BACHELOR OF MECHANICAL ENGINEERING (AERONAUTICS) WITH HONOURS

PROGRAMME SPECIFICATIONS

The Bachelor of Mechanical Engineering (Aeronautics) 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 (Aeronautics) with Honours
4.	**Final Award**		Bachelor of Mechanical Engineering (Aeronautics) with Honours
5.	**Programme Code**		SEMTH
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

Course Classification

No.	Classification	Credit Hours	Percentage
i.	University Courses		
	(q) General	10	
	(r) Language	8	16.4%
	(s) Entrepreneurship	2	
	(t) Co-Curriculum	3	
ii.	Programme Core	87	62.2%
iii.	Programme Electives	30	21.4%
	Total	**140**	**100%**
Classification of courses for engineering programme			
A	Engineering Courses		
	(q) Lecture/Project/ Laboratory	94	
	(r) Workshop/Field/Design Studio	0	75%
	(s) Industrial Training	5	
	(t) Final Year Project	6	
	Total Credit Hours for Part A	**105**	
B	Non-Engineering		
	(q) Applied Science/Mathematic/Computer	12	
	(r) Management/Law/Humanities/Ethics/Economy	12	25%
	(s) Language	8	
	(t) 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 (PCS) courses in UTM
- Other condition as specified.

AREAS OF STUDY

Aeronautical engineering encompasses all aspects of studies related to flying. In this aspect, flying includes aerospace flight. The areas of specialisation in Aeronautical Engineering can be divided into the following: -

(a) Aerodynamics

Aerodynamics is the relationship between air (wind) and the material (solid) that moves in it. Various principles of Fluid Mechanics are considered in a flying problem. For example, aerodynamic study will determine a suitable shape for an aircraft, missile etc.

(b) Aircraft structure

This area will determine the integrity (strength) of a flying body such as an aircraft or a missile. Using dimensions and tolerances, strength of material, shear flow and theory of thin plate, the structure of an aircraft can be determined.

(c) Aircraft propulsion

Propulsion is a study of an aircraft powerplant. This study includes design and selection of appropriate power plant for a particular aircraft. This field has developed vastly since the increase in the cost of petroleum. Engineer shave been competing to invent lighter and more economic power plants.

(d) Aircraft instrumentation and Avionics

Avionics is the acronym for `Aviation Electronics' and together with aircraft instrumentation they involve a wide range of studies. Flying has been facilitated by the use of various electronic devices. Electronic devices, which facilitate flying such as radars ILS (Instrument Landing System) ADF (Automatic Direction Finder) etc., were specifically invented by the Avionic/Aircraft Instrument Engineer. The Avionic/Aircraft Instrument Engineer will have to ensure that the instrument fitted on an aircraft will function satisfactorily together with a high degree of reliability.

(e) Management

The aircraft industry has expanded tremendously during this decade. The industry requires experts to manage and administer its operation smoothly. Regulations concerning the construction and operations of aircraft have been so devised in order to avoid accidents and mistakes which may sacrifice lives.

(f) Transportation

Apart from transporting passengers an aircraft is also used as cargo carriers, ambulance etc. Study in this area trains transportation experts to modify flight schedule and load so that the aircraft can be used economically.

(g) Flight Regulations

To avoid accidents the flying fraternity has formulated special laws for flying. Briefly the laws are divided into two, namely military flight regulations and public flight regulations.

(h) Materials for Aircraft

This field focuses its study on selecting and determining metals, plastic, composites, etc. which are suitable for building an aircraft, rocket etc.

(i) Flight Mechanics

Flight mechanics is an important aspect in the design and operation of an aircraft flight mission. Research area includes aircraft performance (take-off, climbing, cruising, decent and landing) and aircraft static stability and control in steady flight condition.

(j) Flight Dynamics and Control

The area is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. The area includes the equation of motion of rigid body including translation aircraft longitude in a land lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods.

CAREER PROSPECTS

Graduates of this programme are essentially Mechanical Engineers but those with specialisation to Aeronautical Engineering can easily find job opportunities in various sectors. Alternatively, they can also be known as Aeronautical Engineers depending on their job placements in industries, they are in.

The Aeronautical Engineering programme at UTM is offered as a specialisation of mechanical engineering and covers five main areas namely aerodynamics, aircraft Structure, flight dynamics and control, propulsion and aircraft design. Thus, graduates of this programme satisfy the requirement to graduate as an engineer in Mechanical Engineering as well as in the field of specialisation in aeronautics. Apart from TUDM, the Civil Aviation Department requires trained manpower to supervise flying activities in Malaysia. Other organisations that require graduates in the field of aeronautics include Malaysia Airline System, AirAsia, AIROD, Eagle Aircraft, SME Aviation, Malaysia Helicopter Services (MHS), TLDM and PDRM Air Unit. Several other firms also have working opportunities in the airline industry.

In the field of academic and research opportunities is available for Aeronautical Engineers to serve in any institution that runs courses and research in the field of Aeronautics. Several other universities and institutions in Malaysia have started to offer programme in the field of Aeronautics too. Due to the rapid expansion in the airline industry, many airline companies, flying clubs and firms are prepared to get involved actively in the airline industry of the country by offering more job opportunities to UTM graduates.

MOBILITY PROGRAMME (OUTBOUND)

Universiti Teknologi Malaysia (UTM) is offering five (5) types of mobility programs which allow UTM Student to go abroad and join academic programs in universities, institutions or organizations in all over the world. The opportunities offered are as below:

1. Study Abroad / Student Exchange

Study Abroad/Student Exchange programme is a programme which allow student to spend one or two semesters at universities abroad and take courses in regular semester with credit transfer opportunity.

2. Research Internship Abroad

Research Internship is a program which allow student to join research study or internship under the supervision of an academic staff at universities or industries abroad from all over the world.

3. Global Outreach Programme (GOP)

GOP is a 7 to 14 days academic based program to experience various cultures in other countries. It includes immersion elements such as research & academic activities, social responsibility and cross-cultural activities.

4. International Invitation Programme

Students participate in program organised by international institutions/ organisations with the following themes:

(i) Seminar, Conference or Paper Presentation
(ii) Cultural Exhibition and Conference
(iii) Student Development Activity

5. Summer School Abroad

Summer School program is a program which is designed to provide educational opportunities in 4 to 8 weeks during summer holiday abroad. It is related to environment, local community, heritage and tradition.

Details and appropriate forms and procedures can be reached at **UTM International link: http://www.utm.my/international/outbound-mobility-programs/**

COURSE MENU

YEAR 1 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1203	Static*	3	
SEMM 1503	Engineering Drawing	3	
SEMM 1911	Experimental Methods	1	
SEMM 1921	Introduction to Mechanical Engineering	1	
SEEU 1002	Electrical Technology	2	
SSCE 1693	Engineering Mathematics I	3	
UHLB 1112	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	**17**	

YEAR 1 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 1013	Programming for Engineers	3	
SEMM 1113	Mechanics of Solids I*	3	SEMM 1203
SEMM 1213	Dynamics*	3	SEMM 1203
SEMM 1513	Introduction to Design	3	SEMM 1503
UHMS 1182	Appreciation of Ethics and Civilisations (for Local Students Only)	2	
UHLM 1012	Malay Language for Communication 2 (for International Students Only)	2	
UHMT 1012	Graduate Success Attributes	2	
	Total	**16**	

Subject to changes
*** Core Courses – minimum passing grade is C (50%)**
Notes: L – Lecture, T – Tutorial, P/S – Practical/Studio

YEAR 2 : SEMESTER 1			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2123	Mechanics of Solids II*	3	SEMM 1113
SEMM 2313	Mechanics of Fluids I*	3	SEMM 1203, SEMM 1013**
SEMM 2413	Thermodynamics*	3	
SEMM 2921	Laboratory I	1	SEMM 1911
SSCE 1993	Engineering Mathematics II	3	SSCE 1693
UHIT 2302	Thinking of Science and Technology	2	
UHLB 2122	Academic Communication Skills	2	UHLB 1122
	Total	**17**	

YEAR 2 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 2223	Mechanics of Machines & Vibration*	3	SEMM 1213
SEMM 2323	Mechanics of Fluids II*	3	SEMM 2313
SEMM 2433	Applied Thermodynamics and Heat Transfer*	3	SEMM 2413
SEMM 2613	Materials Science	3	
SSCE 2193	Engineering Statistics	3	
SSCE 1793	Differential Equations	3	SSCE 1693
	Total	**18**	

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 3622	Material Technology	2	SEMM 2613
SEMM 3931	Laboratory II	1	SEMM 2921
SEMT 3333	Aerodynamics	3	SEMM 2323**
UBSS 1032	Introduction to Entrepreneurship	2	
	Total	**17**	

YEAR 3 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3033	Finite Element Methods	3	SEMM 1113**
SEMM 3941	Laboratory III	1	SEMM 3931
SEMT 3132	Aircraft Structure I	2	SEMM 2123*
SEMT 3212	Flight Mechanics	2	SEMT 3333**
SEMT 3423	Aircraft Propulsion System	3	SEMM 2413
SEMT 3822	Aviation Management	2	
SEEU2012	Electronics	2	SEEU 1002
UHLB 3132	Professional Communication Skills	2	UHLB 2122
	Total	**17**	

SHORT SEMESTER			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 3915	Industrial Training	5	##, SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
	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 4912	Undergraduate Project I	2	SEMM 2123**, SEMM 2223**, SEMM 2323**, SEMM 2433**
SEMT 4253	Aircraft Instrumentation and Avionics	3	SEEU2012
SEMT 4223	Flight Dynamics & Control	3	SEMT 3212**, SEMM 3233, SKMF3333
SEMT 4513	Aircraft Design I	3	SEMM 1513, SEMT 3212
SEMT 4143	Aircraft Structure II	3	SEMT 3132
UKQF 2xx2	Co-curriculum and Service-Learning Elective	2	
	Total	**16**	

YEAR 4 : SEMESTER 2			
CODE	**COURSE**	**CREDIT**	**PRE-REQUISITE**
SEMM 4924	Undergraduate Project II	4	SEMM 4912
SEMM 4902	Engineering Professional Practice	2	Must be 3rd year
SEMT 4523	Aircraft Design II	3	SEMT 4513, SEMT 4143**
SEMT 4813	Aviation Economy	3	
UXXX 2xx2	Generic Skills or Knowledge Expansion Cluster Elective	2	
UHLX 1112	Foreign Language Elective	2	
UKQT 3001	Extra-curricular experiential Learning	1	Completed 3 extracurricular experience programmes
	Total	**17**	

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

English prerequisite is shown below:

ENGLISH LANGUAGE TESTS	UHLB 1112	UHLB 2122	UHLB 3132
a) MUET : ≥ Band 4 b) IELTS : ≥ Band 5.5 c) TOEFL: ≥ 525 d) TOEFL iBT : ≥ 60 e) CEFR : ≥ B2	Exemption*	Compulsory	Compulsory

* Eligible students are required to apply for UHLB 1112 course credit exemption. The credit exemption form (UTM.E/3.8) is provided at the academic office.

GRADUATION CHECKLIST

To graduate, students must pass all the stated courses in this checklist. It is the responsibility of the students to ensure that all courses are taken and passed. Students who do not complete any of the course are not allowed to graduate.

NO	COURSE CODE	COURSE NAME	CREDIT EARNED (JKD)	CREDIT COUNTED (JKK)	TICK (/) IF PASSED
MECHANICAL ENGINEERING COURSES					
1	SEMM 1013	Programming for Engineers	3	3	
2	SEMM 1113	Mechanics of Solids I	3	3	
3	SEMM 1203	Statics	3	3	
4	SEMM 1213	Dynamics	3	3	
5	SEMM 1503	Engineering Drawing	3	3	
6	SEMM 1513	Introduction to Design	3	3	
7	SEMM 1911	Experimental Methods	1	1	
8	SEMM 1921	Introduction to Mechanical Engineering	1	1	
9	SEMM 2123	Mechanics of Solids II	3	3	
10	SEMM 2223	Mechanics of Machines & Vibration	3	3	
11	SEMM 2313	Mechanics of Fluids I	3	3	
12	SEMM 2323	Mechanics of Fluids II	3	3	
13	SEMM 2413	Thermodynamics	3	3	
14	SEMM 2433	Applied Thermodynamics & Heat Transfer	3	3	
15	SEMM 2613	Materials Science	3	3	
16	SEMM 2713	Manufacturing Processes	3	3	
17	SEMM 2921	Laboratory I	1	1	
18	SEMM 3023	Applied Numerical Methods	3	3	

19	SEMM 3033	Finite Element Methods	3	3	
20	SEMM 3233	Control Engineering	3	3	
21	SEMM 3622	Materials Technology	3	3	
22	SEMM 3915	Industrial Training	5	HL	
23	SEMM 3931	Laboratory II	1	1	
24	SEMM 3941	Laboratory III	1	1	
25	SEMM 4902	Engineering Professional Practice	2	2	
26	SEMM 4912	Undergraduate Project I	2	2	
27	SEMM 4924	Undergraduate Project II	4	4	
28	SEMT 3132	Aircraft Structure I	2	2	
29	SEMT 3212	Flight Mechanics	2	2	
30	SEMT 3333	Aerodynamics	3	3	
31	SEMT 3423	Aircraft Propulsion System	3	3	
32	SEMT 3822	Aviation Management	2	2	
33	SEMT 4143	Aircraft Structure II	3	3	
34	SEMT 4223	Flight Dynamics & Control	3	3	
35	SEMT 4253	Aircraft Instrumentation & Avionics	3	3	
36	SEMT 4513	Aircraft Design I	3	3	
37	SEMT 4523	Aircraft Design II	3	3	
38	SEMT 4813	Aviation Economy	3	3	
TOTAL CREDIT FOR MECHANICAL ENGINEERING COURSES (A)			**101**	**96**	
ELECTRICAL COURSES (School of Electrical Engineering)					
1	SEEU 1002	Electrical Technology	2	2	
2	SEEU 2012	Electronics	2	2	
TOTAL CREDIT FOR ELECTRICAL COURSES (B)			**4**	**4**	
MATHEMATICS COURSES (Faculty of Science)					
1	SSCE 1693	Engineering Mathematics I	3	3	
2	SSCE 1793	Differential Equations	3	3	
3	SSCE 1993	Engineering Mathematics II	3	3	
4	SSCE 2193	Engineering Statistics	3	3	
TOTAL CREDIT FOR MATHEMATICS COURSES (C)			**12**	**12**	
UNIVERSITY GENERAL COURSES					
CLUSTER 1: APPRECIATION OF PHILOSOPHY, VALUE & HISTORY					
1	UHIS 1022	Philosophy and Current Issues (for Local Students Only)	2	2	
	UHIS 1022 OR UHMS 1182	Philosophy and Current Issues OR Appreciation of Ethics and Civilizations (for International Students Only)			

2	UHMS 1182	Appreciation of Ethics and Civilizations (for Local Students)	2	2	
	UHLM 1012	Malay Language 2 (for International Students)			
CLUSTER 2: GENERIC SKILLS					
1	UHMT 1012	Graduate Success Attributes	2	2	
2	UHMT 2012	Leadership	2	2	
3.	UHMS 2022	Critical and Creative Thinking	2	2	
4.	UHMS 2032	The Human side of Knowledge Management	2	2	
5.	UHMS 2042	Development and Global Issues	2	2	
6.	UHMT 2042	Guidance & Counselling	2	2	
7.	UHMT 2062	Psychology of Adjustment	2	2	
8.	UBSS 2072	Fundamentals of Intellectual Property Law	2	2	
9.	UBSS 2082	Law for Entrepreneurs	2	2	
10.	UBSS 2092	Entrepreneurship and Enterprise Development	2	2	
11.	UBSS 2102	Social Entrepreneurship	2	2	
12.	UHMS 2112	Engineering Communication	2	2	
13.	UHMS 2122	Human Communication	2	2	
14.	UHMT 2132	Professional Ethics	2	2	
15.	UMJT 2142	Professional Ethics, Safety and Health (Ningen Ryoku)	2	2	
CLUSTER 3: KNOWLEDGE EXHANCEMENT					
1.	UHIT 2302	Science and Technology Thinking	2	2	
2.	UHIT 1022	Science, Technology and Mankind	2	2	
3.	UHII 2012	Al-Qur'an and Human Civilization	2	2	
4.	UHIT 2032	Life Institutions and Sustainable Development	2	2	
5.	UHIZ 2042	Future Studies	2	2	
6.	UHIT 2052	Family Law	2	2	
7.	UHIZ 2062	World Scinece	2	2	
8.	UHIS 2072	Sustainable Economy	2	2	
9.	UHIS 2082	Practice and Concept of Halal Management	2	2	
10.	UHII 2092	Philosophy of Islamic Art	2	2	
11.	UHII 2102	Islam and Health	2	2	
12.	UHII 2132	Islamic Entrepreneurship	2	2	
13.	UETS 2142	Sustainable Energy	2	2	
CLUSTER 4: CO-CURRICULUM & SERVICE LEARNING					
1	UKQX xxx2	Co-curriculum & Service-Learning Elective	2	2	

2	UKQE 3001	Extra-Curricular Experiential Learning	1	1	
CLUSTER 5: LANGUAGE SKILLS					
1	UHLB 1112	English Communication Skills	2	2	
2	UHLB 2122	Academic Communication Skills	2	2	
3	UHLB 3132	Professional Communication Skills	2	2	
4	UHLB 1032	Introductory Academic English	2	2	
5	UHLB 1042	Intermediate Academic English	2	2	
6	UHLA 1112	Arabic Language	2	2	
7	UHLJ 1112	Japanese Language 1	2	2	
8	UHLC 1112	Mandarin Language I	2	2	
9	UHLF 1112	French Language	2	2	
10	UHLN 1112	Persian Language	2	2	
11	UHLJ 1122	Japanese Language for Communication I	2	2	
12	UHLM 1112	Malay Language for Communication	2	2	
CLUSTER 6: ENTREPRENEURSHIP					
1	UBSS 1032	Introduction to Entrepreneurship	2	2	
TOTAL CREDIT FOR UNIVERSITY GENERAL COURSES (D)			**23**	**23**	
TOTAL CREDIT TO GRADUATE (A + B + C + D)			**140**	**135**	
Note: # Choose one elective either from Cluster 2 (Generic Skills) or Cluster 3 (Knowledge Expansion) for UxxX 2xx2					
OTHER COMPULSORY COURSES – PROFESSIONAL SKILLS CERTIFICATION (PCS) • **Students are required to enrol and pass FIVE (5) PCS courses, in order to be eligible to graduate** • **Please refer to page FE 8 in UG Academic Handbook, for more information about PCS courses.**					
Compulsory PCS Courses (Enrol all 4 courses)					
1	GSPX XXXX	Design Thinking for Entrepreneur			
2	GSPX XXXX	Talent and Competency Management			
3	GSPX XXXX	Faculty Engineering Safety Pass (FESP) *Module 1 – Compulsory for SKM, SKT and SKE students* *Module 2 – Compulsory for SKA, SC, SKBSK students*			
4	GSPX XXXX	English Communication Skills for Graduating Students (ECS)			
Elective PCS Courses (Choose 1 only)					
1	GSPX XXXX	Data Analytic for Organization			
2	GSPX XXXX	Writing			
3	GSPX XXXX	Construction Measurement (Mechanical & Electrical Works)			
4	GSPX XXXX	Professional Ethics and Integrity			
5	GSPX XXXX	More elective courses to be added in future			

COURSE SYNOPSIS

CORE COURSES

SEMM 1013 Programming for Engineers

This course formally introduces the concept of computers, algorithms, programming languages, pseudo-code, and design of programs for solution to computational engineering problems. The two programming languages introduced in this course are C and MATLAB. Topics covered in this course include data types, constants, variables, arithmetic operations, assignment statement, looping, formatted I/O, functions, arrays, matrix operations, data structures, plotting and model building.

SEMM 1113 Mechanics of Solids I

The course provides students with the knowledge to determine the strength and stiffness of engineering structures being used. The structures that will be used in this course are bars, pins, bolts, shafts and beams and the types of applied loadings are axial forces, deformations due to the change in temperature, torsional loads, transverse loads and combination of these loads. At the end of the course, students should be able to determine the mechanical properties of the materials with respect to their strength and stiffness. Students should be able to calculate stresses, strains and deformations in structures due to various types of loading conditions. In addition, they should be able to solve problems related to statically determinate and indeterminate structures.

SEMM 1203 Statics

This course introduces students to the part of mechanic which is a pre-requisite for most engineering courses including SEMM 1213, SEMM 2313 and SEMM 1113. The course enables student to acquire the essential basic knowledge of resultant and equilibrium of forces. It will examine key elements in producing free body diagrams for particles and rigid bodies, as essential first step in solving applied mechanics problems. Exposure to the conceptof moment and equilibrium equations with reference of Newton's Law enhances the relevanceof friction, trusses, frames and machines applications. Students are also introduced to the concept of distributed forces, which include centroid and centre of gravity and the generated surface area and volume of revolution. Hence, students will be able to demonstrate and applythe knowledge in continuing subjects which requires the analytical skills developed in this subject.

SEMM 1213 Dynamics

The course is an extension to SEMM 1203, which is the pre-requisite to this course. It introduces students to the part of mechanics which considers the action of forces in producing motion. This course provides an exposure to students on the theory of the kinetics and kinematics of particles and rigid bodies. The concepts of energy, work, momentum and impulse are also introduced. At the end of the course students should be able to apply the principles to study and analyse the behaviour and responses of dynamical systems. They should also be able to solve the dynamic problems related to the determination of forces energy and power to move a body.

SEMM 1503 Engineering Drawing

This subject introduces student to the use of technical drawing in an effective way for communicating and integrating with engineering concepts. Such environment will provide a platform where the engineer can share and exchange information. This subject will also enlighten the student on the significant changes in the engineering and technical graphic due to the use of computer and CAD (Computer Aided Design) software. At the end of the course, student should be able to apply the skill and knowledge of engineering drawing to interpret design, using graphics method such as geometric drawing, orthographic projection, isometric, machine drawing, detailed drawing, and basic CAD software.

SEMM 1513 Introduction to Design

This course is designed to introduce students to the concepts and methods of engineering design process in solving engineering design problems, creatively and effectively. The design process introduces problem background, concept generations and selections, development of selected concept and testing of selected concept by constructing and testing a prototype. This course serves as a preparation for students to proceed to higher level design classes.

SEMM 1911 Experimental Methods

This course is conducted via lectures and experimental case study data. Students are exposed to the experimental method theory for the initial weeks and then followed by case study data. The lecture contents shall cover the fundamental of experimental method and the basic principles in measurements, instrumentation and analysis of results. It shall focus on the design of mechanical experiments, selection of sensors and transducers, estimation of errors and display of results. It shall also cover the analysis of results and how to prepare proper report writing. Student comprehension will be tested in two written tests. Based on the given experimental data, students are also expected to conduct statistical analysis of results and write the experimental outcome in a report.

SEMM 1921 Introduction to Mechanical Engineering Profession

This course comprises of two modules intended to introduce students to the field of mechanical engineering. The first module raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of generic skills to engineers. It also provides students with a clear overview of different fields within Mechanical Engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skill required for an engineer entrepreneur. This course introduces students to the field of mechanical engineering. It raises the student's awareness to the importance and necessity of developing habits of systematic analysis in solving engineering problems. It introduces the UTM graduate attributes and highlights the importance of both technical and generic skills to mechanical engineers. It also provides students with a clear overview of different fields within mechanical engineering and a description of the mechanical engineer's work and professional responsibilities. It discusses the education requirements for today's mechanical engineers as well as exposes the students to the skills required for an engineering entrepreneur.

SEMM 2123 Mechanics of Solids II

The course is an extension to SEMM 1113, which is the pre-requisite to this course. It aims to extend the student's knowledge and understanding of the behaviour of materials and structures under a variety of loading conditions. The course starts off with plane stress and plane strain transformation, following which several elastic failures criteria's are investigated. The course provides an opportunity to investigate thick cylinders, structural deformation behaviour by using the energy method, instability problems of struts and elasto-plastic bending of beams. Determinate and indeterminate problems will be examined. At the end of the course, students should be able to calculate and evaluate stress, strain and deformation of structures in torsion and bending. They should also be able to evaluate failure modes and estimate fracture life of structures and components. The aspect of designing safe components and structures shall also be emphasized to the students.

SEMM 2223 Mechanics of Machines and Vibration

The course requires SEMM 1213 as the pre-requisite. It is designed to expose students to the application of concepts in mechanics (statics and dynamics) to solve real world mechanical engineering problems pertaining to various machines which include belt and pulley systems, gears, flywheels, governors and gyroscopes. Students will also be exposed to the methods of balancing rotating masses and parts of a combustion engine. The concept of vibration with respect to one-degree-freedom is also studied. At the end of the course, the students should be able to solve problems related to various mechanical systems. In addition, they should be able to evaluate analytically the parameters of components of various machines under study.

SEMM 2313 Mechanics of Fluids I

The principle aim of this course is to provide students with an understanding of the properties of fluids and to introduce fundamental laws and description of fluid behaviour and flow. It will emphasize on the concept of pressure, hydrostatic pressure equation and its application in the measurement of pressure, static force due to immersed surfaces, floatation and buoyancy analysis. Dynamic flow analysis inclusive of technique in solving flow problems is introduce specially to solve flow measurement, mass or volumetric flow rate, momentum in flow and loss in pipe network. Lastly, some basic dimensional analysis and similarities will be introduced. At the end of the course, the student should be able to demonstrate an ability to analyze whether statically, dynamically or kinematically problems related directly to fluids.

SEMM 2323 Mechanics of Fluids II

This course is designed to enhance the basic knowledge that has been developed in the first stage of Fluid Mechanics and expose the students in analysing hydrodynamically the flow field. It will emphasize on the analysis and the importance of ideal, boundary layer, and compressible flow in a practical engineering application. The course will also provide the analysis of flow through fluid machines such as pump and turbine. At the end of the course, students should be able to demonstrate and apply the theory to solve problem related to flow of fluids.

SEMM 2413 Thermodynamics

Thermodynamics is a basic science that deals with energy. This course introduces students to the basic principles of thermodynamics. It will discuss basic concepts and introduces the various forms of energy and energy transfer as well as properties of pure substances. A

general relation for the conservation of energy principle expressed in the First Law of Thermodynamics will be developed and applied to closed systems and extended to open systems. The second law of thermodynamics will be introduced and applied to cycles, cyclic devices and processes.

SEMM 2433 Applied Thermodynamics & Heat Transfer

This course aims to develop a fundamental understanding of the processes by which heat and energy are inter-related and converted and by which heat is transferred. The course will review major principles of energy conversion and the modes of heat transfer. The basic laws of thermodynamics and the governing equations for heat transfer and thermodynamics will be introduced and subsequently used to solve practical engineering problems involving thermodynamics and heat transfer. The course will also cover fundamental principles of power generation systems.

SEMM 2613 Materials Science

This course introduces students to the fundamentals of materials science and engineering with emphasis on atomic bonding, crystal structures and defects in metals. It will introduce students to the various classes of materials including metals, ceramics, polymers and composites and their fundamental structures. The course will also provide basic diffusion mechanisms, metal solidification phase diagrams and heat treatment processes. At the end of the course, students should be able to apply the knowledge of atomic bonding and crystal structures to predict the physical and mechanical behaviour of materials and use the principlesof phase diagrams and heat treatments to the design of materials and their properties.

SEMM 2713 Manufacturing Processes

This course discusses the fundamental aspect of various traditional and non-traditional manufacturing processes for metal and non-metal components. It starts from the overall introduction on manufacturing aspects followed by polymer shaping processes, casting processes, joining processes, metal forming processes and machining processes including CNC and CAM. At the end of this course, the students should be able to select suitable manufacturing processes to produce a part/product. The knowledge gained from this course also allows students to make right decision in designing products based on process requirements.

SEMM 2921 Laboratory I

This course is introduced in the second year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It consists of six laboratories; Strengths of Materials Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluid Laboratory. Students will be grouped into 5 to 6 people for each experiment. It is based on the theory that have been learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment and will be evaluated based on this report.

SEMM 3023 Applied Numerical Methods

This course formally introduces the steps involved in engineering analysis (mathematical modelling, solving the governing equation, and interpretation of the results). Examples of case

studies in applied mechanics, strength of materials, thermal science, and fluid mechanics are presented. Methods for solving the nonlinear equations, simultaneous linear algebraic equations, eigenvalue problem, interpolation, numerical differentiation, numerical integration, initial value problems, boundary value problem and partial differential equation are introduced.

SEMM 3033 Finite Element Methods

This course gives students an exposure to the theoretical basis of the finite element method and its implementation principles and introduces the use of general purpose finite element software for solving real-life engineering problems.

SEMM 3233 Control Engineering

The course shall cover the essential and basic theory of control engineering. It shall cover the followings: open and closed-loop systems, manipulation of block diagram, signal flow graph and *Mason*'s rule, concept of transfer function, time response analysis, classification of system, control action, stability analysis, *Routh* criteria, root locus method, frequency analysis, *Nyquist* and *Bode* plots, relative stability from *Nyquist* and *Bode* diagrams and design of control system. MATLAB and Simulink software package shall be taught and used as a tool in solving control engineering problems where appropriate.

SEMM 3622 Materials Technology

This course introduces students to the basic concepts required to understand and describe the mechanical behaviour and failure mechanism of metals. It will emphasise on the concept of stress intensity factor and fracture mechanics to predict failure of materials and provide understanding on conditions under which fatigue, and creep occur. The course will also introduce students to the theory of electromechanical corrosion in metallic materials, estimate the corrosion rate and understand the methods to control and manage corrosion. By the end of the course, students should be able to apply the criteria of failure to the design of materials and conduct failure analysis of engineering components. This course also covers the properties, processing and applications of non-metallic materials mainly polymer, ceramic and composite.

SEMM 3915 Industrial Training

Industrial training exposes students to the real work setting in various industries for 12 weeks. The students are placed in industries that best suit their area of studies. It is an experiential learning that requires the students to learn the process and able to apply their knowledge acquired in class in actual industrial setting. The knowledge acquired during practical training may be used later in final year classes as well as to equip them with sufficient knowledge for job interviews.

SEMM 3931 Laboratory II

This course is introduced in the third year of Mechanical Engineering programme involving two hours per week and experimental based courses. It consists of six laboratories; Strength of Materials Laboratory, Thermodynamics Laboratory, Materials Science Laboratory, Mechanics of Machines Laboratory, Electrical Laboratory and Fluids Laboratory. Students will be grouped into 5 to 6 for each experiment. It is based on the theory learned in the particular courses at the same semester. In general, every student has to carry out a total of twelve experiments. At the end of the session, students have to submit a report for each experiment

and will be evaluated based on this report.

SEMM 3941 Laboratory III

This course is introduced in the third year of the Mechanical Engineering programme involving two hours per week session and experimental based courses. It is divided into two parts; experimental work at System & Control and Vibration Laboratories and a problem- based-learning (PBL) laboratory (module) depending on the topics/labs facilitated by a lecturer. Students have to produce a short report for the experimental work similar to those in Laboratory I and II. The second part, i.e., the lab module is based on the PBL concept. Student have to plan and design their own experimental work right from the very beginning until the end of the module based on the topics given by the lecturer. Students will be grouped into 5 to 6 for each module. In general, every group have to conduct two experimental works and two modules. At the end of the session, students have to submit two short reports and two formal reports.

SEMM 4902 Engineering Professional Practice

This course introduces students to engineering ethics and an engineer's responsibilities towards safety, health and welfare of the public. It emphasizes on the engineer as a professional man, engineers & society, code of ethics and professional conduct, standards, laws and regulations pertaining to professional engineering practice. The course will also introduce students to organize, in a group, a community service activity in a planned and structured manner. At the end of the course, students should be able to demonstrate and apply engineering professional ethics in their career as an engineer.

SEMM 4912 Undergraduate Project I

This course introduces the final year students on how to do academic research on their own by applying knowledge and skills they acquired from other courses. Given a topic on a project, students have to identify a problem, gather relevant information to the problem and propose solutions to problems. In this course, students have to do some literature surveys in order to understand the nature of the problem and investigate work done by other researchers in line with their work. The students are also required to propose a methodology on how to solve the problems. By the end of this course, the students are expected to submit and present their research proposal to be assessed by their supervisors and panel of assessors.

SEMM 4924 Undergraduate Project II

This course is the continuation of Undergraduate Project (UGP). It enhances the students' knowledge and ability to identify and solve problems through academic research. It will provide an exercise for the student in carrying out research with minimum supervision and the ability to plan and manage their work effectively. This course will also develop the students' capability to present, discuss and analyse results of the research clearly, effectively and confidently in both oral presentation and in dissertation.

ELECTIVE COURSES

SEMT 3132 Aircraft Structures I

The course will give the student an introduction to the various types of structural components used in aircraft, together with their functions and stress calculations under different types of

loading. The lectures will include qualitative descriptions of methods of fabrication and provide a thorough introduction to quantitative methods of analysis. The first section covers the analysis of the statically determinate and indeterminate structure including the various type of truss analysis. Next section covers the analysis of the opened, closed and thin wall beam structure peculiar to aircraft, features discussion on the effect of the various types of load exerted and an introduction to structural idealization. Finally, this section also investigates the stress analysis of the multi-cell structures due to the acting loads and its design characteristics. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft structures.

SEMT 3212 Flight Mechanics

Flight mechanics is an important aspect in the design and operation of an aircraft. A flight mission can only be operated successfully and safely if proper efforts are given to this aspect. Therefore, in this course students will be equipped with the fundamental concept of aircraft performance calculation and static stability determination needed to analyze and design modern aircraft. Proper due shall be given to both aspects of performance and static stability. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in flight mechanics and industrial visit of related industries.

SEMT 3333 Aerodynamics

The course gives an introduction to aerodynamics with specific emphasis to aircraft aerodynamics. The purpose is to instill understanding of the principle of aerodynamics and to provide foundation of fundamental aerodynamics analysis. The contents include: Fluid flow equations (Continuity equation, Euler and Navier Stokes equations); Inviscid flow theory and Joukowski transformation; 2D aerofoil theory (Vortex law, Biot-Savart law, thin aerofoil theory, Fourier theory, thick and cambered aerofoil); Finite wing theory (Vortex system and horseshoe vortex, downwash and lift distribution); Viscous Flow Theory and Boundary Layer; Introduction to industrial aerodynamics (vehicles and buildings).It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aerodynamics.

SEMT 3423 Aerospace Propulsion System

An introduction to aircraft propulsion system including the historical background, review of thermodynamics and fluid mechanics; fundamental of gas dynamics; piston engines; shaft and thrust power; cycle analysis: air standard and cycle with friction; turbojet engine cycle; turbofan engine cycle; gas turbine engine components and their functions; compressor and turbine velocity diagram analysis; turbine blades cooling techniques; gas turbine emissions; chemical rocket engines. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft propulsion system.

SEMT 3822 Aviation Management

This course covers basic management concepts such as Planning, Organizing, Leading and Controlling; Management of the aviation industry; the process of airworthiness; airport operations; aviation organizations and rules; safety, liability and security in aviation industries; main activities of the aircraft manufacturer, main activities of the airline industry. It is a blended

course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aviation and industrial visit of related industries.

SEMT 4143 Aircraft Structures II

This course gives students an understanding of the basic principles in the analysis of aircraft structural components and the determination of their strengths under the various operational loading conditions. It covers the areas of thin plate analysis, analysis of structural instability, introduction to the analysis of unidirectional composites, introduction to aeroelasticity and fatigue of aircraft structures. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems of aircraft structures.

SEMT 4223 Flight Dynamics and Control

This course is about the dynamics behaviour of rigid body aircraft and the application of control system theory to design simple stability augmentation systems to more complex automatic flight control systems. This includes the application of modern multivariable control system design using state-space methods. Topics include axes system and notation, equation of motion of rigid body including translation, aircraft longitudinal and lateral dynamic stability, flying and handling qualities, stability augmentation and automatic flight control system, aerodynamics stability derivatives and multivariable state-space methods. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aircraft dynamics and control, which also comprising The Fourth Industrial Revolution (*IR 4.0*) element.

SEMT 4253 Aircraft Instrumentation and Avionics

Aircraft Instrumentation and Avionics course provides the understanding of various basic instrument and electronics used in aircraft. The major topics cover includes an introduction to instrumentation system, component of instrumentation, air data, calibration equations, gyroscopes, indicators, signal conditioning, data acquisition system, transducers, Introduction to avionics, GPS application. The devices that will be thought are such as ADF, VOR, DME, LORAN C, ILS, RADAR Altimeter, GPS and Primary RADAR.It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aircraft instrumentation and avionics, which also comprising The Fourth Industrial Revolution (*IR 4.0*) element.

SEMT 4513 Aircraft Design I

The course will allow students to learn methodology and decision making in aircraft design process. This Integrated Design Project (IDP) offers a distinctive opportunity to use knowledge and skill from previous studies in aeronautics class to conduct a practical aircraft design project. Contents of learning include feasibility study, aircraft aerodynamics, aircraft performance & stability and component design.

SEMT 4523 Aircraft Design II

This course gives students an exposure to the aircraft design process and methodology. Students are split into a number of groups to carry out aircraft components design and analyses. The progress of this Integrated Design Project (IDP) is closely monitored by the lecturers. Lectures are given to provide the student with information and guidance as project

goes along. Group presentation and feedback from lecturers are regularly arranged for student evaluation and design improvement.

SEMT 4813 Aviation Economy

This course aims to expose Aeronautical engineering students with fundamental elements of economics commonly used in engineering and aviation. The course begins by introducing key economic concepts such as the cash flow diagram and factors in engineering economy. These fundamental concepts are applied on various decision-making tools such as Net Present Value, Future Worth, Annual Worth, Rate of Return and Benefit/Cost Analysis to solve aviation economics related problems. It is a blended course that combines traditional teaching methods to Problem-Based Learning (PBL) approach based on real problems in aviation and industrial visit of related industries.