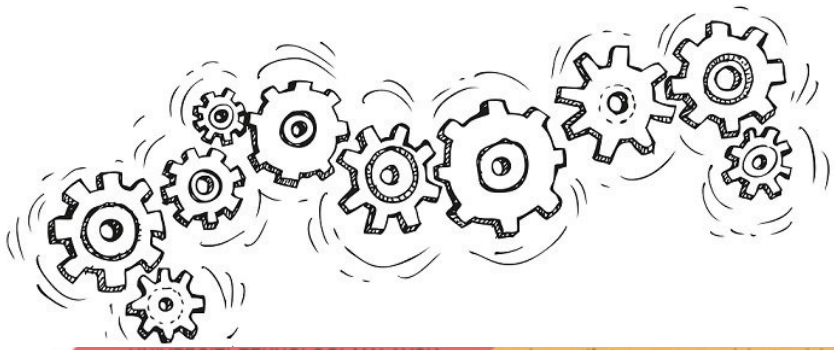
- different levels of learning outcomes,
- 7 UTM graduate attributes,
- areas of study, and
- curriculum structure

of the Bachelor of Mechanical Engineering With Honours Programme (SEMMH)

CONTENTS



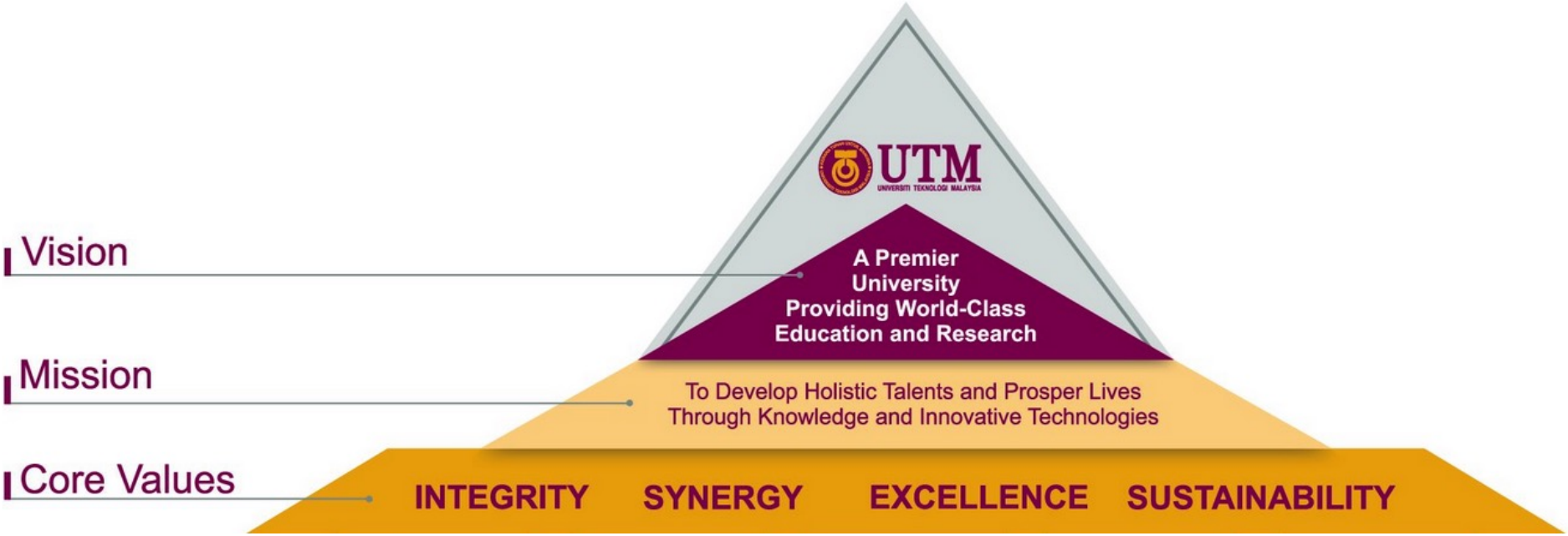
2.1 Vision & Mission of UTM



UTM ONLINE LEARNING

UTM
UNIVERSITI TEKNOLOGI MALAYSIA

I AM UTM
UNIVERSITI TEKNOLOGI MALAYSIA

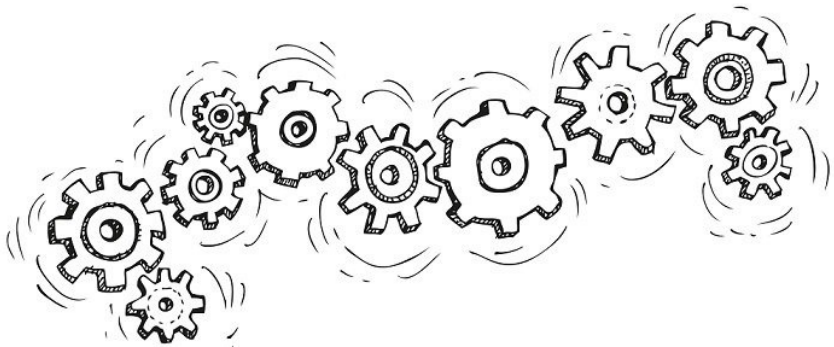


Faculty of Engineering (FE)

- Faculty of Engineering (FE) was formed on 1st July 2018, by merging 6 big faculties into one
- With the transformation, Faculty of Engineering now comprises six schools namely School of Biomedical Engineering and Health Sciences, School of Chemical and Energy Engineering, School of Civil Engineering, School of Computing, School of Mechanical Engineering and School of Electrical Engineering
- This transformation strengthens the collaboration of expertise with different engineering backgrounds within the faculty
- **Vision of FE**: To be a premier global faculty in engineering & technology
- **Mission of FE**: Synergizing academic capacity to nurture holistic talents & lead in innovative technologies

So, what is your personal Vision & Mission ? In life, career…

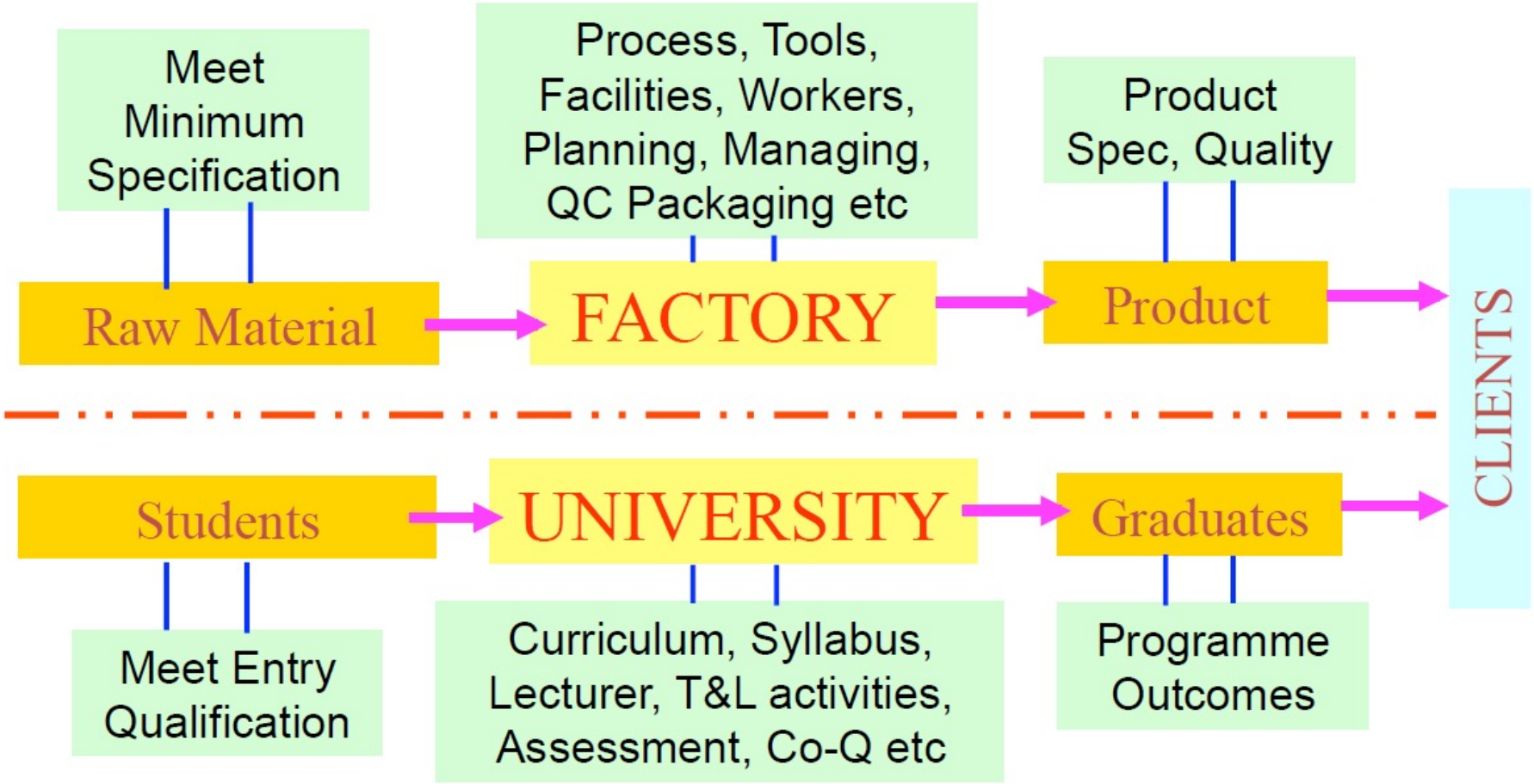
2.2 Outcomes



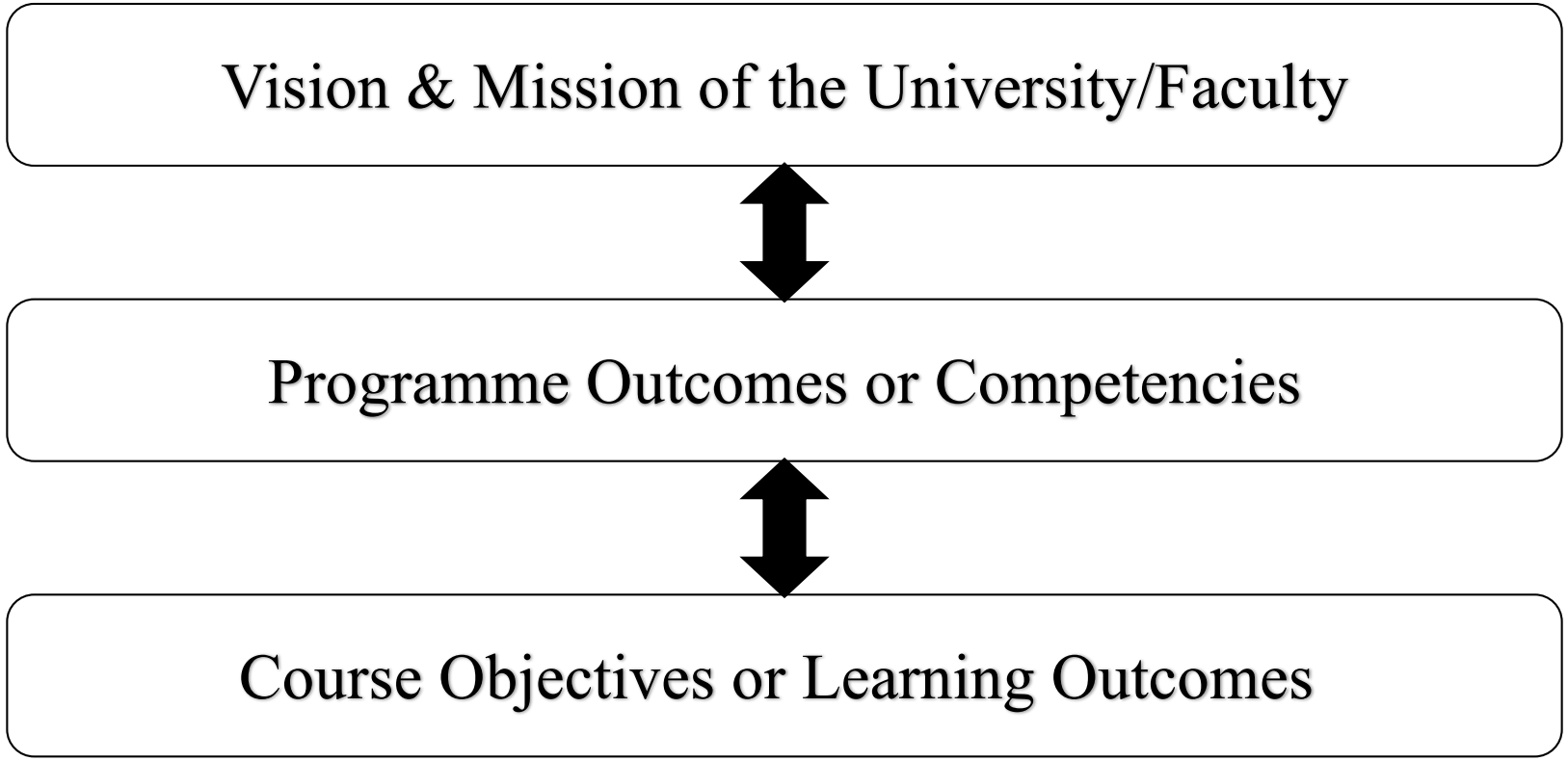
Outcome Based Education (OBE)

- OBE is an educational system which focuses on a clear set of learning outcomes
- OBE is based on the student-centered learning philosophy
- Outcomes address Knowledge, Skills and Attitudes to be attained by students

2.2 Outcomes


Meet Minimum Specification
Process, Tools, Facilities, Workers, Planning, Managing, QC Packaging etc
Product Spec, Quality
Raw Material
FACTORY
Product
CLIENTS
Students
UNIVERSITY
Graduates
Meet Entry Qualification
Curriculum, Syllabus, Lecturer, T&L activities, Assessment, Co-Q etc
Programme Outcomes

2.2 Outcomes


Vision & Mission of the University/Faculty
Programme Outcomes or Competencies
Course Objectives or Learning Outcomes

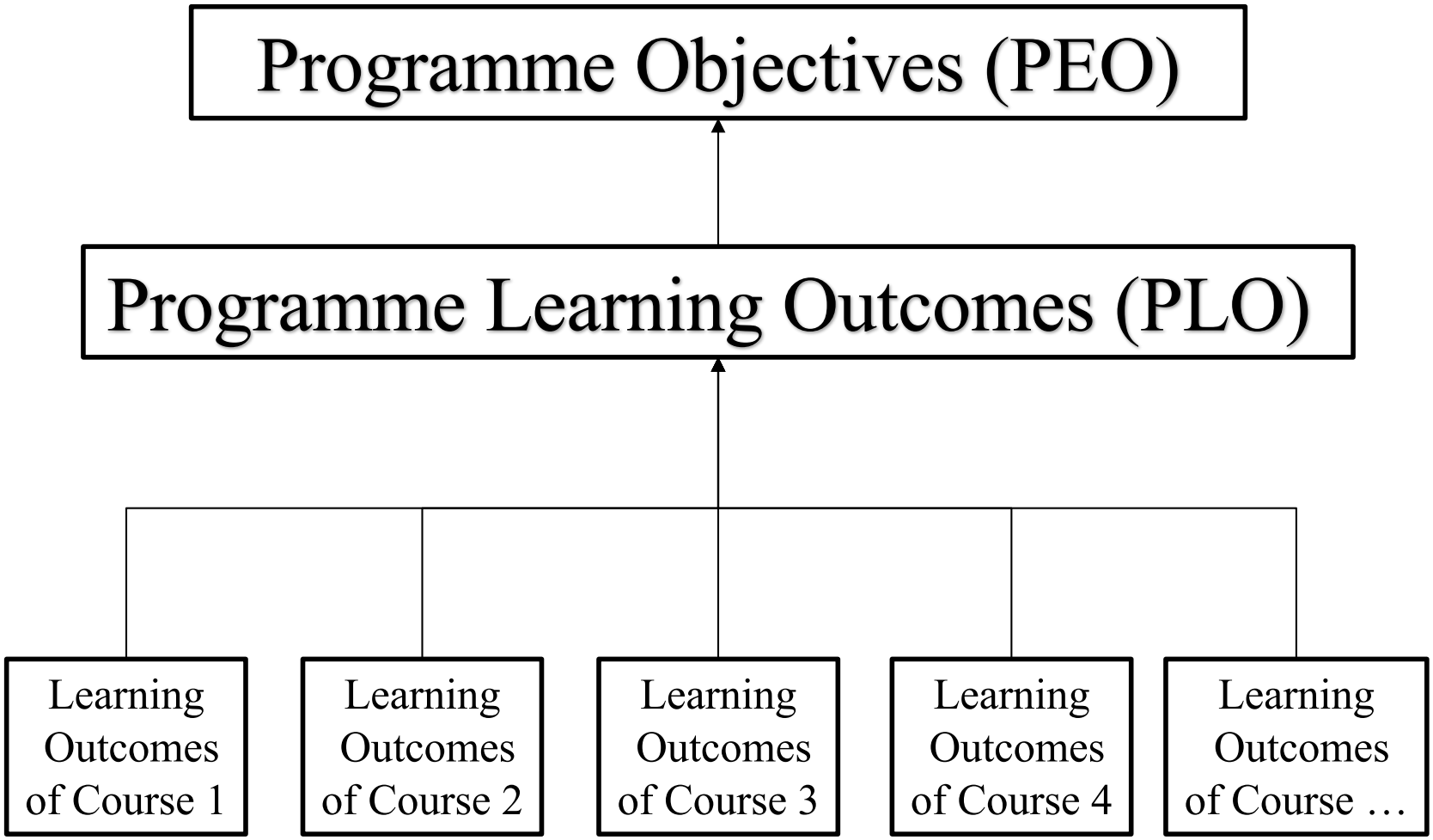
2.2 Outcomes

- **What are Programme Objectives (PEO)?**
  - "Broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve." (ABET Criteria, 2004)
  - "Broad goals that addresses institutional and program mission statements and are responsive to the expressed interests of various group of stakeholders." (Felder and Brent, 2003)

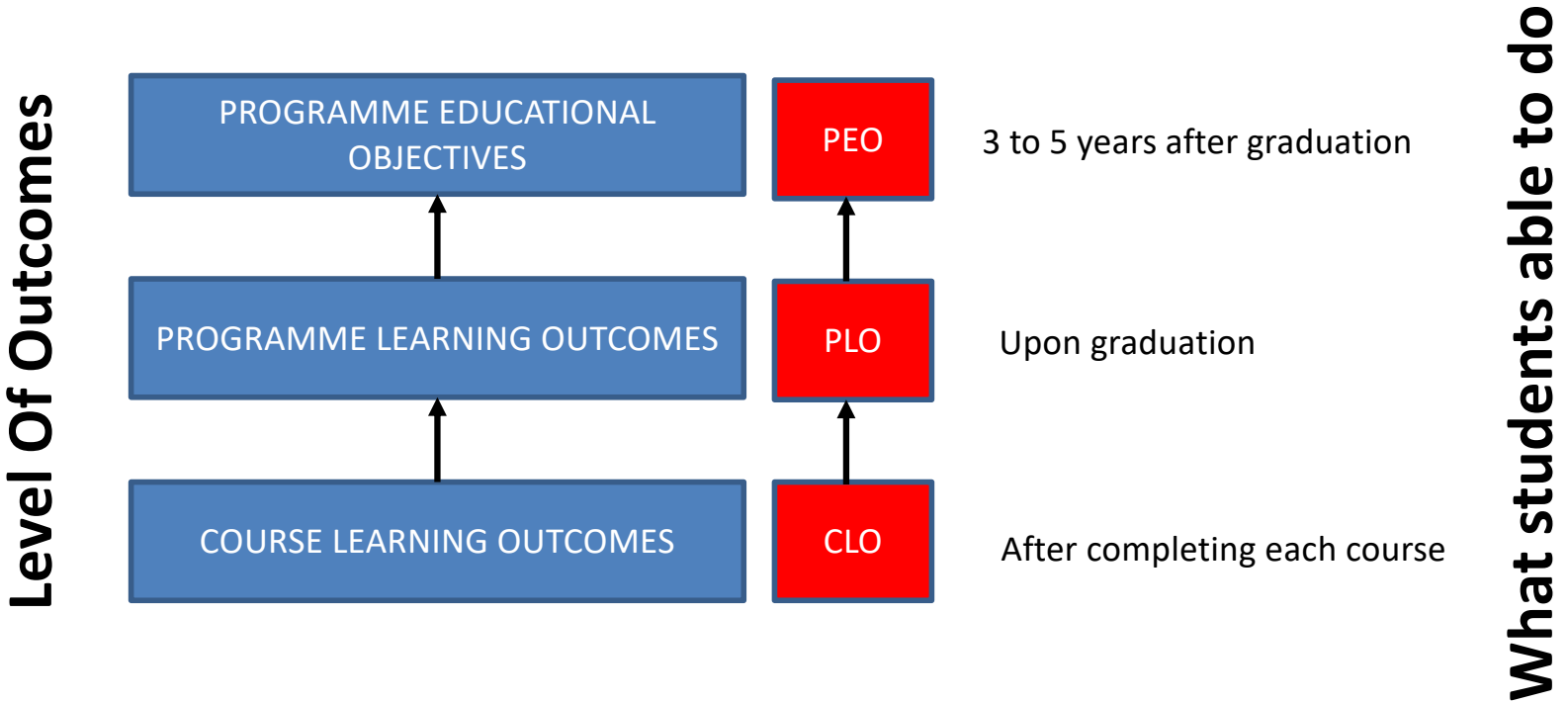
- **What are Programme Learning Outcomes (PLO) ?**
  - Statements that describe what students are expected to know and be able to do by the time of graduation.
  - These relate to the skills, knowledge, and behaviors that student acquire in their matriculation through the program.

- **What are Course Learning Outcomes (CLO) ?**
  - Statements of student actions or what the student is able to do as the course progresses that serve as evidence of the achievement of PLO.
  - These statements are more course specific and relate to the course content
  - They specify what learners' new behaviours will be after a learning experience
  - CLO states the knowledge, skills and attitudes students will gain.

2.2 Outcomes


Programme Objectives (PEO)
Programme Learning Outcomes (PLO)
Learning Outcomes of Course 1
Learning Outcomes of Course 2
Learning Outcomes of Course 3
Learning Outcomes of Course 4
Learning Outcomes of Course …

2.2 Outcomes


Level Of Outcomes
PROGRAMME EDUCATIONAL OBJECTIVES
PEO
3 to 5 years after graduation
PROGRAMME LEARNING OUTCOMES
PLO
Upon graduation
COURSE LEARNING OUTCOMES
CLO
After completing each course
What students able to do

School of Mechanical Engineering
Programme Educational Objectives (PEO)

Code	Programme Educational Objectives
PEO1	Demonstrate academic and technological excellence professionally and globally, particularly in areas related to mechanical engineering practices and contribute innovatively to the nation's wealth creation.
PEO2	Career advancement by achieving higher levels of responsibility, leadership and acquiring professional and advanced academic qualifications.
PEO3	Recognize and practice professional, ethical, environmental and societal responsibilities and value different global and cultural aspects of the work and society.
PEO4	Adapt and communicate effectively and be successful working with multidisciplinary teams.

School of Mechanical Engineering
Programme Learning Outcomes (PLO)

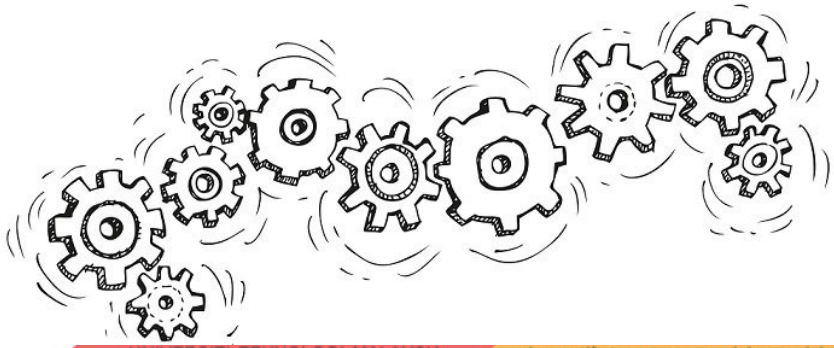
Code	Programme Learning Outcomes
PLO1	Engineering Knowledge
PLO2	Problem Analysis
PLO3	Design/Development of Solutions
PLO4	Investigation
PLO5	Modern Tools Usage
PLO6	The Engineer & Society
PLO7	Environment and Sustainability
PLO8	Ethics
PLO9	Communication
PLO10	Team Working
PLO11	Lifelong Learning
PLO12	Project Management, Finance & Entrepreneurship

2.2 Outcomes

SEMM 1921 CLO to PLO Mapping

No.	Course Learning Outcomes (CLO)	Programme Learning Outcomes (PO)												Learning Taxonomy	Delivery (Teaching Methods)	Assessment	Key Performance Indicators/ Index
		Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Investigation	Modern Tools	The Engineer & Society	Environment & Sustainability	Ethics	Communication	Team Working	Life Long Learning	Management, Finance & Entrepreneurship				
		1	2	3	4	5	6	7	8	9	10	11	12				
1.	Discuss thinking skills, problem solving skills and generic skills	✓												C2	Lecture	Test	Average marks of 65%
2.	Describe the characteristics of the mechanical engineering profession	✓												C2	Lecture	Test	
3.	Prepare technical report in a clear and concise manner.						✓		✓	✓				P2 C3 A3	Lecture	Assignments	
4.	Examine current issues in mechanical engineering						✓							C4	Lecture	Assignments	
5.	Identify basic concepts and use resources to seek basic skills of an entrepreneurial engineer	✓												C1 A3	Lecture	Test	
	Overall	✓					✓		✓	✓							

2.3 Graduate Attributes

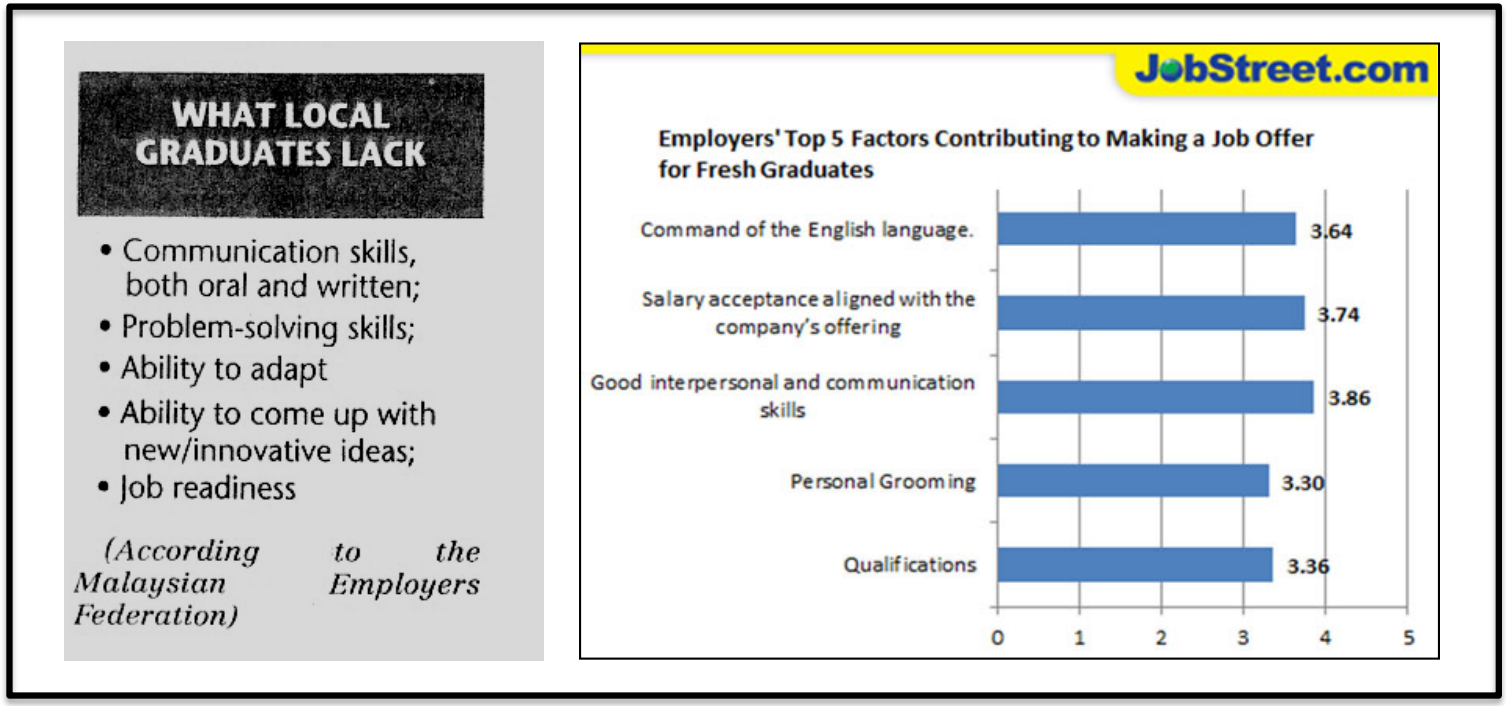


Few comments from the Industry/Employer:

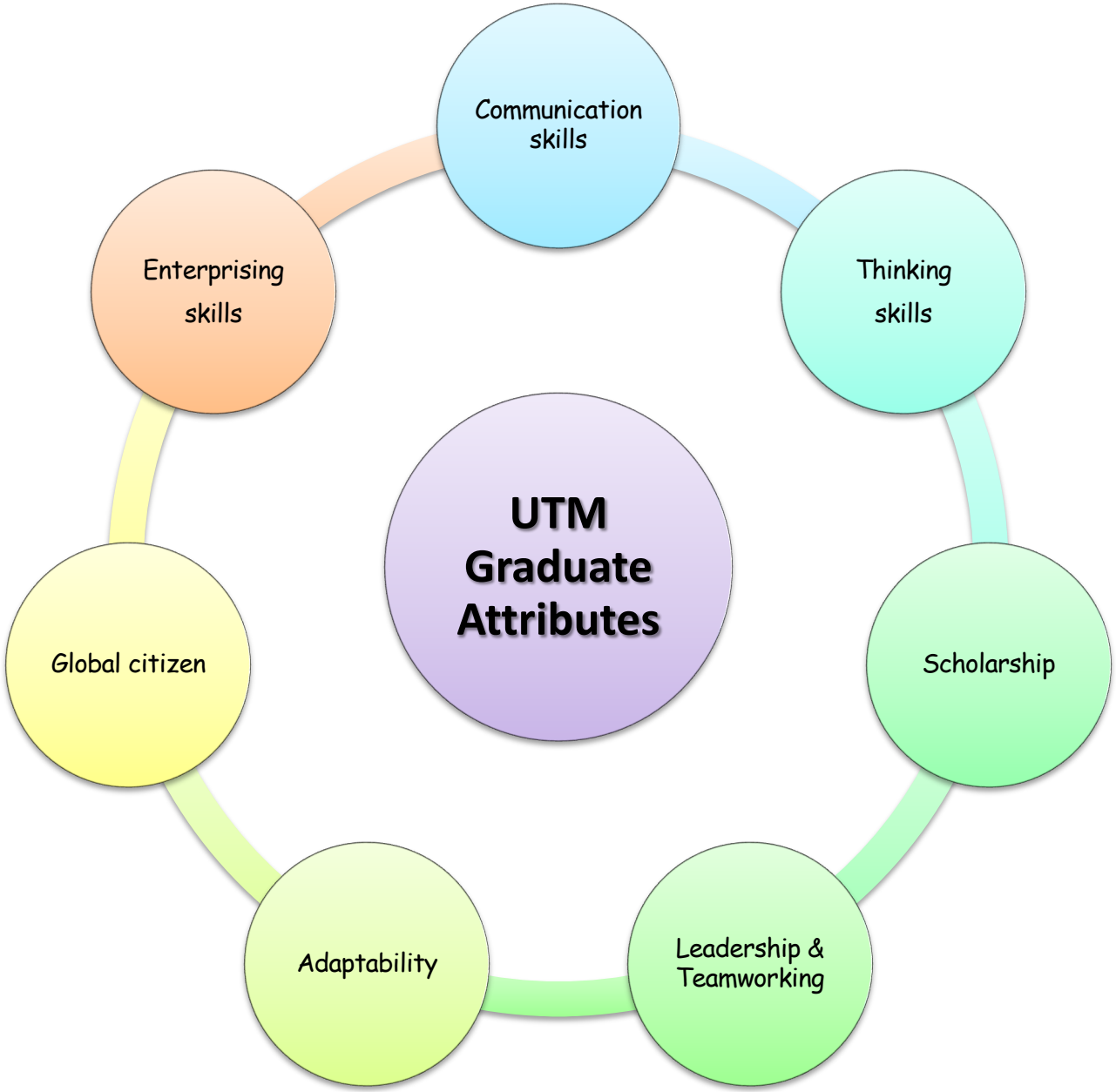
"They are lack of mindset to excel, no urge to learn more."

"They can't blend well easily with others. They are inexpressive and lack of creative in new ideas…and their command of English is poor."

"They are narrow-minded and not risk-takers. Even during big meetings we can see that those who dare to share their views are more of foreign graduates."



UTM Graduate Attributes



Source: http://www.utm.my/undergraduates/generic-skills/

UTM GRADUATE ATTRIBUTES

✓ COMMUNICATION SKILLS

CS1 Ability to convey ideas in writing clearly, effectively and comprehensible.
CS2 Ability to deliver ideas orally in a clear, effective and comprehensible manner.
CS3 Ability to listen actively and respond accordingly.
CS4 Ability to make clear presentations to a diverse audience with confidence.
CS5 Ability to use a variety of media in presentations.
CS6 Ability to negotiate and reach agreement.
CS7 Ability to communicate with people from different cultures and backgrounds.
CS8 Ability to use third language in conversations when the need arises.

✓ THINKING SKILLS

TH1 Ability to define and analyze complex, overlapping, ill-defined problems and make well-supported judgment.
TH2 Ability to expand on and discuss ideas.
TH3 Ability to look for alternative ideas and creative solutions.
TH4 Ability to 'think outside the box'.
TH5 Ability to think critically.
TH6 Ability to think holistically and systematically.

✓ SCHOLARSHIP

SC1 Ability to seek and manage relevant information from a variety of sources.
SC2 Ability to be receptive to new ideas towards self-directed or autonomous learning.
SC3 Ability to develop an inquisitive mind.
SC4 Ability to use systematic research methodology.

✓ LEADERSHIP AND TEAMWORKING SKILLS

TW1 Ability to establish rapport, interact and work effectively with others to accomplish common objectives.
TW2 Ability to lead and influence team members to complete given tasks.
TW3 Ability to understand other people's attitude and behavior, respect their ideas and have mutual trust.
TW4 Ability to understand responsibility towards group decision.

✓ ADAPTABILITY

AD1 Ability to adapt to the culture of new communities and work environment.
AD2 Ability to recognize potential for improvement.
AD3 Ability to apply known solutions to new situations.
AD4 Ability to initiate and implement change.
AD5 Ability to work effectively under pressure.

UTM GRADUATE ATTRIBUTES

✓ GLOBAL CITIZEN

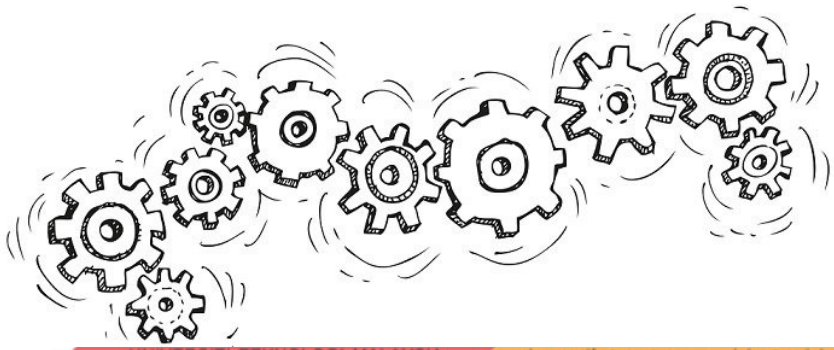
GC1 Spiritually grounded, compassionate and caring.
GC2 Ability to keep updated with current world issues.
GC3 Ability to act ethically in making decisions and interacting with the community.
GC4 Ability to act professionally and responsibly in carrying out duties.
GC5 Ability to understand the impact of socio-cultural, economic, environmental and politics on professional practices.
GC6 Ability to practice and prioritize principles of sustainability in making decisions.

✓ ENTERPRISING SKILLS

ES1 Ability to identify opportunities (including business).
ES2 Ability to use innovative methods in dealing with issues.
ES3 Willingness to take risks.
ES4 Ability to use entrepreneurial mindset in dealing with problems.
ES5 Ability to be resilient.
ES6 Ability to act effectively and imaginatively in difficult situations.

https://ileague.utm.my/generic-skills

2.4 The Mechanical Engineering Program



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UNIVERSITI TEKNOLOGI MALAYSIA

FACULTY OF ENGINEERING

ACADEMIC SESSION 2021/2022

UNDERGRADUATE HANDBOOK

SEMMH (Page 49 in Handbook)

BACHELOR OF MECHANICAL ENGINEERING WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering with Honours is offered either on a full-time or part-time basis. The full-time programme is offered only at the UTM Main Campus in Johor Bahru while the part-time programme is offered at various learning centres throughout Malaysia. The duration of study for the full-time programme is subjected to the student's entry qualification and lasts between four (4) years to a maximum of six (6) years.

The programme is offered on full-time basis and is based on a 2-Semester per academic session. Generally, students are expected to undertake courses equivalent to between fifteen (15) to eighteen (18) credit hours per semester. Assessment is based on course works and final examinations given throughout the semester.

General Information

1.	**Awarding Institution**		Universiti Teknologi Malaysia
2.	**Teaching Institution**		Universiti Teknologi Malaysia
3.	**Programme Name**		Bachelor of Mechanical Engineering with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering with Honours
5.	**Programme Code**		SEMMH
6.	**Professional or Statutory Body of Accreditation**		Engineering Accreditation Council (EAC)
7.	**Language(s) of Instruction**		Bahasa Melayu and English
8.	**Mode of Study (Conventional, distance learning, etc.)**		Conventional
9.	**Mode of Operation (Franchise, self-govern, etc.)**		Self-govern
10.	**Study Scheme (Full Time / Part Time)**		Full Time
11.	**Study Duration**		Minimum : 4 years Maximum : 6 years
Type of Semester		No of Semesters	No of Weeks/Semester
Normal		8	14
Short		1	8
12.	**Entry Requirements**		Matriculation / STPM / Diploma or equivalent

SEMMH

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses		
	(i) General	10	
	(j) Language	8	16.4%
	(k) Entrepreneurship	2	
	(l) Co-Curriculum	3	
ii.	Programme Core	105	75%
iii.	Programme Electives	12	8.6%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses		
	(i) Lecture/Project/ Laboratory	94	
	(j) Workshop/Field/Design Studio	0	75%
	(k) Industrial Training	5	
	(l) Final Year Project	6	
	Total Credit Hours for Part A	**105**	
B	Non-Engineering		
	(i) Applied Science/Mathematic/Computer	12	
	(j) Management/Law/Humanities/Ethics/Economy	12	25%
	(k) Language	8	
	(l) Co-Curriculum	3	
	Total Credit Hours for Part B	**35**	
Total credit hours for Part A and B		**140**	**100%**
Total Credit Hours to Graduate		**140 credit hours**	

AWARD REQUIREMENTS

To graduate, students must:

- Attain a total of not less than 140 credit hours with a minimum CGPA of 2.00.
- Has passed all specified courses.
- Has applied for graduation and has been approved by the University.
- Has completed all five (5) Professional Skills Certification (PSC) courses in UTM
- Other condition as specified.

SEMMH

AREAS OF STUDY

Mechanical Engineering programme makes up the core of the engineering studies in the School of Mechanical Engineering. Students pursuing specialisation in a particular field shall take additional elective courses. The fundamental areas of study in mechanical engineering are described as follows:

(a) **Applied Mechanics**

Applied Mechanics is the application of mechanics principles to real world problems. It is a field of engineering which combines the fundamental physical sciences with mathematical, computational and experimental techniques. The term mechanics refers to the formulation of rules predicting the behaviour of physical system under the influence of any type of interaction with its environments, particularly due to the action of the forces that cause the behaviour or response of the physical system at rest (statics) or in motion (dynamics).

Applied Mechanics covers the following disciplines:

- Mechanics of Materials and Structures
- Mechanics of Machines
- Dynamic Systems and Control

The above sub-fields provide the essential knowledge which is required by the mechanical-based engineers to include Aeronautical, Automotive, Naval Architecture and Offshore Engineering, Materials, Manufacturing and Industrial Engineering counterparts.

Examples of the elective courses in Applied Mechanics are:-

- Mechanics of Composite Materials
- Failure of Engineering Component and Structures
- Mechanical Vibration
- Machine Condition Monitoring
- Noise
- Robotics

(b) **Thermodynamics**

Thermodynamics is taught at two levels – basic and applied. In the basic level, focus is given to the understanding of the concept of system, heat, work as well as material properties in relation to heat and work and their influence on a particular thermodynamic system. The second level involves application of theories based on thermodynamic laws in studying and analysing primary devices. Focus is on the methods of generating heat and power, minimisation of fuel usage, efficiency and other parameters. Thermodynamics is an important field, very much needed in several industrial sectors such as power generation, petrochemistry, automotive, and building maintenance. It is a course which directly involved in power generation/energy savings, different engine designs and supporting systems with high capability and cost effectiveness.

Examples of elective courses in Thermodynamics are:

- Combustion Processes
- Air Conditioning
- Internal Combustion Engine
- Heat Transfer
- Power Plant Technology

SEMMH

(c) **Fluid Mechanics**

It is a field of study which deals with fluid properties, surface hydrostatic force (examples: dam gate, reservoir, pressure and flow measurement, piping system design, potential flow and boundary layer) to determine flow type and resulting force, pumps and turbines. The principles applied include Newton's law, thermodynamic laws and basic knowledge in Mathematics. The scope of study is based on its application in the engineering field.

Examples of elective courses:

- Turbomachinery
- Hydraulic and Pneumatic Systems
- Computational Fluid Dynamics (CFD)

(d) **Design**

Introduction to Design

Students are exposed to the concepts and methods to develop an efficient design process and applying it to solve engineering design problems creatively and effectively.

Component Design

Students are exposed to analysis in machine design element failure theories. This includes failures due to static and fatigue loads. It involves fatigue strength and endurance level, modified stress, Goodman diagram and fatigue design under tensile and combined stresses. The content will encompass the design and selection of bolts, welding, spring, ball and roller bearings, gears and belts. At the end of the course, a student should have the capabilities to identify, analysis and design the machine elements in the perspective of static and fatigue failure aspect.

System Design

Students are able to design methodologies and principles specific to the practice of mechanical design. Emphasis is on developing efficient and effective design techniques as well as project-oriented skills from both technical and non-technical consideration. Students are able to identify and apply appropriate methodology in performing design tasks, recognise the fundamental principles of mechanical design and practices as well as formulate and apply general problem-solving strategy in the analysis of situation problem and potential problem. Students are able to identify and apply industry standards in design communication.

(e) **Materials Science and Materials Technology**

This course is important to engineers because it provides the basic knowledge on engineering materials such as metals, polymers, ceramics and composites so that proper materials can be selected for a particular design or product. This course relates the structure to the properties of materials so the behaviour of materials can be better understood.

SEMMH - Course Menu

COURSE MENU

YEAR 1: SEMESTER 1			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 1013	Programming for Engineers	3	
SEMM 1203	Statics*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1122	English Communication Skills	2	
UHIS 1022	Philosophy and Current Issues (for Local Student Only)	2	
UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilisations (for International Students Only)		
	Total	**18**	

YEAR 1 : SEMESTER 2			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
SEEU 1002	Electrical Technology	2	
SSCE 1793	Differential Equations	3	SSCE 1693
UHMT 1012	Graduate Success Attributes	2	
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)	2	
	Total	**18**	

Subject to changes

*** Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

SEMMH - Course Menu

YEAR 2 : SEMESTER 1			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2223	Mechanics of Machines & Vibration*	3	SEMM 1213
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013**
SEMM 2413	Thermodynamics*	3	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
UHIT 2302	Thinking of Science and Technology	2	
	Total	**16**	

YEAR 2 : SEMESTER 2			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2423	Applied Thermodynamics*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SEEU 2012	Electronics	2	SEEU 1002
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**17**	

Subject to changes

***Core Courses – minimum passing grade is C (50%)**

Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 3 : SEMESTER 1			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 2713	Manufacturing Processes	3	
SEMM 3023	Applied Numerical Methods	3	SEMM 1013, SSCE 1793
SEMM 3233	Control Engineering	3	SEMM 1213**, SSCE 1793**
SEMM 3242	Instrumentation	2	SEEU 2012**
SEMM 3931	Laboratory II	1	SEMM 2921
SSCE 2193	Engineering Statistics	3	
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	**17**	

SEMMH - Course Menu

YEAR 3 : SEMESTER 2			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 3033	Finite Element Methods	3	SEMM 1113**
SEMM 3253	Mechatronics	3	SEMM 1013**, SEEU 2012**
SEMM 3443	Heat Transfer	3	SEMM 2413**, SSCE 1793**
SEMM 3523	Component Design	3	SEMM 2123**, SEMM 1513
SEMM 3813	Industrial Engineering	3	
SEMM 3941	Laboratory III	1	SEMM 3931
UHLB 3162	English for Professional Purposes	2	ULAB 1122, ULAB 2122
	Total	**18**	

SHORT SEMESTER			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2423**
	Total	**5**	

Subject to changes
** **Minimum grade D- (30%) in the pre-requisite courses**
Obtained minimum of 80 credits
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 4 : SEMESTER 1			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 3823	Engineering Management, Safety and Economics	3	
SEMM 4533	System Design	3	SEMM 3523
SEMM 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2423**
SEMX 4xx3	Elective I	3	
SEMX 5xx3	PRISMS Elective 1		
SEMX 4xx3	Elective II	3	
SEMX 5xx3	PRISMS Elective II		
UxxX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
	Total	**16**	

YEAR 4 : SEMESTER 2			
CODE	COURSE	CREDIT	PRE-REQUISITE
SEMM 4902	Engineering Professional Practice	2	
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMX 4xx3	Elective III	3	
SEMX 5xx3	PRISMS Elective III		
SEMX 4xx3	Elective IV	3	
SEMX 5xx3	PRISMS Elective IV		
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-Curricular Experiential Learning (ExCEL)	1	
	Total	**15**	

Subject to changes
** **Minimum grade D- (30%) in the pre-requisite courses**
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

SEMMH - Elective Courses

ELECTIVE COURSES

Apart from the core course, students must also take 12 credits of elective course.

Areas	Code	Elective Courses
Area 1: Mechanical	SEMM 4113	Plasticity & Application
	SEMM 4123	Structural Analysis
	SEMM 4133	Failure of Engineering Components & Structures
	SEMM 4143	Mechanics of Composite Materials
	SEMM 4153	Applied Stress Analysis
	SEMM 4163	Surface Mount Technology
	SEMM 4213	Mechanical Vibration
	SEMM 4233	Mechanisms & Linkage
	SEMM 4243	Advanced Control
	SEMM 4253	Industrial Automation
	SEMM 4273	Robotics
	SEMM 4293	Noise
	SEMM 4313	Turbomachinery
Engineering	SEMM 4323	Fluid Power
	SEMM 4333	Computational Fluid Dynamics
	SEMM 4343	Hydraulic Machine & Pipe System
	SEMM 4353	Lubrications
	SEMM 4413	Internal Combustion Engine
	SEMM 4423	Power Plant Engineering
	SEMM 4433	Refrigeration & Air Conditioning
	SEMM 4443	Thermal Fluid System Design
	SEMM 4453	Combustion
	SEMM 4463	Energy and Environment
	SEMM 4513	Computer Aided Design

PRISMS ELECTIVE COURSES

For students who intend to enrol in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

SEMMH - Elective Courses

PRISMS ELECTIVE COURSES

For students who intend to enrol in PRISMS, refer to the PRISMS Section for a list of related elective courses associated with the Postgraduate Programme.

Requirements

Students who are eligible to apply for PRISMS are those with academic qualification who are in Year 3 Semester 2 with cumulative average grade value of CGPA 3.3 and above. Students can apply for PRISMS in Year 3 Semester 2 through the Program Integrasi Sarjana Muda-Sarjana (PRISMS) application form and must be recommended by the Academic Advisor, approved by the Program Director and certified by the Chair of School or Dean of Faculty.

End of Lecture 2