

POSTGRADUATE ACADEMIC HANDBOOK 2025/2026

BY TAUGHT COURSE

POSTGRADUATE ACADEMIC HANDBOOK

**Master by Coursework
Session 2025/2026**

**FACULTY OF
INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

All the information in this Academic Handbook is precise and current at the time of print.

Version September 2025

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Published and Printed in Malaysia by

Penerbit UTeM Press

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TOP MANAGEMENT



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Universiti Teknikal Malaysia Melaka (UTeM) was established under Section 20 University and University College Act 1971 (Act 30) through “Perintah Universiti Teknikal Malaysia Melaka (Pemerbadanan 2007)” gazetted as P.U. (A) 43 on the 1st of February 2007.

UTeM was initially known as Kolej Universiti Kebangsaan Malaysia (KUTKM), established on the 1st of December 2001.

VISION

To be one of the world’s leading **innovative** and **creative technical** universities.

MISSION

UTeM determined to lead and contribute to the wellbeing of the country and the world by:

1. Promoting knowledge through innovative teaching and learning, research and technical scholarship.
2. Developing professional leaders with impeccable moral values.
3. Generating sustainable development through smart partnership with the community and industry.

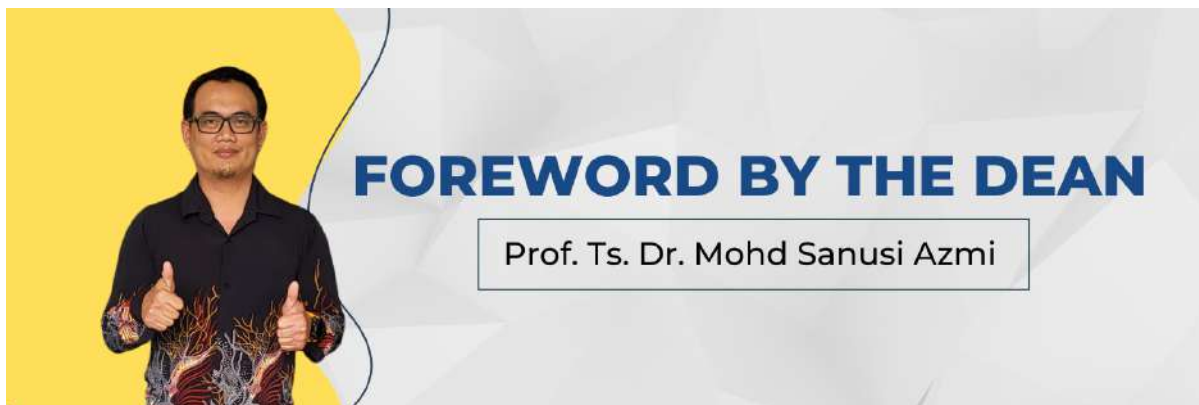
MOTTO

Excellence through **competency**



EDUCATIONAL GOALS

- 1) To conduct academic and professional programmes based on relevant needs of the industries.
- 2) To produce graduates with relevant knowledge, technical competency, soft skills, social responsibility and accountability.
- 3) To cultivate scientific method, critical thinking, creative and innovative problem solving and autonomy in decision making amongst graduates.
- 4) To foster research development and innovation activities with industries for the prosperity of the Nation.
- 5) To equip graduates with leadership and teamwork skills as well as develop communication and life-long learning skills.
- 6) To develop technopreneurship and managerial skills amongst graduates.
- 7) To instill an appreciation of the arts and cultural values and awareness of healthy life styles amongst graduates.



Assalamualaikum w.r.t. and greetings,

Welcome to all new diploma, undergraduate, and postgraduate students in the 2025/2026 session. It is expected that the presence of students from various states and countries at the Faculty of Information and Communication Technology (FTMK), UTeM, this year will further enhance the lively atmosphere of the faculty with its teaching, learning, academic activities, and non-academic activities.

We at FTMK warmly welcome students to acquire knowledge and technical skills based on the application-oriented approach that is the strength of FTMK. FTMK students are trained in both theory and application so that their development as FTMK students at UTeM becomes a success for you and the UTeM community.

Therefore, in order to make FTMK students shine at UTeM, FTMK students need to be aware of and understand the academic handbook for 2025/2026, which will accompany them throughout their studies. Students need to plan their academic studies for each semester and understand credit calculations, prerequisite courses, as well as the rules and guidelines outlined in this academic handbook.

Students are expected to fully utilize the academic handbook for 2025/2026. We hope students will continue their high learning momentum by enhancing their knowledge and skills before entering the workforce.

As members of FTMK and UTeM, we will always be with the students and pray for the success of all students.

FTMK Truly World! Thank you.



Faculty Vision

To become a creative, innovative and world class centre of excellence in education, research and services of information and communication technology field.



Faculty Mission

To develop highly competent professionals with outstanding personalities through a world class technical education on the basis of **application-oriented teaching, learning and research** with smart partnership with industry and university.



Faculty Objectives

- i. To create ethical, competent and skilful ICT professionals of local, international and industry's choice.
- ii. To spearhead and develop applied research in the ICT field to produce new knowledge and innovative technology needed by the industry which can be commercialized and recognized internationally.
- iii. To improve staff professionalism and competence and contribute to university income through consultation, professional training and continuous quality teaching.
- iv. To improve ICT understanding, promote ICT culture in the society and provide social services which leads to social well-being and economic development.
- v. To create continuous smart partnership with local and foreign industry and institutions of excellence.
- vi. To develop high quality infrastructure and faculty administration system and support programme development to achieve faculty objectives.

FTMK

Faculty of Information and Communication Technology (FTMK) is one of the earliest formed faculty at Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM) on 1st of December 2000. The Faculty started to operate on **22 June 2001** with its pioneer batch of students of academic session 2001/2002. Since 1st February 2007, Kolej Universiti Teknikal Kebangsaan Malaysia (KUTKM) is known as Universiti Teknikal Malaysia Melaka (UTeM).

Department of Software Engineering

SE

Department of Computer System and Communication

SKK

Department of Interactive Media

MI

Department of Diploma Studies

Diploma

MANAGEMENT & ADMINISTRATION



DEAN
PROFESSOR TS. DR. MOHD
SANUSI BIN AZMI



DEPUTY DEAN
(ACADEMIC)
TS. DR. AHMAD SHAARIZAN
BIN SHAARANI



DEPUTY DEAN
(RESEARCH &
POSTGRADUATE STUDIES)
TS. DR. MOHD RIZUAN
BIN BAHAROM



DEPUTY DEAN
(STUDENT DEVELOPMENT)
ASSOCIATE PROFESSOR TS. DR.
MUHAMMAD HAZIQ LIM
BIN ABDULLAH



DEPUTY REGISTRAR
MDM. ROZINAH
BINTI YAKOP



HOD
(COMPUTER SYSTEM
AND
COMMUNICATION)
TS. DR. ZURINA
BINTI SA'AYA



HOD
(INTERACTIVE
MEDIA)
TS. DR. MOHAMAD
LUTFI
BIN DOLHALIT



HOD
(SOFTWARE
ENGINEERING)
TS. DR. RAJA RINA
BINTI RAJA IKRAM



HOD
(DIPLOMA
STUDIES)
TS. DR. ZURAINI
BINTI OTHMAN



RESEARCH
MANAGER
TS. DR.
NORHARYATI
BINTI HARUM



SEN. ASSISTANT
REGISTRAR
MR. AHMAD HAFIZ
BIN MOHD PUAD



POSTGRADUATE
COORDINATOR
TS. DR. LIZAWATI
BINTI SALAHUDDIN



LAB COORDINATOR
TS. MUHAMMAD HELMY
BIN EMRAN



ASSISTANT
REGISTRAR
MDM. MAHFUZAH
BINTI MD. SHUKOR

List of Programme offered (Postgraduate)

DOCTOR OF PHILOSOPHY

1. Doctor of Philosophy in Information and Communication Technology, PITA.
2. Doctor of Information Technology, PDIT.

MASTER'S DEGREE

By research:

1. Master in Information and Communication Technology, MITA.

By coursework:

1. Master of Computer Science (Multimedia Computing), MCSM.
2. Master of Computer Science (Database Technology), MITD.
3. Master of Computer Science (Internetworking Technology), MITI.
4. Master in Software Engineering, MSWE
5. Master in Mobile Software Development, MMSD.

Postgraduate Coordinator and Programme Coordinators

POSTGRADUATE COORDINATOR

Ts. Dr. Lizawati Binti Salahuddin.

PROGRAMME COORDINATORS

- 1) **Master of Computer Science (Multimedia Computing), MCSM**
Ts. Dr. Che Ku Nuraini Binti Che Ku Mohd
- 2) **Master of Computer Science (Database Technology), MITD**
Dr. Nurul Izrin Binti Md Saleh
- 3) **Master of Computer Science (Internetworking Technology), MITI**
Ts. Dr. Aslinda Binti Hassan
- 4) **Master in Software Engineering, MSWE**
Ts. Dr. Kasturi A/P Kanchymalay
- 5) **Master in Mobile Software Development, MMSD**
Dr. Zahriah Binti Othman

Lab Facilities

Faculty of Information and Communication Technology (FTMK) has been equipped with the state-of-art computers and software and integrated into UTeM Network. These facilities ease the process of teaching and learning in FTMK.

Averages of 36 computers with latest software are located at each lab and studio to ensure practical teaching and learning is applicable for the students. Server, router, switches, wireless, digital camera, video, biometric machines are also provided for teaching and learning purposes.

Lab Staffs

The labs in FTMK are administered by the Lab Coordinator assisted by Assistant Engineers to ensure smooth teaching and learning processes. The infrastructure committee members are responsible for maintaining and managing respective clients in FTMK environment.

Loan Facilities on Lab Equipment

Students are allowed to use the lab equipment to complete their assignments or projects on time. The equipment that are allowed to be used are wireless equipment, video camera, digital camera, biometric tool, GSM and others.

Lab Operational Hours

During Semester:

Monday to Thursday	8:00 am to 6:00 pm
Friday	8:00 am to 12:15 pm 2:45 pm to 6:00 pm

During Semester Break:

Monday to Thursday	8:00 am to 5:00 pm
Friday	8:00 am to 12:15 pm 2:45 pm to 5:00 pm

Saturday-Sunday / Public Holidays Close

NAME OF FACILITY	DESCRIPTION
Seminar Hall	The hall is equipped with audio-visual facility for 250 pax at a time
Lecture Rooms	Rooms No. 1 to 7 with each room for 60 pax Rooms No. 13 to 14 with each room for 120 pax
Recording Capture System (ReCap)	Lecture Hall for interactive learning environment for 114 pax
Collaborative Learning Laboratory (CLeAR)	A collaborative learning laboratory with 120 pax capacity
Mini Theatre	The theatre room for film and animation presentation for 35 pax
Virtual Reality Studio	Laboratory for motion capture and games development
Photography/Recording Studio	Multimedia recording and editing studio
Research Laboratories	1. Innovative Software System & Services (IS3) Laboratory 2. Optimization, Modelling, Analytics and Simulation (OptiMAS) Laboratory 3. Computational Intelligence and Technologies (CIT) Laboratory 4. Advanced Interaction Technology (AdViT) Laboratory 5. Pervasive Computing & Educational Technology (PET) Laboratory 6. Biomedical and Engineering (BIOCORE) Laboratory

Teaching Laboratories

1. Computer Game Laboratory
2. Software Engineering Lab 1, 2 and 3
3. Programming Laboratory 1, 2, 3 and 4
4. Database Laboratory 1, 2 and 3
5. Network Laboratory 1 and 2
6. CCNA & CCNP Laboratory
7. Fiber Optic Laboratory
8. System / Hardware Laboratory
9. Wireless Laboratory
10. Virtual Reality Laboratory
11. Multimedia Laboratory 1, 2, 3 and 4
12. Student Workshop Laboratories

Other Facilities

1. Visiting Professor Rooms
2. Executive Laboratory
3. Administration Office – Level 2 & 3
4. Viva Voce Room
5. FICTS Room
6. Student Common Room
7. Surau or Prayer Room
8. Lobby Area
9. Parking Area for students and staffs
10. Lanai Budi Student Seating Area

Lab Usage Regulation

1. Students must display their matric card at all times in the lab.
2. Students are not allowed to bring in their bags into the lab.
3. Students are not allowed to eat/drink or bring in any foods or drinks into the lab.
4. Students are not allowed to wear sandals in the lab except sandals with back straps for female students and covered sandals for male students.
5. Students are not allowed to wear t-shirt without collar in the lab. UTeM's students' dress code is referred.
6. All lab equipment used must be returned in its original condition.
7. Chairs must be arranged neatly after use.
8. Do not leave used papers or litters in the lab. Please throw it into rubbish bin if it is not needed anymore.
9. All equipment must be switched off after used.
10. Students should not enter the lab without lecturers' or tutors' presence.
11. For after-hours lab usage, students must record their details in the lab record book and submit their matric card to Assistant Engineers in duty.
12. Students are prohibited from playing games, chatting or surfing the net for unrelated content in the lab.
13. Students are not allowed to bring out any lab equipment except with permission from the lecturers or Assistant Engineers in duty.
14. Students are not allowed to bring in laptop, CPU, monitor, mouse, CD, VCD or any computer equipment except with permission from the lecturers or Assistant Engineers in duty.
15. Users are not allowed to do any installation on computers in the lab.
16. All requests for software installation into students' laptop will not be entertained.
17. Students must report immediately to lecturer or Assistant Engineers on duty if any lab equipment got lost or broken during their students' usage.

18. Research labs are for post graduates' students ONLY. Post-graduate students can get the access by referring to their supervisor.

Additional Lab Rules Outside Teaching and Learning Allocated Times

1. Total users for a lab must comply with the maximum capacity allowed for a particular lab.
2. Students are allowed to use labs outside teaching and learning allocated times with permission from a lecturer. The lecturer will be responsible for lab for the duration of the usage. Students must record their start and end times of usage in the record book provided in the lab.
3. Studios and Recording room usage are strictly by booking only. Students can use the studios or recording room through their lecturer or Assistant Engineer on duty.

DISCIPLINARY ACTIONS WILL BE TAKEN AGAINST ANY STUDENT WHO IS FOUND BREAKING ANY RULE LISTED ABOVE.



ENTRY REQUIREMENTS

University General Requirements

- a) A Bachelor's degree (Level 6, MQF) in Computing or related fields with a minimum CGPA of 2.50, as accepted by the HEP Senate; OR
- b) A Bachelor's degree (Level 6, MQF) in Computing or related fields with a minimum CGPA of 2.00 and not meeting a CGPA of 2.50 can be accepted subject to a thorough rigorous assessment as determined by the HEP; OR
- c) A Bachelor's degree (Level 6, MQF) in a Non-Computing field with a minimum CGPA of 2.00 can be accepted, subject to a thorough rigorous assessment as determined by the HEP to identify the appropriate prerequisite courses that are equivalent to their working experience in the Computing or related fields; OR
- d) A Bachelor's degree (Level 6, MQF) in a Non-Computing field with a minimum CGPA of 2.00 can be accepted subject to appropriate prerequisite courses; OR
- e) Other qualifications equivalent to a Bachelor's degree (Level 6, MQF) in Computing or related fields recognized by the Government of Malaysia must fulfil the requirement on item a) or b).

Note: For candidates without Computing Degree, prerequisite modules in computing must be offered to adequately prepare them for their advanced study.

Language Requirements

For international applicants, the following additional requirements must be fulfilled:

- a) Achieve a minimum of Band 4 in MUET or equivalent to CEFR (Low B2).

If a student does not meet this requirement, the HEP must offer English proficiency courses to ensure that the student's proficiency is sufficient to meet the needs of the programme.

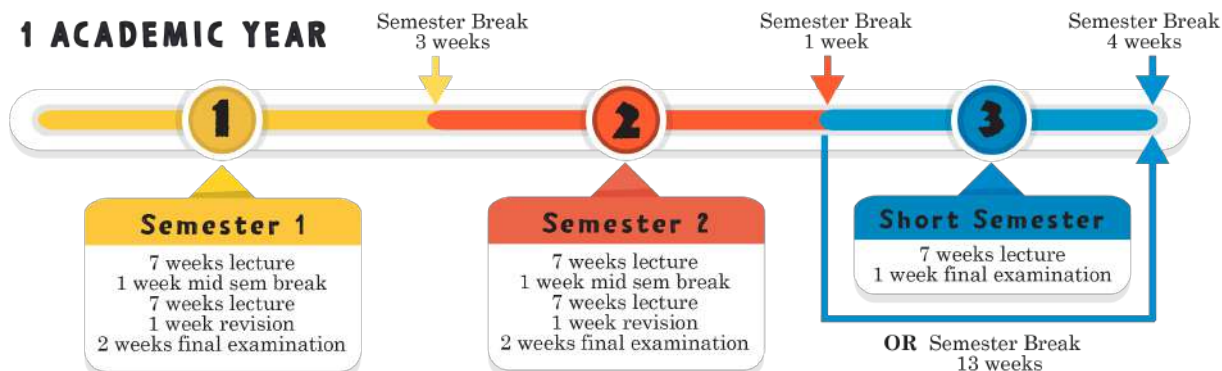


The university has implemented its academic system according to semester system. Every academic year comprises of two semesters and in some instances the faculty also offers a special semester which is arranged during the semester break.

Specifically, there are 18 weeks per semester, which is divided as follows:

- 7 weeks for the first part of lecture.
- 1 week of mid semester break.
- 7 weeks for the second part of lecture.
- 1 week of revision.
- 2 weeks for final examination.

While for the short semester, there are only a total of 8 weeks of implementation, which include 7 weeks of lecture and 1 week of final examination.



Duration of Studies





Grading System

The university has implemented its academic system according to semester system. The semester system is widely used in local higher learning institutions in Malaysia.

While student's achievement in courses taken is shown by grades. The relationship between marks, grades and evaluation points is shown in the following table.

Marks	Letter Grades	Grade Points	Remarks	Credit Hours Earned
80 - 100	A	4.0	Excellent	Yes
75 - 79	A-	3.7	Very Good	Yes
70 - 74	B+	3.3	Good	Yes
65 - 69	B	3.0	Pass	Yes
60 - 64	B-	2.7	Conditional Pass (Redeemable)	Yes
55 - 59	C+	2.3	Fail	No
50 - 54	C	2.0	Fail	No
47 - 49	C-	1.7	Fail	No
44 - 46	D+	1.3	Fail	No
40 - 43	D	1.0	Fail	No
0 - 39	E	0.0	Fail	No



Academic Achievement

GRADE POINT AVERAGE (GPA)

GPA is average points obtained by students at the end of each semester.

$$\text{Total Grade Point (TGP)} = k_1m_1 + k_2m_2 + \dots + k_nm_n$$

$$\text{Total Calculated Point (TCP)} = k_1 + k_2 + \dots + k_n$$

$$\text{GPA} = \frac{\text{TGP}}{\text{TCP}}$$

where

k_n = credit hour for course n ,

m = grade point obtained for course n ,

n = number of courses registered.

CUMULATIVE GRADE POINT AVERAGE (CGPA):

CGPA refers to the cumulative grade point average obtained for all semester studied.

$$\text{CGPA} = \frac{TGP_1 + TGP_2 + \dots + TGP_n}{TCP_1 + TCP_2 + \dots + TCP_n}$$

Academic Standing

- A student must attain a minimum **CGPA of 3.00** in order to be eligible **for graduation**.
- The **minimum CGPA** that would allow a student to remain in the programme is **2.70**.
- If a student obtains a **Conditional Pass(KS)** status in **TWO (2) consecutive** semesters, he/she will be **dismissed** from the programme.





MASTER OF COMPUTER SCIENCE (Multimedia Computing)

Programme Details

This programme is specifically designed to equip students with advanced knowledge and practical skills in multimedia computing and information technology. The programme emphasizes the integration of computer science principles and digital media technologies to meet the growing demands of the creative and digital industries. Students will gain expertise in areas such as Human-Computer Interaction (HCI), Computer Graphics and Visualization, Virtual Reality, Augmented Reality, Animation and Game Development that can meet industry needs.

Programme Educational Objectives (PEO)

This program is specifically designed to equip students with the use of the latest technologies to design and develop high-level multimedia based applications that meet industry needs.

Below are the PEO for this programme:

- PEO 1:** Practice in-depth and specialist knowledge and skills of Computer Science in Multimedia Computing to support organizational goals.
- PEO 2:** Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.
- PEO 3:** Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.
- PEO 4:** Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

Programme outcomes

Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of PO for this programme:

- P01:** Have in-depth skills and strong mastery knowledge in Computer Science (Multimedia Computing);
- P02:** Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;
- P03:** Ability to consistently explore and expand contemporary knowledge in targeted discipline (Multimedia Computing);
- P04:** Ability to gain employment for career development in related Computer Science field (Multimedia Computing);
- P05:** Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;
- P06:** Ability to apply expertise in working environment; and
- P07:** Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure - Full Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITS 5113	Computer Architecture & Compiler	3
MITM XXXX	Elective 1	3
MITM XXXX	Elective 2	3
Total credit		18
Semester 2 (February)		
Course Code	Course	Credit
MITI 5213	Computational Methods	3
MITM 5313	Advanced Human Computer Interaction	3
MITU 5213	Project 1	3
MITM XXXX	Elective 3	3
MITM XXXX	Elective 4	3
MPSW XXXX	University Core Course	3
Total credit		18
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5226	Project 2	6
Total credit		6

February Intake:

Semester 2 (February)		
Course Code	Course	Credit
MITI 5213	Computational Methods	3
MITM 5313	Advanced Human Computer Interaction	3
MPSW 5013	Research Methodology	3
MITM XXXX	Elective 1	3
MITM XXXX	Elective 2	3
MPSW XXXX	University Core Course	3
Total credit		18
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5213	Project 1	3
MITM XXXX	Elective 3	3
Total credit		6
Semester 1 (September)		
Course Code	Course	Credit
MITU 5226	Project 2	6
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITS 5113	Computer Architecture & Compiler	3
MITM XXXX	Elective 4	3
Total credit		18

University Core Courses - choose ONE (1) only:

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose FOUR (4) only:

Course Code	Course	Credit
MITM 5323	Mobile Application Development	3
MITM 5333	Multimedia Based Instructional Design	3
MITM 5413	Multimedia Professional Ethics	3
MITM 5233	Computer Graphics and Visualization	3
MITM 5223	Advance 3D Animation	3
MITM 5113	Advanced Web Programming	3
MITM 5123	Advanced Audio and Video Technology	3
MITM 5213	3D Modelling	3

Note: Total credit hours = 42 credits

Programme Structure - Part Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5043	Research Methodology	3
MITI 5213	Computational Methods	3
MITM XXXX	Elective 1	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MPSW XXXX	University Course	3
MITP 5113	Algorithm Analysis and Design	3
MITM XXXX	Elective 2	3
Total credit		9
Semester 3 (September)		
Course Code	Course	Credit
MITM 5313	Advanced Human Computer Interaction	3
MIT5 5113	Computer Architecture and Compiler	3
MITU 5213	Project 1	3
MITM XXXX	Elective 3	3
Total credit		12
Semester 4 (February)		
Course Code	Course	Credit
MIT5 5313	Advanced Data Communications and Network	3
MTPU 5226	Project 2	6
MITM XXXX	Elective 4	3
Total credit		12

Elective courses - choose TWO (2) only:

University Courses - choose ONE (1) only:

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose FOUR (4) only:

Course Code	Course	Credit
MITM 5323	Mobile Application Development	3
MITM 5333	Multimedia Based Instructional Design	3
MITM 5413	Multimedia Professional Ethics	3
MITM 5233	Computer Graphics and Visualization	3
MITM 5223	Advance 3D Animation	3
MITM 5113	Advanced Web Programming	3
MITM 5123	Advanced Audio and Video Technology	3
MITM 5213	3D Modelling	3

Note: Total credit hours = 42 credits

COURSE DETAILS

MPSW 5013 Research Methodology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Apply ethical research skills in constructing research questions, objectives and hypothesis (if any) relevant to the research problem.
- CLO2: Synthesize relevant literature to address the knowledge gaps.
- CLO3: Develop research proposal with an improvement of existing knowledge.

Synopsis:

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to introduce students to the principles and good practices and the important concepts of conducting scientific research and managing ethical research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their study field.

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2. Gray, D. E., Doing research in the business world. Sage Publications Limited, 2019.
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6. Zobel, J., 3rd Edition, Writing for Computer Science, Springer-Verlag London, 2014.
7. Arkoudas, K., Musser, D., Fundamental Proof Methods in Computer Science: A Computer-Based Approach, MIT Press, 2017.
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MPSW 5063 Entrepreneurship

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyse entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
- CLO2: Apply commercially viable ideas, projects, products prototypes for commercialization within the context of societal framework and to deliver business model canvassing and business value proposition.
- CLO3: Develop creative and viable high tech business models and strategies.

Synopsis:

The objectives of this course are to provide students a robust foundation in theories relevant to the improvement of entrepreneurial behaviour and capabilities in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and key stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the areas of entrepreneurial expertise necessary in order to found and/or grow a technology venture.

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2. Sergi, B. S., & Scanlon, C. C. (Eds.), Entrepreneurship and Development in the 21st Century. Emerald Publishing Limited, 2019.
3. Bianchi, C., Glavas, C., & Mathews, S., SME international performance in Latin America: The role of entrepreneurial and technological capabilities. *Journal of Small Business and Enterprise Development*, 24(1), 176–195, 2017.
4. Patric Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Design a Better Business: New Tools, Skills, and Mindset for Strategy and Innovation. Wiley, 2016.
5. Baldock, R., North, D., & Ullah, F., New Technology-Based Firms in the New Millennium. *New Technology Based Firms in the New Millennium*, 11, 203–226, 2015.
6. Alexander Osterwalder & Yves Pigneur, Value Proposition Design: How to Create Products and Services Customers Want. Wiley, 2015.
7. Alexander Osterwalder & Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Wiley, 2010.

MPSW 5073 Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyze the core concepts and principles, functions, and process in project management.
- CLO2: Develop a comprehensive & viable project proposal.
- CLO3: Evaluate best practices and methodology in project management.

Synopsis:

This subject focuses on the principles of project management based on Project Management Body of Knowledge (PMBOK). Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality and human resources). Various tools for supporting the analysis of works in project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, work breakdown structure, managing uncertainty, building project plan, implementing and revising project plan, completing the project and contract laws. Microsoft Project (MS Project) will be introduced as project management software tools.

References:

1. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, 2018.

2. Project Management Institute, A Guide to the Project management Body of Knowledge (PMBOK® Guide) – Sixth Edition, 2017.
3. Clifford F. Gray · Erik W. Larson, Project Management the Managerial Process, McGraw Hill, 2021.
4. Meredith, J., Mantel, S. and Mantel, S. Jr., Project Management: A Strategic Managerial Approach. New York, Wiley, 2017.
5. Trevor L Young, Successful Project Management, Kogan Page Publishers, 2016.

MPSW 5033 Engineering Technology Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the principles of engineering management and technology management across different industries.
- CLO2: Apply relevant issues in engineering management and technology management across different industries.
- CLO3: Analysis the impact of relevant issues in the context of engineering management and technology management across different industries.

Synopsis:

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management pro-

vide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the course will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

1. Paul Trott, Innovation Management and New Product Development (6th Edition) 6th Edition, Pearson; 6 editions, 2016.
2. A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, John Wiley & Sons, 2011.
3. William J Stevenson, Operations Management 13th Edition, McGraw-Hill Education, 2017.
4. by Jim Hall, Tina Scott, Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma CreateSpace Independent

Publishing Platform, 2016.

5. Sharon Armstrong, Barbara Mitchell Weiser, The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional , 2019.

MPSW 5053 Quality Systems Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the conceptual understanding of Quality.
- CLO2: Identify Quality System Management information.
- CLO3: Propose Quality System Management techniques and tools in the practice of organizations.

Synopsis:

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method, failure mode and effect analysis (FMEA) and quality function deployment. Several quality control

tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

1. S. Thomas Foster, Managing Quality: Integrating the Supply Chain, 6th Edition, Pearson, 2017.
2. Howard S. Gitlow, Richard J. Melnyck and David M. Levine, Guide to Six Sigma and Process Improvement for Practitioners and Students, A: Foundations, DMAIC, Tools, Cases, and Certification, 2nd Edition, 2015.
3. Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
4. Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
5. Manual Procedure for Malaysia Halal Certification, 3rd Revision, Jabatan Kemajuan Islam Malaysia, 2015.

MITU 5213 Project 1

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Formulate the problems, objectives and scope based on complex technology solutions.

CLO2: Perform literature review and appropriate methodology to complete the project.

CLO3: Defend the proposed project solutions in written and verbal forms.

Synopsis:

This course is the first part of project that requires a student to prepare a master research proposal based on the theories and techniques of technologies learnt previously. Student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. Besides writing the proposal, student needs to present and defend his/her proposal. Student is expected to demonstrate ability to identify and propose solutions to the identified problems.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITU 5226 Project 2

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate solutions to the proposed project.
- CLO2: Verify solutions to understand the strengths, weaknesses and limitations of the project.
- CLO3: Defend the contributions of the project in written and verbal forms.

Synopsis:

This course is the second part of project that show the ability of student in applying the theories and techniques of technologies learnt previously. Student must write the second fold of dissertation which consists of four chapters of dissertation i.e. Chapter 4: Analysis & Design, Chapter 5: Implementation, Chapter 6: Evaluation and Chapter 7: Conclusion & Future Works. These chapters must align with the proposed solution developed as the end product of this project. Student is required to justify the contribution of the proposed solution throughout the presentation sessions.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify algorithm design technique and method of analysis.
- CLO2: Explain algorithms efficiency in terms of the amount of resources, which are time and storage space required to execute the algorithm.
- CLO3: Explain algorithm design technique based on problem type.

Synopsis:

This course introduces the students to the fundamentals principles of design and analysis of algorithms. It covers formal techniques to support the design and analysis of algorithms that emphasizes on both the underlying mathematical theory and practical considerations of efficiency. By learning a range of algorithm design techniques as Brute Force, Divide & Conquer, Decrease & Conquer, Transform and Conquer, Greedy Algorithms and Dynamic Programming, students should be able to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different range of behaviors of algorithms and the notion of tractable and intractable problems will be discussed.

References:

1. Levitin, A., Introduction to the Design and Analysis of Algorithm, Addison Wesley, 2017.
2. Puntambekar, A., Design and Analysis of Algorithms. Technical Publications, 2018.
3. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
4. Mueller, J. P. and Massaron, L., Algorithms For Dummies (For Dummies (Computers)) 1st Edition. For Dummies, 2017.
5. Bhasin, H., Algorithms: Design and Analysis Paperback. Oxford Univ Pr (Sd), 2015.
6. Malik. D. S., C++ Programming: From Problem Analysis to Program Design 8th Edition. Course Technology, 2017.
7. Dimri, S. C., Malik, P., and Ram, M., Algorithms: Design and Analysis, De Gruyter, 2021.

MITS 5313 Advanced Data Communications and Network**Learning Outcomes:**

At the end of the course, students should be able to:

- CLO1: Evaluate the theory of data communications related to the network models in current technologies.
- CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends and technologies.

CLO3: Relate the present research in data communications and networking in order to apply in the real environment based on the concept.

Synopsis:

This course introduces the fundamental concepts and terminology of data communication and networking, encompassing both technical and managerial aspects and to help students better understand the challenges and opportunities faced by modern business. Topics will include fundamentals of telecommunications, data transmission mechanisms, telecommunication media and technologies, considerations for LAN and WAN implementations, the Internet and intranet applications, emerging telecommunications technologies, and trends in the telecommunications industry. Students will also be able to understand, explain and apply the fundamentals of data communication and network technology concepts and skills in network applications, troubleshooting, and configuring the computer networks using guided or unguided media.

References:

1. Jerry FitzGerald, Alan Dennis, Alexandra Durcikova, Business Data Communications and Networking, 14th Edition, Wiley, 2020.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.

3. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, 2017.
4. Manish Agrawal and Rekha Sharma, Business Data Communications and IT Infrastructures, Prospect Press, 2016.
5. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2015.
6. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2015.

MITI 5213 Computational Methods

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Construct solution in computational methods through simple modelling.
- CLO2: Design a concept of computational methods to support algorithms and computer programs.
- CLO3: Formulate computational methods in computer science problems.

Synopsis:

This course covers on the topic of computational methods for computer science, which covers the topic on systems of equations and eigenvalues. The course also covers the interpolation, differentiation and integration. Finally, the topic on

ordinary differential equations and partial differential equations are introduced as an advanced topic in this course.

References:

1. MirHassani S. A. and Hooshmand F., Methods and Models in Mathematical Programming (First Edition), Springer, 2019.
2. Angela B. S. and George W. S., Introduction to Computational Science: Modeling and Simulation for the Sciences, 2nd Edition, Princeton University Press, 2014.
3. James B. R., Computational Methods for Engineers with MATLAB Applications, Ferret Publishing, 2013.
4. Peter G. C., Computational Mathematics: Theory, Methods and Applications, Nova Science Publishers, 2011.
5. Venkateshan S.P. and Prasanna S., Computational Methods in Engineering, Ane Books Pvt. Ltd, 2014.
6. Dan G.C, Ionel M.N and Mihaela I-B, Computational Methods for Data Evaluation and Assimilation, Chapman and Hall/CRC, 2014.

MITM 5313 Advanced Human Computer Interaction

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain how multi-discipline areas in HCI influence the design of interactive applications/systems .
- CLO2: Follow and explain the process of designing and evaluating interactive applications/systems.
- CLO3: Construct a design solution to HCI problems.

Synopsis:

This course aims to extend the students' basic knowledge of the multi-discipline areas rooted in the HCI body of knowledge. It will equip the students with the current and advanced knowledge of the main issues, theories and methodologies, and how the knowledge should be applied. The topics covered in this course are: cognitive psychology, interaction design methodology, usability evaluation, multisensory and advanced user-interface design, human factors, ergonomics and emerging issues in HCI and interaction design. The teaching methods consist of lectures, lab activities and guided independent learning for some of the challenging topics.

References:

1. Jennifer Preece, Yvonne Rogers and Helen Sharp, Interaction Design: beyond human-computer interaction, 5th Edition, John Wiley & Sons, 2019.
2. Mike Kuniavsky, Smart Things: Ubiquitous Computing User Experience Design, Elsevier, 2010.
3. José A. Macías, Toni Granollers, Pedro M. La-torre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multi-modal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MIT 5113 Computer Architecture & Compiler

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain computer architecture concept including the detailed interactions in computer system and its performance, and how computer architecture is influenced by the needs of compiled program.
- CLO2: Revise the compiler structure and relate the impact of compiler structure on programming language design.
- CLO3: Apply the knowledge of current trend in computer architecture and compiler design.

Synopsis:

This subject covers advanced topics in computer architecture, including multiprocessor and internal memory architecture. It incorporates the latest research and development on topics such as branch prediction, instruction-level parallelism, multithreading, and cache hierarchy design. It also covers the fundamental of compilers design including lexical analysis, various types of parsers, intermediate and object code generation and code optimization. The impact compiler structure on the programming language design will also be examined. The students shall have the knowledge of computer system organization.

References:

1. William Stallings, Computer Organization & Architecture, 10th Edition, Prentice Hall, 2016.
2. Linda Null, Essentials of Computer Organization and Architecture, 5th Edition, Jones & Bartlett Learning, 2018.
3. David A. Patterson and John L. Hennessy, Computer Architecture: A Quantitative Approach, 5th Edition, Morgan Kauffman, 2017.
4. Keith Cooper and Linda Torczon, Engineering A Compiler, 2nd Edition, Morgan Kaufmann, 2011.
5. Charles N. Fisher, Ron K. Cytron and Richard J. LeBlanc, Crafting A Compiler, Addison Wesley, 2010.
6. Alfred V. Aho, Monica S. Lam and Ravi Sethi, Compilers: Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2012.

MITM 5323 Mobile Application Development

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the fundamental technologies of mobile database system and issues in creating, designing and managing the mobile database system.
- CLO2: Illustrate important concept and architecture in mobile database system including Mobile Database Recovery Schemes, Querying Location Dependent Data, and Data Caching and Broadcast.
- CLO3: Develop a mobile database application to provide solution to a simple open mobile database problem.

Synopsis:

The database field has experienced rapid and incessant growth since the development of centralized relational databases. This course will discuss topics that are of growing importance in both the database research community and industry. Topics covered include conceptual, logical, and physical design of mobile database systems, technologies required for mobile databases, replication requirements for mobile databases, query processing and transaction management in mobile database systems, mobile database security, mobile database recovery schemes, the relationship between mobile database applications and the World Wide

Web, communication facilities, data confidentiality and current issues in mobile databases.

References:

1. Vijay, K., Mobile Database Systems, Wiley-Interscience, 2006.
2. Laberge, R. & V. Srdjan, Building PDA Databases for Wireless and Mobile Development, Wiley, 2002.
3. Zaniolo, C., Advanced Database Systems, Morgan Kaufmann Publishers Inc, 1997.
4. Mukherjea, S., Mobile Application Development, Usability, and Security: Advances in Multimedia and Interactive Technologies, IGI Global, 2016.
5. Gerardus, B., Mobile Database, 3rd Edition, Emereo Pty Limited, 2018

MITM 5333 Multimedia Based Instructional Design

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate a clear understanding of the theories, philosophies, and current research driving the field of Educational Technology, Instructional Design and Web TV.
- CLO2: Discuss and compare a working knowledge of the instructional design process

and its application in a media development situation.

CLO3: Distinguish between the use of instructional technologies to deliver instruction and using instructional technologies to provide meaningful learning.

Synopsis:

The purpose of this course is to assist students in learning how to adapt and apply instruction design techniques to multimedia based in both face-to-face (F2F) and distance/online settings. In this subject, students will be introduced to an overview of the field of Instructional Technology. This course focuses on helping students to develop an awareness and understanding of the theories and philosophies driving the field. In addition, this course will explore common computer-related technologies used within most learning environments. This subject will also explore the variety of interactive instructional techniques possible with computer-based instruction. The student will also learn the concepts and development process of iBook, CD or Web-based multimedia applications and produce products that integrate multimedia applications into effective e-Learning instructions. This subject also covers the principles and techniques used to design and develop content for multimedia production. Specific topics in writing include an introduction to communication, the elements of story creation and correct formats for linear and interactive scripts will be explored. At the end of

the semester, the students are required to write and present a concept paper on a proposed multimedia production for a real client.

References:

1. Robert Reiser and John V. Dempsey, Trends and Issues in Instructional Design and Technology, 4th Edition, 2017.
2. Charles Reigeluth, Instructional-Design Theories and Models : Building a Common Knowledge Base, Jossey-Bass, 2015.
3. Peggy Ertmer, James Quinn and Krista Glazewski, The ID Casebook : Case Studies in Instructional Design, 4th Edition, Pearson, 2019.
4. Rita Richey, James Klein & Monica Tracy, The Instructional Design Knowledge and Practice, Routledge, 2010.
5. Walter Dick, Lou Carey & James Carey, The Systematic Design of Instruction, Pearson, 2014.

MITM 5413 Multimedia Professional Ethics

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Develop an in depth understanding of the nature and function of multimedia issues and values especially in Malaysia.

CLO2: Measure form and content of multimedia issues and values contributing to the development of the MSC.

CLO3: Interpret application of multimedia issues and values and regulation in current and future multimedia industry.

Synopsis:

A general introduction to multimedia issues and values and the statutory, regulatory, industry codes and ethical conventions operating in Malaysia. Topics covered include: Broadcasting, Content and Audio-Visual Production/Screen Industries, Free Speech and Defamation, Information Equity, Internet and Online Services, Media Ownership, Print Media, Journalism and Media Ethics, Privacy, Spectrum Management, Telecommunications, Universal Service and Regional Communications. General Principles of Intellectual Property will be covered, as well as copyright issues, and relevant entertainment law. The emphasis will be on the harmonization of these issues into the present and future cyber laws in Malaysia, and the relevance and implications of media law in the MSC and Government initiatives, in accordance with the 2020 Vision.

References:

1. Lawrie Zion & David Craig, Ethics for Digital Journalist: Emerging Best Practices, Routledge Taylor & Francis Group, New York & London, 2014.

2. Multimedia Bill 1998, Copyright Act 1987, Printing Presses and Publications Act 1984, Digital Signature Act 1997, Computer Crime Act 1997, Advertising Code and Regulations.
3. Larry P. Gross, John Stuart Katz, Jay Ruby, Image Ethics in Digital Edge, University of Minnesota Press, 2003.
4. Khaw Lake Tee & Tay Pek San, Copyright Law in Malaysia. Lexis Nexis Sdn Bhd, 4th edition, 2017.
5. Smedinghoff, T. J. ed. Online Law: Legal Guide to doing business on the Internet, Pearson Technology Group, 2007.
6. Nathan M. Crystal, Professional Responsibility: Problems of Practice and the Profession, Wolters Kluwer; 7 edition, 2019.
7. Christopher Meyers, The Professional Ethics Toolkit, Wiley-Blackwell, 1st edition, 2018.

MITM 5233 Computer Graphics and Visualization

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Apply computer graphics concepts which are necessary to model problems in different fields such as film special effects, games development, virtual reality, and data visualization.
- CLO2: Present coherent technical and scientific results both orally and in writing

and have an understanding of the non-technical aspects to effectively cooperate with other specialists towards the solutions of complex technical problems.

CLO3: Design and develop software tools to create animation for a real life in certain environment such as architecture and precise engineering.

Synopsis:

This course assumes a good knowledge of fundamental methods in computer graphics and will start with the basic concepts that underline all graphics applications like computer games, movies, medicine and information visualization. It will provide the student with a sound, broad technical basis in high performance computer graphics in the areas of high quality image generation and interactive graphics. Student will be equipped for projects in specific application areas related to gaming, film special effects, virtual reality and visualization in the final stage of the program. This course will also provide a practical class on advanced computer graphics programming. It will cover major aspects of digital image generation: geometric modelling, computer animation, and rendering. The goal of the course is to provide a strong foundation for computer graphics principles, and provide a hands-on introduction to recent advanced topics, e.g., subdivision surfaces, real-time global illumination, and physically based animation.

References:

1. John, Huges, Andries van Dam, Morgan McGuire, David Sklar, James Foley, Steven Feiner, Kurt Akeley, Computer Graphics: Principles and Practice, 3rd Edition, Addison-Wesley Professional, 2013.
2. Steven Gortler, Foundation of 3D Computer Graphics, MIT Press, 2012.
3. Jonas Gomes, Luiz Velho, Computer Graphics : Theory and Practice, A K Peters/CRC Press, 2012.
4. Sumanta Guha, Computer Graphics through OpenGL, Chapman and Hall/CRC, 2010.
5. Colin Ware, Information Visualization 3rd Edition: Perception for Design (Interactive Technologies), Morgan Kaufmann, 2012.
6. Gonzalez, R.C, Woods, R. E., Digital Image Processing, 4th Edition, Prentice Hall, 2018.

MITM 5223 Advance 3D Animation

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Elaborate and develop advance working animation using key features of modeling, lighting and rendering.
- CLO2: Explain the methods of distributed rendering in scientific research and the animation industry.
- CLO3: Built the relationship between current streams of 3D design and animation research.

CLO4: Explore distributed rendering on a large-scale project using a specific animation package.

Synopsis:

This course concentrates on the principles and common techniques to all animation. Students will get experience in a number of specific animation methods. The course will equip the students with the current and advanced knowledge of the computer animation and rigging techniques, rendering concept, shading and surface characteristics, image resolution and visual effect techniques. They will also learn lighting and rendering techniques, High Dynamic Range Image (HDRI) as well as implement the principle of animations in the projects. The teaching methods consist of lectures, activities and guided independent learning for some of the challenging topics.

References:

1. Jonathan Cooper, Game Anim: Video Game Animation Explained, A K Peters/CRC Press, 2019. .
2. Andy Beane, 3D Animation Essentials, Sybex, 2015.
3. David Rodriguez, Animation Methods: The Only Book You'll Ever Need, CreateSpace Independent Publishing Platform, 2016.
4. Ami Copine, 3D Art Essentials : The Fundamentals of 3D Modeling, Texturing and Animation, Focal Press, 2016.

5. Rick Parent, Computer Animation 3rd Edition : Algorithms and Techniques, Morgan Kaufmann, 2016.

MITM 5113 Advanced Web Programming

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain and integrate knowledge of advanced web design techniques and technologies.
- CLO2: Using and apply important components and necessary tools in developing web application.
- CLO3: Develop web applications with back-end databases and PHP.

Synopsis:

This advanced hands-on course will teach you to effectively plan, design, program, maintain, administer, and troubleshoot dynamic web-sites, web servers and web-based database systems using the latest technology including Ajax, JQuery Apache Server and PHP. It emphasis 4 components in developing web applications which are; Client Site Technologies: HTML5, CSS3 and Ajax; Server Site Technologies: JQuery and PHP; Database Server: MySQL; and Web Servers : Apache.

References:

1. Christopher Murphy, Richard Clark, Oli Studholme, Divya Manian, Beginning HTML5 and CSS3: The Web Evolved, Apress, 2012.
2. Michael B. White, Mastering JavaScript: A Complete Programming Guide Including jQuery, AJAX, Web Design, Scripting and Mobile Application Development, Newstone Publishing, 2019.
3. Jonathan Hayward, Django JavaScript Integration: AJAX and jQuery, Packt Publishing, 2011.
4. Andrew Curioso, Ronald Bradford, Patrick Galbraith, Expert PHP and MySQL (Wrox Programmer to Programmer), Wrox, 2010.
5. XML Guild, Advanced XML Applications from the Experts at the XML Guild, Course Technology PTR, 2006.
6. Jermaine G. Anderson, Beginning Flash, Flex and AIR Development for Mobile Devices, Wrox, 2011.
7. Imar Spaanjaar, Beginning ASP.Net 4: in C# and VB, Wrox, 2014.

MITM 5123 Advanced Audio and Video Technology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Conceive advance knowledge in digital audio and video technology.
- CLO2: Demonstrate advanced skills in using audio video software for video editing

and audio analysis that meets industrial standards.

CLO3: Adapt best practices when developing audio and video application.

Synopsis:

This course provides students with the knowledge and advanced skills they required to understand and produce a high quality video that meet the industrial standards using fundamental audio video concepts and tools. Students will also be introduced to applied speech and audio processing techniques. The course is also structured to equip students with the foundation to start research work in fields related to audio and video technology.

References:

1. Ken Pohlmann, Principles of Digital Audio, 6th.Edition, McGraw-Hill/TAB Electronics, 2010.
2. Jan Roberts-Breslin, Making Media Foundations of Sound and Image Production, 4th Edition, Elsevier Science & Technology, 2017.
3. Beg Waggoner, Compression for Great Video and Audio, 2nd Edition, Focal Press, 2009.
4. Ken Dancyger, The Technoique of Film and Video Editing: History, Theory and Practices. A Focal Press Book, 2019.
5. Walter Fischer, Digital Video and Audio Broadcasting Technology: A Practical Engineering Guide (Signals and Communication Technology) (4th Ed). Springer, 2020.





MASTER OF COMPUTER SCIENCE (Database Technology)

Programme Details

This programme is specifically designed to equip students with the knowledge and technical skills on technology, design and database management that can meet industry needs.

Programme Educational Objectives (PEO)

Programme Educational Objectives (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation.

Below are the PEO for this programme:

- PEO 1:** Practice in-depth knowledge and skills of Computer Science with specialization in Database Technology field.
- PEO 2:** Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures towards lifelong learning.
- PEO 3:** Demonstrate knowledge of current issues in technology through learning and research activities using scientific methods.
- PEO 4:** Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community and business.

Programme Outcomes (PO)

Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of PO for this programme:

- PO 1:** Demonstrate originality and independence in undertaking analytical and critical evaluation, and synthesis of complex information, specialized concepts, theories, methods and practice in Computer Science;
- PO 2:** Apply knowledge critically and collectively to manage and resolve complex problems or issues in field of database technology;
- PO 3:** Apply the practical skill in working environment related to database technology field;
- PO 4:** Communicate effectively the knowledge, skills, ideas, critique and rationale in both written and verbal forms using appropriate methods to peers, experts, and non-experts;
- PO 5:** Competently use a wide range of suitable digital technologies and quantitative mechanisms to design and plan evaluation activities for enhancing study, research and practice;
- PO 6:** Demonstrate significant autonomy, independence and leadership skills at work and class with self-advancement through continuous academic or professional development; and
- PO 7:** Initiate or lead entrepreneurial projects and adhere to legal, ethical, professional and sustainable practices.

Programme Structure - Full Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MPSW XXXX	University Course	3
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITP 53533	Spatial Database	3
MXXX XXXX	Elective 1	3
Total credit		18
Semester 2 (February)		
Course Code	Course	Credit
MITP 5523	Database Administration and Security	3
MITP 5563	Advanced Database Systems Principles	3
MITP 5364	Big Data Analytics	4
MITU 5213	Project 1	3
MXXX XXXX	Elective 2	3
Total credit		16
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5226	Project 2	6
Total credit		6

February Intake:

Semester 2 (February)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MPSW XXXX	University Elective Course	3
MITP 5523	Database Administration and Security	3
MITP 5563	Advanced Database Systems Principles	3
MITP 5364	Big Data Analytics	4
MITP XXXX	Elective 1	3
Total credit		19
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5213	Project 1	3
MXXX XXXX	Elective 2	3
Total credit		6
Semester 1 (September)		
Course Code	Course	Credit
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITP 5353	Spatial Database	3
MITU 5226	Project 2	6
Total credit		18

University Core Courses - choose ONE (1) only:

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose TWO (2) only:

Course Code	Course	Credit
MITP 5553	Data Warehousing and Data Mining	3
MITP 5343	Data Integration	3
MITP 5253	Software Quality	3
MMSD 5213	Agile Project Management	3

Note: Total credit hours = 40 credits

Programme Structure - Part Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5043	Research Methodology	3
MIT5 5313	Advanced Data Communications and Network	3
MITP 5353	Spatial Database	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MITP 5523	Database Administration and Security	3
MITP 5563	Advanced Database Systems Principles	3
MITP 5364	Big Data Analytics	4
Total credit		10
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITP XXXX	Elective 1	3
Total credit		3
Semester 4 (September)		
Course Code	Course	Credit
MPSW XXXX	University Course	3
MITP 5113	Algorithm Analysis and Design	3
MITU 5213	Project 1	3
Total credit		9
Semester 5 (February)		
Course Code	Course	Credit
MTPU 5226	Project 2	6
MXXX XXXX	Elective 2	3
Total credit		9

University Courses - choose ONE (1) only:

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose TWO (2) only:

Course Code	Course	Credit
MITP 5553	Data Warehousing and Data Mining	3
MITP 5343	Data Integration	3
MITP 5253	Software Quality	3
MMSD 5213	Agile Project Management	3

Note: Total credit hours = 40 credits

COURSE DETAILS

MPSW 5013 Research Methodology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Propose a research proposal with an improvement of existing knowledge.
- CLO2: Synthesize relevant literature to address the knowledge gaps.
- CLO3: Apply ethical research skills in constructing research questions, objectives and hypotheses (if any) relevant to research problem.

Synopsis:

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of study.

References:

1. Kumar, R., Research methodology: A step-by-step guide for beginners. Sage Publications Limited, 2019.
2. Gray, D. E., Doing research in the business world. Sage Publications Limited, 2019.
3. Creswell, J. W., & Creswell, J. D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. In Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 2018.
4. Tang, H., Engineering Research: Design, Methods, and Publication. John Wiley & Sons, 2020.
5. Sidek, S., Kamalrudin, M. & Mat Deris, M., Research Survival Toolkit: Writing a winning fundamental research proposal, Melaka: University Publisher, UTeM, 2017.
6. Zobel, J., 3rd Edition, Writing for Computer Science, Springer-Verlag London, 2014.
7. Arkoudas, K., Musser, D., Fundamental Proof Methods in Computer Science: A Computer-Based Approach, MIT Press, 2017.
8. Creswell, J. W., & Poth, C. N., Qualitative inquiry and research design: Choosing among five approaches. Sage publications, 2016.

MPSW 5063 Entrepreneurship

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyse entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
- CLO2: Apply commercially viable ideas, projects, products prototypes for commercialization within the context of societal framework and to deliver business model canvassing and business value proposition.
- CLO3: Develop creative and viable high tech business models and strategies.

Synopsis:

The objectives of this course are to provide students a robust foundation in theories relevant to the improvement of entrepreneurial behaviour and capabilities in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and key stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the areas of entrepreneurial expertise necessary in order to found and/or grow a technology venture.

References:

1. Duening, Thomas N., Robert A. Hisrich,

and Michael A. Lechter. Technology Entrepreneurship: Taking Innovation to the Marketplace. Academic Press, 2020.

2. Sergi, B. S., & Scanlon, C. C. (Eds.), Entrepreneurship and Development in the 21st Century. Emerald Publishing Limited, 2019.
3. Bianchi, C., Glavas, C., & Mathews, S., SME international performance in Latin America: The role of entrepreneurial and technological capabilities. *Journal of Small Business and Enterprise Development*, 24(1), 176–195, 2017.
4. Patric Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, Design a Better Business: New Tools, Skills, and Mindset for Strategy and Innovation. Wiley, 2016.
5. Baldock, R., North, D., & Ullah, F., New Technology-Based Firms in the New Millennium. *New Technology Based Firms in the New Millennium*, 11, 203–226, 2015.
6. Alexander Osterwalder & Yves Pigneur, Value Proposition Design: How to Create Products and Services Customers Want. Wiley, 2015.
7. Alexander Osterwalder & Yves Pigneur, Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers, Wiley, 2010.

MPSW 5073 Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyze the core concepts and principles, functions, and process in project management.
- CLO2: Develop a comprehensive & viable project proposal.
- CLO3: Evaluate best practices and methodology in project management.

Synopsis:

This subject focuses on the principles of project management based on Project Management Body of Knowledge (PMBOK). Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality and human resources). Various tools for supporting the analysis of works in project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, work breakdown structure, managing uncertainty, building project plan, implementing and revising project plan, completing the project and contract laws. Microsoft Project (MS Project) will be introduced as project management software tools.

References:

1. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, 2018.

2. Project Management Institute, A Guide to the Project management Body of Knowledge (PMBOK® Guide) – Sixth Edition, 2017.
3. Clifford F. Gray · Erik W. Larson, Project Management the Managerial Process, McGraw Hill, 2021.
4. Meredith, J., Mantel, S. and Mantel, S. Jr., Project Management: A Strategic Managerial Approach. New York, Wiley, 2017.
5. Trevor L Young, Successful Project Management, Kogan Page Publishers, 2016.

MPSW 5033 Engineering Technology Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the principles of engineering management and technology management across different industries.
- CLO2: Apply relevant issues in engineering management and technology management across different industries.
- CLO3: Analysis the impact of relevant issues in the context of engineering management and technology management across different industries.

Synopsis:

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management pro-

vide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the course will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

1. Paul Trott, Innovation Management and New Product Development (6th Edition) 6th Edition, Pearson; 6 editions, 2016.
2. A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, John Wiley & Sons, 2011.
3. William J Stevenson, Operations Management 13th Edition, McGraw-Hill Education, 2017.
4. by Jim Hall, Tina Scott, Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma CreateSpace Independent

Publishing Platform, 2016.

5. Sharon Armstrong, Barbara Mitchell Weiser, The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional , 2019.

MPSW 5053 Quality Systems Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the conceptual understanding of Quality.
- CLO2: Identify Quality System Management information.
- CLO3: Propose Quality System Management techniques and tools in the practice of organizations.

Synopsis:

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method, failure mode and effect analysis (FMEA) and quality function deployment. Several quality control

tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

1. S. Thomas Foster, Managing Quality: Integrating the Supply Chain, 6th Edition, Pearson, 2017.
2. Howard S. Gitlow, Richard J. Melnyck and David M. Levine, Guide to Six Sigma and Process Improvement for Practitioners and Students, A: Foundations, DMAIC, Tools, Cases, and Certification, 2nd Edition, 2015.
3. Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
4. Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
5. Manual Procedure for Malaysia Halal Certification, 3rd Revision, Jabatan Kemajuan Islam Malaysia, 2015.

MITU 5213 Project 1

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Formulate the problems, objectives and scope based on complex technology solutions.

CLO2: Perform literature review and appropriate methodology to complete the project.

CLO3: Defend the proposed project solutions in written and verbal forms.

Synopsis:

This course is the first part of project that requires a student to prepare a master research proposal based on the theories and techniques of technologies learnt previously. Student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. Besides writing the proposal, student needs to present and defend his/her proposal. Student is expected to demonstrate ability to identify and propose solutions to the identified problems.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITU 5226 Project 2

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate solutions to the proposed project.
- CLO2: Verify solutions to understand the strengths, weaknesses and limitations of the project.
- CLO3: Defend the contributions of the project in written and verbal forms.

Synopsis:

This course is the second part of project that show the ability of student in applying the theories and techniques of technologies learnt previously. Student must write the second fold of dissertation which consists of four chapters of dissertation i.e. Chapter 4: Analysis & Design, Chapter 5: Implementation, Chapter 6: Evaluation and Chapter 7: Conclusion & Future Works. These chapters must align with the proposed solution developed as the end product of this project. Student is required to justify the contribution of the proposed solution throughout the presentation sessions.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify algorithm design technique and method of analysis.
- CLO2: Explain algorithms efficiency in terms of the amount of resources, which are time and storage space required to execute the algorithm.
- CLO3: Explain algorithm design technique based on problem type.

Synopsis:

This course introduces the students to the fundamentals principles of design and analysis of algorithms. It covers formal techniques to support the design and analysis of algorithms that emphasizes on both the underlying mathematical theory and practical considerations of efficiency. By learning a range of algorithm design techniques as Brute Force, Divide & Conquer, Decrease & Conquer, Transform and Conquer, Greedy Algorithms and Dynamic Programming, students should be able to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different range of behaviors of algorithms and the notion of tractable and intractable problems will be discussed.

References:

1. Levitin, A., Introduction to the Design and Analysis of Algorithm, Addison Wesley, 2017.
2. Puntambekar, A., Design and Analysis of Algorithms. Technical Publications, 2018.
3. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
4. Mueller, J. P. and Massaron, L., Algorithms For Dummies (For Dummies (Computers)) 1st Edition. For Dummies, 2017.
5. Bhasin, H., Algorithms: Design and Analysis Paperback. Oxford Univ Pr (Sd), 2015.
6. Malik. D. S., C++ Programming: From Problem Analysis to Program Design 8th Edition. Course Technology, 2017.
7. Dimri, S. C., Malik, P., and Ram, M., Algorithms: Design and Analysis, De Gruyter, 2021.

MIT5 5313 Advanced Data Communications and Network

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Evaluate the theory of data communications related to the network models in current technologies.
- CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends and technologies.

CLO3: Relate the present research in data communications and networking in order to apply in the real environment based on the concept.

Synopsis:

This course introduces the fundamental concepts and terminology of data communication and networking, encompassing both technical and managerial aspects and to help students better understand the challenges and opportunities faced by modern business. Topics will include fundamentals of telecommunications, data transmission mechanisms, telecommunication media and technologies, considerations for LAN and WAN implementations, the Internet and intranet applications, emerging telecommunications technologies, and trends in the telecommunications industry. Students will also be able to understand, explain and apply the fundamentals of data communication and network technology concepts and skills in network applications, troubleshooting, and configuring the computer networks using guided or unguided media.

References:

1. Jerry FitzGerald, Alan Dennis, Alexandra Durcikova, Business Data Communications and Networking, 14th Edition, Wiley, 2020.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.

3. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, 2017.
4. Manish Agrawal and Rekha Sharma, Business Data Communications and IT Infrastructures, Prospect Press, 2016.
5. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2015.
6. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2015.

MITP 5364 Big Data Analytics

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Distinguish the eco system for big data.
- CLO2: Demonstrate the performance of various data analytics techniques.
- CLO3: Implement star schemas and data mining techniques.

Synopsis:

This course not only explores the fundamentals of big data, but also the eco system, challenges and applications of big data. Students are exposed to the framework (Hadoop), distributed data processing programming (MapReduce), programming languages/tools (e.g. R, Python) and NoSQL storage solution (e.g. Cassandra, MongoDB) and data analytics techniques

(e.g. association rules, classification, clustering and text analysis).

References:

1. Rathinaraja Jeyaraj, Ganeshkumar Pugalendhi & Anand Paul, Big Data with Hadoop MapReduce: A Classroom Approach, Apple Academic Press, 2020.
2. Fabio Nelli, Python Data Analytics, Apress, 2018.
3. Venkat Ankam, Big Data Analytics, Packt, 2016.
4. Simon Walkowiak, Big Data Analytics with R, Packt, 2016.
5. Benjamin Bengfort & Jenny Kim, Data Analytics with Hadoop: An Introduction for Data Scientists, O'Reilly, 2016.

MITP 5523 Database Administration and Security

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Examine the concepts, techniques, and issues in the administration and security of the database systems, environments, and applications.
- CLO2: Demonstrate the ability to apply appropriate technical and investigative techniques in solving problems related to database administration and security using recent technologies and solutions.

CLO3: Propose the application of efficient administration and security methods in databases and other areas such as network and the internet.

Synopsis:

This course covers the concepts, techniques, and issues in the administration and security of database systems, environments, and applications. Students will gain knowledge on the current database administration and security techniques and practices. They will also explore how to manage various structures in the database and conduct performance monitoring, user management as well as backup and recovery techniques. As for database security, students will learn how to secure the database from potential attacks and threats. Topics include data availability, integrity, and security, security architecture, database application security models, virtual private databases, and database auditing. In this course, students will also exercise information seeking about issues and recent technologies in database administration and data security.

References:

1. Fogel, S. et. al, Oracle Database Administrator's. Oracle Corp, 2015.
2. William, S. & Lawrie, B., Computer Security: Principles and Practice 4th Edition, Pearson, 2017.

3. Pavlovic, Z. & Veselica, M., Oracle Database 12c Security Cookbook, Packt Publishing, 2016.
4. Afyouni, Hassan A., Database Security and Auditing – Protecting Data Integrity and Accessibility. Thomson-Course Technology, 2006.
5. Kosseff, J., Cybersecurity Law, Wiley, 2019.

MITP 5353 Spatial Databases

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the trend of different topics in spatial data via independent study and research.
- CLO2: Develop skills of using Spatial Analysis for solving practical problems.
- CLO3: Apply the knowledge in current trend of spatial data projects.

Synopsis:

The aim of the subject is to facilitate students' critical appreciation of current developments and concerns in spatial database and its use in business, environmental and resources managements, prediction future scenario. Students will evaluate the impact of the current developments and issues for their own work roles. The content will be a negotiated set of topics based on current developments in spatial database and spatial information development. The course also

give students experience in critical reading and analyzing journal literature's.

References:

1. Paul Bolstad, GIS Fundamentals: A First Text on Geographic Information Systems, 4th edition 4th Edition, XanEdu Publishing Inc., 2012.
2. Wilper L. Gorr and Kristen S. Kurland, GIS Tutorial 1: Basic Workbook, 10.1 Edition, Fifth Edition, Esri Press, 2013.
3. Michael Law & Amy Collins, Getting to Know ArcGIS Desktop, Esri Press, 2018.
4. Wilper L. Gorr & Kristen S. Kurland, GIS Tutorial 1 for ArcGIS Pro: A Platform Workbook, Esri Press, 2017.
5. Shekar, S. and Crawla, S., Spatial Databases: A Tour. Prentice Hall, 2013.
6. Rigaux, P., Scholl, M., Voisard, A., Spatial Applications - with Application to GIS, Morgan Kaufmann, 2001.

MITP 5563 Advanced Database System Principles

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain advanced data modeling concepts, query processing and issues in designing, developing and managing database systems.

CLO2: Construct advanced data model and queries based on user requirements of a database system.

CLO3: Identify various issues in managing database systems such as security, data quality and ethics.

Synopsis:

Understanding how to analyze and model the data in the organization is fundamental to the management of databases. This course will have advanced topics component that aim at knowledge regarding the implementation of database management systems as well as insights into the development and administration of database systems in various environments. This course explores key aspects of database system analysis, design and implementation, focusing on various topics from advanced concepts in modeling, query processing, performance tuning, transaction management and other current issues.

References:

1. Thomas Conolly, Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition, Pearson, 2015.
2. Carlos Coronel & Steven Morris, Database Principles: Fundamental of Design, Implementation, and Management, 13th Edition, Course Technology, 2019.
3. Jeffrey A. Hoffer, Ramesh Venkataraman &

Heikki Topi, Modern Database Management, 12th Edition, Pearson, 2016.

4. Elmasri Ramez & Shamkant B. Navathe, Fundamentals of Database System, 7th Edition, Pearson, 2017.
5. Abraham Silberschatz, Henry F. Korth & S. Sudarshan, Database System Concepts, 7th Edition, New York: McGraw-Hill, 2020.
6. Avi Silberschatz, Henry F. Korth & S. Sudarshan, Database System Concepts. McGraw-Hill, 2010.

MITP 5553 Data Warehousing and Data Mining

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Design data warehouses based on the data warehousing model and lifecycle.
- CLO2: Demonstrate the performance of data warehousing and data mining techniques.
- CLO3: Implement star schemas and data mining techniques.

Synopsis:

This subject focuses on two parts: data warehousing and data mining. The data warehousing portion covers the fundamentals of data warehousing, multidimensional data analysis and

factors involved in the analysis, planning, design, loading, maintenance and exploitation of successful data warehouse. The data mining portion covers the fundamentals of data mining, techniques, algorithms, tools and topics in knowledge discovery.

References:

1. Parteek Bhatia, Data Mining and Data Warehousing: Principles and Practical Techniques, 1st Edition, Cambridge University Press, 2019.
2. Han, J., Kamber, M. & Pei, J., Data Mining: Concepts and Techniques, 3rd Edition, Morgan Kaufman, 2011.
3. Ponniah, P., Data Warehousing Fundamentals for IT professionals, 2nd Edition, John Wiley & Sons, 2010.
4. Provost, F. & Fawcett, T., Data Science for Business, O'Reilly Media Inc., 2013.
5. Witten, I., Frank, E. & Hall, M. A., Data Mining: Practical Machine Learning Tools and Techniques, Morgan Kaufman, 2011.

MITP 5343 Data Integration

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Design data integration strategy using string, schema and data matching.

CLO2: Examine query processing requirements for data integration.

CLO3: Prepare data integration implementation report.

Synopsis:

Data integration problems arise whenever data from separate sources need to be combined as the basis for new applications. The availability of integrated data from multiple independent, heterogeneous data sources is crucial for many applications. The course introduces the fundamentals of data integration, where issues arising in data integration, the theoretical foundations of the area, and algorithms and software systems that facilitating integration will be covered.

References:

1. AnHai Doan, Alon Halevy & Zachary Ives, Principles of Data Integration, Morgan Kaufmann Publishers, 2012.
2. Gerardus Blokdyk, Web Data Integration A Complete Guide - 2020 Edition, 5STARCook, 2020.

MITP 5253 Software Quality

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Explain software quality assurance, standards, metrics and measurements.

CLO2: Integrate the current scenario or issues related to software quality topics.

CLO3: Practice software quality assurance plan which include organization, procedure, documentation, standard model measurement and metrics.

Synopsis:

The course discuss on quality term as a multifaced concept which can be described from many perspectives. Then this quality issues is extended into software context where assuring software quality is critical in software development. Therefore an organization requires planned quality assurance to ensure quality embedded into the software. Software metrics are tools of measurement attributes of a system, component or process possess a given attribute are essential in software engineering. The use of process standards in the entire software development and product standards are also integral part of assuring quality.

References:

1. Claude Y. Laporte Alain April, "Software Quality Assurance", 1st edition, IEEE Computer Society, IEEE Press, 2018.
2. Tarlinder, A., "Developer Testing: Building Quality into Software", 1st edition, Addison-Wesley Signature Series, 2016.
3. Munta, J. B., "Software Quality and Java Automation Engineer Survival Guide: Basic

Concepts, Self Review, Interview Preparation”, Everydayon Inc, 2016.

4. Linz, T., “Testing in Scrum: A guide for Software Quality Assurance in the Agile World”, 1st edition, Rock Nook Computing, 2014.
5. Jones, C., “The Economics of Software Quality”, 1st Edition, Addison-Wesley Professional, 2011.
6. Tian, J., “Software Quality Engineering: Testing, quality assurance, and Quantifiable Improvement”, John Wiley & Sons Inc. Publication, 2005.

MMSD 5213 Agile Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the concept of agile project management for any IT projects.
- CLO2: Present on the principles and practices of agile project management in the IT projects.
- CLO3: Demonstrate the standard guideline to produce a project vision and the product roadmap in a collaborative team environment for the purpose of IT project completion.

Synopsis:

This subject introduces the basic concept of agile project management to the student. It covers the agile project management process which includes agile tools and techniques for today knowledge-based projects. A knowledge-based project requires the project manager to manage, optimize and facilitate knowledge as a resource throughout the duration. This subject also covers support areas such as risk management. This subject exposes the student to the transition of a traditional project management into an agile project management.

References:

1. Taylor, T. 2023, Agile Project Management for Beginners 2023, independently published.
2. Stern, T.V. 2020, Lean and Agile Project Management: How to Make Any Project Better, Faster, and More Cost Effective 2e, Taylor & Francis.
3. Edge, J. 2020, Agile: An Essential Guide to Agile Project Management the Kanban Process and Lean Thinking + A Comprehensive Guide to Scrum, Moliva Ab.
4. Wright, J. 2020, Project Management 6 Books in 1: The Complete Guide to Agile Project Management Lean Analytics Scrum Kanban Kaizen and Six Sigma, Josh Wright.
5. Smith, L. 2019, Agile Software Development with C#, Scrum, eXtreme Programming, and Kanban 2e, independently published.





MASTER OF COMPUTER SCIENCE (Internetworking Technology)

Programme Details

This programme is specifically designed to equip students with the latest technical knowledge and advanced technology in internetworking that can meet industry needs.

Programme Educational Objectives (PEO)

Programme Educational Objectives (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation.

Below are the PEO for this programme:

- PEO 1:** Practice in-depth knowledge and skills of Computer Science with specialization in Internetworking Technology field.
- PEO 2:** Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures towards lifelong learning.
- PEO 3:** Demonstrate knowledge of current issues in technology through learning and research activities using scientific methods.
- PEO 4:** Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community and business.

Programme Outcomes (PO)

Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of PO for this programme:

- PO 1:** Demonstrate originality and independence in undertaking analytical and critical evaluation, and synthesis of complex information, specialized concepts, theories, methods and practice in Computer Science;
- PO 2:** Apply knowledge critically and collectively to manage and resolve complex problems or issues in field of internetworking technology;
- PO 3:** Apply the practical skill in working environment related to internetworking technology field;
- PO 4:** Communicate effectively the knowledge, skills, ideas, critique and rationale in both written and verbal forms using appropriate methods to peers, experts, and non-experts;
- PO 5:** Competently use a wide range of suitable digital technologies and quantitative mechanisms to design and plan evaluation activities for enhancing study, research and practice;
- PO 6:** Demonstrate significant autonomy, independence and leadership skills at work and class with self-advancement through continuous academic or professional development; and
- PO 7:** Initiate or lead entrepreneurial projects and adhere to legal, ethical, professional and sustainable practices.

Programme Structure - Full Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MPSW XXXX	University Course	3
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITS 5213	Distributed Computing Systems	3
MITS XXXX	Elective 1	3
Total credit		18
Semester 2 (February)		
Course Code	Course	Credit
MITS 5523	Advanced Mobile Computing	3
MITS 5343	Advanced Network Design and Diagnostics	3
MITS 5354	Internet Security	4
MITU 5213	Project 1	3
MITS XXXX	Elective 2	3
Total credit		16
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5226	Project 2	6
Total credit		6

February Intake:

Semester 2 (February)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MPSW XXXX	University Core Course	3
MITS 5523	Advanced Mobile Computing	3
MITS 5343	Advanced Network Design and Diagnostics	3
MITS 5354	Internet Security	4
MITS XXXX	Elective 1	3
Total credit		19
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITU 5213	Project 1	3
MITS XXXX	Elective 2	3
Total credit		6
Semester 1 (September)		
Course Code	Course	Credit
MITP 5113	Algorithm Analysis and Design	3
MITS 5313	Advanced Data Communications and Network	3
MITS 5213	Distributed Computing Systems	3
MITU 5226	Project 2	6
Total credit		15

University Courses - choose ONE (1) only;

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose TWO (2) only:

Course Code	Course	Credit
MIT5 5323	Advanced Scalable Internetworking	3
MIT5 5333	Advanced High Performance Networks	3
MIT5 5363	Internet Governance	3
MIT5 5373	Network and Internet Programming	3
MIT5 5383	Emerging Internetworking Technology	3

Note: Total credit hours = 40 credits

Programme Structure - Part Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5043	Research Methodology	3
MITS 5313	Advanced Data Communications and Network	3
MITS 5213	Distributed Computing Systems	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MPSW XXXX	University Course	3
MITS 5523	Advanced Mobile Computing	3
MITS 5343	Advanced Network Design and Diagnostics	3
Total credit		9
Semester 3 (Short Semester)		
Course Code	Course	Credit
MITS 5354	Internet Security	4
Total credit		4
Semester 4 (September)		
Course Code	Course	Credit
MITP 5113	Algorithm Analysis and Design	3
MITU 5213	Project 1	3
MITS XXXX	Elective 1	3
Total credit		9
Semester 5 (February)		
Course Code	Course	Credit
MTPU 5226	Project 2	6
MITS XXXX	Elective 2	3
Total credit		9

Elective courses - choose TWO (2) only:

University Courses - choose ONE (1) only:

Course Code	Course	Credit
MPSW 5033	Engineering and Technology Management	3
MPSW 5053	Quality System Management	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3

Elective Courses - choose TWO (2) only:

Course Code	Course	Credit
MITS 5323	Advanced Scalable Internetworking	3
MITS 5333	Advanced High Performance Networks	3
MITS 5363	Internet Governance	3
MITS 5373	Network and Internet Programming	3
MITS 5383	Emerging Internetworking Technology	3

Note: Total credit hours = 40 credits

COURSE DETAILS

MPSW 5013 Research Methodology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Propose a research proposal with an improvement of existing knowledge.
- CLO2: Synthesize relevant literature to address the knowledge gaps.
- CLO3: Apply ethical research skills in constructing research questions, objectives, and hypotheses (if any) relevant to the research problem.

Synopsis:

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of

study.

References:

1. Kumar, R., Research methodology: A step-by-step guide for beginners. Sage Publications Limited, 2019.
2. Gray, D. E., Doing research in the business world. Sage Publications Limited, 2019.
3. Creswell, J. W., & Creswell, J. D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. In Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 2018.
4. Tang, H., Engineering Research: Design, Methods, and Publication. John Wiley & Sons, 2020.
5. Sidek, S., Kamalrudin, M. & Mat Deris, M., Research Survival Toolkit: Writing a winning fundamental research proposal, Melaka: University Publisher, UTeM, 2017.
6. Zobel, J., 3rd Edition, Writing for Computer Science, Springer-Verlag London, 2014.
7. Arkoudas, K., Musser, D., Fundamental Proof Methods in Computer Science: A Computer-Based Approach, MIT Press, 2017.
8. Creswell, J. W., & Poth, C. N., Qualitative inquiry and research design: Choosing among five approaches. Sage publications, 2016.

MPSW 5063 Entrepreneurship

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyse entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
- CLO2: Apply commercially viable ideas, projects, products prototypes for commercialization within the context of societal framework and to deliver business model canvassing and business value proposition.
- CLO3: Develop creative and viable high tech business models and strategies.

Synopsis:

The objectives of this course are to provide students a robust foundation in theories relevant to the improvement of entrepreneurial behaviour and capabilities in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and key stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the areas of entrepreneurial expertise necessary in order to found and/or grow a technology venture.

References:

1. Duening, Thomas N., Robert A. Hisrich, and Michael A. Lechter. *Technology Entrepreneurship: Taking Innovation to the Marketplace*. Academic Press, 2020.
2. Sergi, B. S., & Scanlon, C. C. (Eds.), *Entrepreneurship and Development in the 21st Century*. Emerald Publishing Limited, 2019.
3. Bianchi, C., Glavas, C., & Mathews, S., *SME international performance in Latin America: The role of entrepreneurial and technological capabilities*. *Journal of Small Business and Enterprise Development*, 24(1), 176–195, 2017.
4. Patric Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, *Design a Better Business: New Tools, Skills, and Mindset for Strategy and Innovation*. Wiley, 2016.
5. Baldock, R., North, D., & Ullah, F., *New Technology-Based Firms in the New Millennium*. *New Technology Based Firms in the New Millennium*, 11, 203–226, 2015.
6. Alexander Osterwalder & Yves Pigneur, *Value Proposition Design: How to Create Products and Services Customers Want*. Wiley, 2015.
7. Alexander Osterwalder & Yves Pigneur, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, Wiley, 2010.

MPSW 5073 Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyze the core concepts and principles, functions, and process in project management.
- CLO2: Develop a comprehensive & viable project proposal.
- CLO3: Evaluate best practices and methodology in project management.

Synopsis:

This subject focuses on the principles of project management based on Project Management Body of Knowledge (PMBOK). Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality and human resources). Various tools for supporting the analysis of works in project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, work breakdown structure, managing uncertainty, building project plan, implementing and revising project plan, completing the project and contract laws. Microsoft Project (MS Project) will be introduced as project management software tools.

References:

1. Project Management Institute, A Guide to

the Project Management Body of Knowledge (PMBOK® Guide) – Fifth Edition, 2018.

2. Project Management Institute, A Guide to the Project management Body of Knowledge (PMBOK® Guide) – Sixth Edition, 2017.
3. Clifford F. Gray · Erik W. Larson, Project Management the Managerial Process, McGraw Hill, 2021.
4. Meredith, J., Mantel, S. and Mantel, S. Jr., Project Management: A Strategic Managerial Approach. New York, Wiley, 2017.
5. Trevor L Young, Successful Project Management, Kogan Page Publishers, 2016.

MPSW 5033 Engineering Technology Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the principles of engineering management and technology management across different industries.
- CLO2: Apply relevant issues in engineering management and technology management across different industries.
- CLO3: Analysis the impact of relevant issues in the context of engineering management and technology management across different industries.

Synopsis:

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the course will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

1. Paul Trott, Innovation Management and New Product Development (6th Edition) 6th Edition, Pearson; 6 editions, 2016.
2. A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, John Wiley & Sons, 2011.
3. William J Stevenson, Operations Management 13th Edition, McGraw-Hill Education, 2017.
4. by Jim Hall, Tina Scott, Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma CreateSpace Independent Publishing Platform, 2016.
5. Sharon Armstrong, Barbara Mitchell Weiser, The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional , 2019.

MPSW 5053 Quality Systems Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the conceptual understanding of Quality.
- CLO2: Identify Quality System Management information.
- CLO3: Propose Quality System Management techniques and tools in the practice of organizations.

Synopsis:

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method,

failure mode and effect analysis (FMEA) and quality function deployment. Several quality control tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

1. S. Thomas Foster, Managing Quality: Integrating the Supply Chain, 6th Edition, Pearson, 2017.
2. Howard S. Gitlow, Richard J. Melnyck and David M. Levine, Guide to Six Sigma and Process Improvement for Practitioners and Students, A: Foundations, DMAIC, Tools, Cases, and Certification, 2nd Edition, 2015.
3. Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
4. Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
5. Manual Procedure for Malaysia Halal Certification, 3rd Revision, Jabatan Kemajuan Islam Malaysia, 2015.

MITU 5213 Project 1

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Formulate the problems, objectives and scope based on complex technology solutions.
- CLO2: Perform literature review and appropriate methodology to complete the project.
- CLO3: Defend the proposed project solutions in written and verbal forms.

Synopsis:

This course is the first part of project that requires a student to prepare a master research proposal based on the theories and techniques of technologies learnt previously. Student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. Besides writing the proposal, student needs to present and defend his/her proposal. Student is expected to demonstrate ability to identify and propose solutions to the identified problems.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITU 5226 Project 2

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate solutions to the proposed project.
- CLO2: Verify solutions to understand the strengths, weaknesses and limitations of the project.
- CLO3: Defend the contributions of the project in written and verbal forms.

Synopsis:

This course is the second part of project that show the ability of student in applying the theories and techniques of technologies learnt previously. Student must write the second fold of dissertation which consists of four chapters of dissertation i.e. Chapter 4: Analysis & Design, Chapter 5: Implementation, Chapter 6: Evaluation and Chapter 7: Conclusion & Future Works. These chapters must align with the proposed solution developed as the end product of this project. Student is required to justify the contribution of the proposed solution throughout the presentation sessions.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed

Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITP 5113 Algorithm Analysis and Design**Learning Outcomes:**

At the end of the course, students should be able to:

- CLO1: Identify algorithm design technique and method of analysis.
- CLO2: Explain algorithms efficiency in terms of the amount of resources, which are time and storage space required to execute the algorithm.
- CLO3: Explain algorithm design technique based on problem type.

Synopsis:

This course introduces the students to the fundamentals principles of design and analysis of algorithms. It covers formal techniques to support the design and analysis of algorithms that emphasizes on both the underlying mathematical theory and practical considerations of efficiency. By learning a range of algorithm design techniques as Brute Force, Divide & Conquer, Decrease & Conquer, Transform and Conquer, Greedy Algorithms and Dynamic Programming, students should be able to develop efficient algorithms for simple computational tasks and reasoning about the correctness of them. Through the complexity measures, different

range of behaviors of algorithms and the notion of tractable and intractable problems will be discussed.

References:

1. Levitin, A., Introduction to the Design and Analysis of Algorithm, Addison Wesley, 2017.
2. Puntambekar, A., Design and Analysis of Algorithms. Technical Publications, 2018.
3. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
4. Mueller, J. P. and Massaron, L., Algorithms For Dummies (For Dummies (Computers)) 1st Edition. For Dummies, 2017.
5. Bhasin, H., Algorithms: Design and Analysis Paperback. Oxford Univ Pr (Sd), 2015.
6. Malik. D. S., C++ Programming: From Problem Analysis to Program Design 8th Edition. Course Technology, 2017.
7. Dimri, S. C., Malik, P., and Ram, M., Algorithms: Design and Analysis, De Gruyter, 2021.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Evaluate the theory of data communications related to the network models in

current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends and technologies.

CLO3: Relate the present research in data communications and networking in order to apply in the real environment based on the concept.

Synopsis:

This course introduces the fundamental concepts and terminology of data communication and networking, encompassing both technical and managerial aspects and to help students better understand the challenges and opportunities faced by modern business. Topics will include fundamentals of telecommunications, data transmission mechanisms, telecommunication media and technologies, considerations for LAN and WAN implementations, the Internet and intranet applications, emerging telecommunications technologies, and trends in the telecommunications industry. Students will also be able to understand, explain and apply the fundamentals of data communication and network technology concepts and skills in network applications, troubleshooting, and configuring the computer networks using guided or unguided media.

References:

1. Jerry FitzGerald, Alan Dennis, Alexandra Dur-

cikova, Business Data Communications and Networking, 14th Edition, Wiley, 2020.

2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. James Kurose and Keith Ross, Computer Networking: A Top-Down Approach, 7th Edition, Pearson, 2017.
4. Manish Agrawal and Rekha Sharma, Business Data Communications and IT Infrastructures, Prospect Press, 2016.
5. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2015.
6. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2015.

MITS 5354 Internet Security

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the concept, issues, and trends of internet security.
- CLO2: Perform a case study about the current attack trends towards the social, ethical issues, and the related cyber laws.
- CLO3: Construct the appropriate security mechanism to defense from the attacks.

Synopsis:

This course provides a study of various attack techniques at the network, transport, and application layer. Students also are exposed to the current attacks trend and the related cyber laws and ethical issues. In addition, the basics of cryptography and the applications are also introduced in the topic. This course also covers the defense mechanisms in the three layers; network, transport, and application.

References:

1. Wenliang Du (2019). Internet Security: A Hands-on Approach. ISBN: 1733003924, 9781733003926
2. Wm. Arthur Conklin, Greg White, Chuck Cothren, Roger L. Davis, Dwayne Williams (2021). Principles of Computer Security: CompTIA Security+ and Beyond, Sixth Edition (Exam SY0-601), McGraw-Hill, 6th Edition. ISBN: 9781260474329
3. Fernando Maymi, Shon Harris (2021). CISSP All-in-One Exam Guide, 9th Edition. McGraw-Hill. ISBN: 1260467376
4. Tim Rains (2020). Cybersecurity Threats, Malware Trends, and Strategies: Learn to mitigate exploits, malware, phishing, and other social engineering attacks. ISBN: 1800206011, Packt Publishing.
5. Wenliang Du, (2019). Computer & Internet Security: A Hands-on Approach. ISBN: 1733003932.

6. Charles J. Brooks, Christopher Grow, Philip Craig, and Donald Short, (2018). Cybersecurity Essentials. ISBN: 9781119362395. Sybex

MIT 5213 Distributed Computing Systems

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Organize the heterogeneous main components architectures in distributed system.
- CLO2: Display knowledge about the design principles of distributed system architecture.
- CLO3: Propose solution on large-scale heterogeneous distributed system performances problem.

Synopsis:

This course is concerned with the principles and implementation of the software necessary to manage system resources, particularly in a distributed environment. A core knowledge of basic operating systems concepts (virtual memory, I/O, process management and communication) is assumed. The design issues and distributed system concepts are covered such as coverage of large-scale applications, fault modelling and fault tolerance, models of system execution, and technology related to distributed systems.

References:

1. Steen M. V., Tanenbaum, A. Distributed Systems, 4th Edition, CreateSpace Independent Publishing Platform, 2023
2. Raptis, D. Distributed Systems for practitioners, 2020, Kindle Edition, 2020
3. Ghosh, S. Distributed Systems: An Algorithmic Approach, 2nd Edition, Chapman and Hall/CRC, 2020
4. Tanenbaum, A., Steen M. V. Distributed Systems: Principles and Paradigms. 2nd Edition. CreateSpace Independent Publishing Platform, 2016.
5. Burns, B. Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services, 1st edition, O'Reilly Media; 2018
6. Stallings, W. Operating Systems: Internals and Design Principles. 9th Edition, Pearson, 2017.
7. Hennessy, J.L., Patterson, D.A. Computer Architecture: A Quantitative Approach. 6th Edition. Morgan Kauffman, 2017.

MITS 5523 Advanced Mobile Computing

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Describe the concept and different technologies of mobile computing.
- CLO2: Relate the advancement in mobile computing with the changes of all aspects of human life.
- CLO3: Propose mobile computing application to solve current issues in certain area.

Synopsis:

This course introduces to students the fundamental concept of mobile computing and mobile application development. Mobile computing will be discussed from the perspectives of mobile technology, application development, and user interaction. The course will overview various mobile computing applications, technologies, and wireless communication. This course also introduced the uses of mobile application frameworks and development environments to reinforce concepts covered in lectures. Students will obtain hands-on experiences through mobile computing projects to solve any aspects of human life such as personal communication, education, business and healthcare. The course will look at some current research in mobile computing and identify potential research problems in this field.

References:

1. Raj Kamal, Mobile Computing, Oxford University Press India, 3Ed, 2019.
2. M. Bala Krishna and Jaime Lloret Mauri, Advances in Mobile Computing and Communication: Perspectives and Emerging Trends in 5G Networks, CRC Press, 2016.
3. Sunilkumar S. Manvi and Mahabaleshwar S. Kakkasageri, Wireless and Mobile Networks, Concepts And Protocols, 2Ed, Wiley, 2016.
4. Koushik Sinha, Sasthi C. Ghosh and Bhabani P. Sinha, Wireless Networks and Mobile Computing, Chapman and Hall / CRC Press, 2016.
5. Rafael Barrett, Wireless Networks and Mobile Computing, Wilford Press, 2016.

MITS 5343 Advanced Network Design And Diagnostics

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Design networks project that meets a customer's business and technical goals.
- CLO2: Identify the processes and tools used in order to understand traffic flow, protocol behavior, and internetworking technologies.
- CLO3: Explain the acquired understanding of tools and language during analysis and design of a network structure which can

fulfill the customer requirement in terms of network performance, security, capacity, and weight.

Synopsis:

This course covers a top-down approach to network design, the concept, guidelines, practice, and diagnostics for requirement analysis and flows analysis. The technology choices, inter-connection mechanism and network management, and security will be covered in logical design. Some issues on network design will be included in physical design and addressing and routing.

References:

1. Michael G. Solomon, David Kim (2021), Fundamentals of Communications and Networking, 3rd Edition, Publisher(s): Jones & Bartlett Learning, ISBN: 9781284200126
2. Michel Thomatis (2019), "Network Design Cookbook", 2nd Edition, Cisco Press (ISBN: 9781387224715).
3. Ergun, O (2019), "Service Provider Networks: Design and Architecture Perspective", (ISBN: 978-1096289395).
4. White, Michael B. (2018), "Computer Networking: The Complete Guide to Understanding Wireless Technology, Network Security, Computer Architecture and Communications Systems (Including Cisco, CCNA and CCENT)", Newstone, (ISBN: 978-1727672916)

5. P. Stephen (2017), "Managing Networks in Project-Based Organisations", John Wiley & Sons Ltd, (ISBN: 9781118929926)
6. R, White and D, Donohue (2014), "The Art of Network Architecture, The: Business-Driven Design (Networking Technology)", 1st Edition, Cisco Press, (ISBN: 978-1587143755)
7. Oppenheimer, P (2010), "Top Down Network Design", 3rd Edition, Cisco Press, (ISBN: 978-1587202834).

MIT 5373 Network and Internet Programming

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate an understanding of the usage of the application programming interfaces for each of the different network protocols with emphasis on the application and transport layers.
- CLO2: Form an integrated solution for Internet application problems using suitable network programming interfaces.
- CLO3: Formulate and integrate appropriate network programming interfaces to solve Internet application problems in a small group environment.

Synopsis:

This course reviews concepts, techniques, and systems issues in advanced Internet application development, and explores new challenges and research issues that are critical for developing network and Internet applications, such as network monitoring, web servers, and web services. One of the important goals of the course is to look beyond the present status of the Internet and conjecture what possible future technologies and applications will evolve. The course will include a significant project component that will typically require programming skills.

References:

1. Pradeeban Kathiravelu, Dr. M. O. Faruque Sarker, Python Network Programming Cookbook - Second Edition: Practical solutions to overcome real-world networking challenges, Packt Publishing, 2017.
2. Eric Chou, Mastering Python Networking: Your one-stop solution to using Python for network automation, programmability, and DevOps, 3rd Edition, Packt Publishing, 2020.
3. Mat Ryer, Go Programming Blueprints: Build real-world, production-ready solutions in Go using cutting-edge technology and techniques, Second Edition, Packt Publishing, 2016.
4. Jan Newmarch, Network Programming with Go: Essential Skills for Using and Securing Networks, Apress, 2017.
5. Maarten van Steen, Andrew S. Tanenbaum, Distributed Systems, Pearson Education,

2018.

MITS 5323 Advanced Scalable Internet-working

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain in detail the network requirement and current trend technology for building the advanced scalable network.
- CLO2: Design the advanced scalable network by integration remote access and reliable routing protocol.
- CLO3: Demonstrate routing protocol operation, configurations, troubleshooting and network monitoring activities.

Synopsis:

This subject emphasizes the theory of building advanced scalable network. It also involves the use of internetworking architecture and network equipment. The theory and technique on routing protocol and remote access technologies will be emphasized to build a scalable internetwork. The hands-on covers the configuration of routing protocol and network monitoring tools. In addition, it exposes WAN technologies including VPN, Frame Relay, Software Defined Network (SDN).

References:

1. Cisco System, Inc. Scaling Networks v6 Companion Guide: Official Certificate Guide (Cisco Networking Academy Program). Cisco Press, 2017.
2. Cisco System, Inc. Switching, Routing and Wireless Essentials Companion Guide (CCNAv7): Official Certificate Guide (Cisco Networking Academy Program). Cisco Press, 2020.
3. Cisco System, Inc. Enterprise Networking, Security, and Automation Companion Guide (CCNAv7), (Cisco Networking Academy Program). Cisco Press. 2020.
4. John W. Capobianco, Automate Your Network: Introducing the Modern Approach to Enterprise Network Management, Kindle, 2019.
5. Thomas D. Nadeau, Software-defined networks: An Authoritative Review of Network Programmability Technologies, 1st Edition, O'Reilly Media, 2013.
6. Paul Goransson, Software Defined Networks: A Comprehensive Approach, 1st Edition, Morgan Kaufmann, 2014.
7. John Tiso, Inc. Designing Cisco Network Service Architectures (ARCH) Foundation Learning Guide, 3rd Edition, Cisco Press, 2011.

MITS 5333 Advanced High Performance Networks

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Evaluate high performance networks with guaranteed QoS, particularly in a saturated/congested networks.
- CLO2: Identify the main techniques and mechanism of queue management that provide high quality of service (QoS).
- CLO3: Propose solutions to the problems in poorly designed network by utilizing efficient queuing algorithm and efficient traffic control scheme.

Synopsis:

This course is an in-depth study of the theory, design and performance analysis of high-performance networks. Topics include specific high-performance network implementations and emerging technologies, including multimedia transmission, routing protocols, traffic control management, quality of service (QoS), and next generation networks. Performance analysis of networks will include simulation of basic queuing models.

References:

1. Jerry FitzGerald, Alan Dennis, Alexandra Durcikova, 2020. Business Data Communications and Networking, 14th Edition, Wiley.
2. Forouzan, Behrouz A., 2021. ISE Data Communications and Networking with TCP/IP Protocol Suite, 6th Edition, McGraw-Hill.

3. James Kurose and Keith Ross, 2017. Computer Networking: A Top-Down Approach, 7th Edition, Pearson.
4. Manish Agrawal and Rekha Sharma, 2016. Business Data Communications and IT Infrastructures, Prospect Press.
5. Curt M. White, 2015. Data Communications and Computer Networks, 8th Edition, Cengage Learning
6. William Stallings, 2015. Data and Computer Communications, 10th Edition, Pearson.

MIT5 5363 Internet Governance

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Elaborate the concepts, architecture and application of the related Internet Governance models and technologies.
- CLO2: Integrate knowledge concerning current issues, impact to society and open issues in Internet Governance.
- CLO3: Identify the key elements, factors, benefit, risks and ethics that drive the successful adoption of Internet Governance and Security in a business case.

Synopsis:

This course focuses on the technical, security, legal, economic, development, sociocultural, and

human rights aspects of Internet governance. Providing a brief introduction, a summary of major questions and debates, and a survey of different views and approaches for each issue related and offers a practical framework for analysis and discussion of Internet governance and security.

References:

1. Jovan Kurbalija, An introduction to internet governance, Diplo Foundation, 2016.
2. Laura Denardis and Derrick Cogburn, Researching Internet Governance: Methods, Frameworks, Futures (Information Policy), The MIT Press, 2020.
3. Roxana Radu, Negotiating internet governance”. Oxford University Press, 2019.
4. Alison Harcourt, George Christou, and Seamus Simpson, Global Standard Setting in Internet Governance, OUP Oxford, 2020.
5. Carol Glen, Controlling Cyberspace: The Politics of Internet Governance and Regulation, Praeger, 2017.
6. Wade Hoxtell and David Nonhoff, Internet Governance: Past, Present and Future, Konrad-Adenauer-Stiftung, 2019.
7. Funk, Gerhard, et al., Implementation Guideline ISO/IEC 27001:2013; A practical guideline for implementing an ISMS in accordance with the international standard ISO/IEC 27001:2013, ISACA Germany Chapter e.V., 2017.
8. Laura B. Madsen, Healthcare Business Intelligence: A Guide to Empowering Successful

Data Reporting and Analytics; Data Governance Policies and Procedures, John Wiley & Sons, Inc., 2012.

9. John Ladley, Data Governance: How to Design, Deploy, and Sustain an Effective Data Governance Program, Academic Press, 2019.

MITS 5383 Emerging Internetworking Technology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Elaborate on the concept, architecture, and application of the related emerging technologies.
- CLO2: Perform literature study on the current trends, impact to society, and open issues of the related emerging technologies.
- CLO3: Identify the key attributes, factors, benefits, and risks that drive the successful adoption of emerging technologies in a business case.

Synopsis:

This course will provide state-of-art of emerging technologies in internetworking which covers topics in three main areas: smart networking technologies and application, large-scale distributed system, and next-generation wireless communication. For each topic, students will be introduced to the platform, system architecture,

and principle designs. In addition, existing barriers, challenges, and opportunities of emerging internetworking technology are presented.

References:

1. Perry Lea, IoT and Edge Computing for Architects: Implementing edge and IoT systems from sensors to clouds with communication systems, analytics, and security, Packt Publishing, 2020.
2. Anand Nayyar, Handbook of Cloud Computing: Basic to Advance research on the concepts and design of Cloud Computing, 2019.
3. Afif Osseiran, 5G Mobile and Wireless Communications, Cambridge University Press, 2016.
4. Benny Bing, 5G Technologies and Applications: An Introduction to the Next Wireless Frontier, Amazon, 2019.
5. Pablo Aguilera, 802.11ax: A Hyperconnected World and the Next-Generation WiFi, 2016.
6. Kuo Hung Huang, Changing Humanities and Smart Application of Digital Technologies, 2017.
7. Akhilesh, K. B., Möller, Dietmar P.F, Smart Technologies Scope and Applications, Springer, 2020.
8. A. Gehlot, R. Singh, R.K. Sharma, K.K Sharma, LoRA and IoT Networks for Applications in Industry 4.0, 2020.
9. Bharat S. Chaudhari and Marco Z., LPWAN Technologies for IoT and M2M Applications. Science Direct, 2020.





MASTER IN MOBILE SOFTWARE DEVELOPMENT

Programme Details

The goal of this programme is to produce expert developers and designers of mobile applications within the ICT practitioner and related disciplines, which can strengthen their role and become the leader that instil innovative and entrepreneurial values on the global stage by applying suitable mobile application development's principles and techniques.

Programme Educational Objectives (PEO)

Programme Educational Objectives (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation.

Below are the PEO for this programme:

- PEO 1:** Computing specialists who have in-depth knowledge and can apply enhanced technical, digital, and numeracy skills with specializations to provide innovative solutions in mobile software development.
- PEO 2:** Computing specialists who have leadership, interpersonal and communication skills to interact with a wide variety of audiences effectively.
- PEO 3:** Computing specialists who engage and advocate lifelong learning activities using scientific methods and have an entrepreneurial mindset.
- PEO 4:** Computing specialists who uphold professional practices ethically and with integrity.

Programme Outcomes (PO)

Programme Outcomes (PO)

Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of PO for this programme:

- PO 1:** Ability to integrate in-depth knowledge to promote computing solutions.
- PO 2:** Ability to recommend innovative solutions using advanced mobile software development technology.
- PO 3:** Ability to demonstrate practical skill in developing computing solutions or tools that are functional, efficient or effective.
- PO 4:** Ability to demonstrate effective interaction and participate in mobile software solutions discussion within a group or with a diverse audience.
- PO 5:** Ability to display effective communication within a group or with a diverse audience by producing and presenting technical materials in mobile software development.
- PO 6:** Ability to practice digital skills to acquire, interpret and extend knowledge in computing.
- PO 7:** Ability to apply numerical skills to acquire, interpret and extend knowledge in computing solutions.
- PO 8:** Ability to demonstrate leadership, teamwork, autonomy and responsibility in delivering services related to mobile software solutions.
- PO 9:** Ability to display capabilities of self-advancement through life-long learning.
- PO 10:** Ability to display capabilities of having an entrepreneurial mindset in delivering solutions.
- PO 11:** Ability to conduct ethical, professional and sustainable practices in managing research and services in relevant fields.

Programme Structure - Full Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MMSD 5113	Native Mobile Development I	3
MMSD 5123	User Experience Management & User Interface Design	3
MMSD 5153	Mobile Back-end	3
MMSD XXXX	Elective 1	3
Total credit		15
Semester 2 (February)		
Course Code	Course	Credit
MMSD 5133	Mobile Application Security and Privacy	3
MMSD 5143	Mobile Application Testing	3
MMSD 5163	Mobile Application Architecture	3
MMSD XXXX	Elective 2	3
MMSD XXXX	Elektif 3	3
MMSD 5314	Project I	4
Total credit		19
Semester 3 (Short Semester)		
Course Code	Course	Credit
MMSD 5326	Project II	6
Total credit		6

February Intake:

Semester 1 (February)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MMSD 5133	Mobile Application Security and Privacy	3
MMSD 5143	Mobile Application Testing	3
MMSD 5163	Mobile Application Architecture	3
MMSD XXXX	Elective 1	3
MMSD XXXX	Elective 2	3
Total credit		18
Semester 2 (Short Semester)		
Course Code	Course	Credit
MMSD 5314	Project I	4
Total credit		4
Semester 3 (September)		
Course Code	Course	Credit
MMSD 5113	Native Mobile Development I	3
MMSD 5123	User Experience Management & User Interface Design	3
MMSD 5153	Mobile Back-end	3
MMSD XXXX	Elective 3	3
MMSD 5326	Project II	6
Total credit		18

Elective courses - choose THREE (3) only:

Course Code	Course	Credit
MMSD 5213	Agile Project Management	3
MMSD 5223	Native Mobile Development II	3
MMSD 5233	Mobile Analytics	3
MMSD 5243	Internet of Things Applications Development	3
MPSW 5063	Entrepreneurship	3

Note: Total credit hours = 40 credits

Programme Structure - Part Time

September Intake:

Semester 1 (September)		
Course Code	Course	Credit
MMSD 5113	Native Mobile Development I	3
MMSD 5153	Mobile Back-end	3
MMSD XXXX	Elective 1	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MMSD 5163	Mobile Application Architecture	3
MMSD XXXX	Elective 2	3
Total credit		9
Semester 3 (September)		
Course Code	Course	Credit
MMSD 5123	User Experience Management & User Interface Design	3
MMSD 5314	Project I	4
Total credit		7
Semester 4 (February)		
Course Code	Course	Credit
MMSD 5133	Mobile Application Security and Privacy	3
MMSD 5143	Mobile Application Testing	3
MMSD XXXX	Elective 3	3
Total credit		9
Semester 5 (Short Semester)		
Course Code	Course	Credit
MMSD 5326	Project II	6
Total credit		6

Programme Structure - Part Time

February Intake:

Semester 1 (February)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MMSD 5163	Mobile Application Architecture	3
MMSD XXXX	Elective 1	3
Total credit		9
Semester 2 (September)		
Course Code	Course	Credit
MMSD 5113	Native Mobile Development I	3
MMSD 5153	Mobile Back-end	3
MMSD XXXX	Elective 2	3
Total credit		9
Semester 3 (February)		
Course Code	Course	Credit
MMSD 5133	Mobile Application Security and Privacy	3
MMSD 5143	Mobile Application Testing	3
MMSD XXXX	Elective 3	3
Total credit		9
Semester 4 (Short Semester)		
Course Code	Course	Credit
MMSD 5314	Project I	4
Total credit		4
Semester 5 (September)		
Course Code	Course	Credit
MMSD 5123	User Experience Management & User Interface Design	3
MMSD 5326	Project II	6
Total credit		9

Elective courses - choose THREE (3) only:

Course Code	Course	Credit
MMSD 5213	Agile Project Management	3
MMSD 5223	Native Mobile Development II	3
MMSD 5233	Mobile Application Analytics	3
MMSD 5243	Internet of Things Applications Development	3
MPSW 5063	Entrepreneurship	3

Note: Total credit hours = 40 credits

COURSE DETAILS

MPSW 5013 Research Methodology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Propose a research proposal with an improvement of existing knowledge.
- CLO2: Synthesize relevant literature to address the knowledge gaps.
- CLO3: Apply ethical research skills in constructing research questions, objectives, and hypotheses (if any) relevant to the research problem.

Synopsis:

The course is designed to introduce students to the principles and good practices of Research and Development (R & D). Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research program at postgraduate level. At the end of the course, students are expected to submit a research proposal on the topic of their interest.

References:

1. Nathan R. Durdella, *Qualitative Dissertation Methodology: A Guide for Research Design and Methods*, 1st Edition, SAGE Publications, 2018.
2. Willie Chee Keong Tan, *Research Methods: A Practical Guide for Students and Researchers*, World Scientific Publishing Company, 2017.
3. Robert K. Yin, *Case Study Research and Applications: Design and Methods*, 6th Edition, SAGE Publications, 2017.
4. Konstantine Arkoudas, David Musser, *Fundamental Proof Methods in Computer Science: A Computer-Based Approach*, MIT Press, 2017.
5. Jessica DeCuir-Gunby and Paul A. Schutz, *Developing a Mixed Methods Proposal: A Practical Guide for Beginning Researchers (Mixed Methods Research Series)*, 1st Edition, SAGE Publications, 2016.
6. John W. Creswell, *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*, 4th Edition, SAGE Publications, 2014.
7. Justin Zobel, *Writing for Computer Science*, 3rd Edition, Springer-Verlag London, 2014.
8. Siti Uzairiah Mohd Tobi, *Qualitative Research and Nvivo 10 Exploration*, Aras Publication, 2014.

MPSW 5063 Entrepreneurship

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the conceptual understanding of 'Entrepreneurship', 'Marketing' and 'Business Plan'.
- CLO2: Identify commercially viable ideas, projects, prototypes products & compelling Intellectual Property (IP) for commercialisation.
- CLO3: Develop a cohesive and robust business plan on a chosen topic.
- CLO4: Identify the constraints and interactions within the technological, business, global and social environments.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her business plan at the highest ethical standards.

Synopsis:

This course is designed for ambitious new competences, engineers and scientists in creating acquiring and existing business, or working in industries serving the entrepreneurs, or post-grads interested in acquiring and developing their talent as well as familiarising with the concepts, issues, and techniques of new venture creation. It addresses challenging issues on high technology venturing, intellectual property and intellectual property development, the installation of innovative organisation, the effective control of the

innovation, and the management of the supply chain. A key element of the Entrepreneurship program is the development of business plan by teams aiming to create new ventures. Topics include development of successful ideas, developing a profitable business models, writing a business plan, market opportunities for high-tech products enabled by technology, technology and innovation, intellectual property rights, inventions inventors and invention ownership, strategic control for new ventures and venture legal aspects.

References:

1. Bruce R. Barringer & R. Duanne Ireland, Entrepreneurship: The Successful Launch of New Ventures, 5th Edition, Prentice Hall, 2015.
2. Bygrave & Zacharakis, Entrepreneurship, John Wiley & Son, 2008.
3. Mary Coulter, Entrepreneurship in Action, 2nd Edition, Prentice Hall, 2003.
4. Kuratko & Hodgetts, Entrepreneurship, 3rd Edition, Dryden Press, 2004.

MMSD 5113 Native Mobile Development I

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the concept and fundamentals

of native mobile application and development.

CLO2: Built an application using Android native language.

CLO3: Integrate the application with existing API services available on the internet and device's hardware.

Synopsis:

This course will offer a comprehensive preliminary to native mobile application development using java. Topics that will be included in this course includes decentralized data storage plus centralizing data via web service call, multi-threaded programming in native as well as incorporating existing API service available on the internet such as Google API and Firebase API. In addition, students are exposed to integrate the application with available hardware available on devices such as sensors and GPS.

References:

1. Neil Smyth, Android Studio Electric Eel Essentials - Kotlin Edition: Developing Android Apps Using Android Studio 2022.1.1 and Kotlin, Payload Media, 2023.
2. Aleksei Sedunov, "Kotlin In-Depth: A Guide To A Multipurpose Programming Language for Server-Side, Front-End, Android, and Multiplatform Mobile (English Edition)", BPB Publications, 2022.
3. Greg Lim, Beginning Android Development

with Kotlin (2022-2023), Independently Published , 2021.

4. Duncan McGregor and Nat Pryce, Java To Kotlin: A Refactoring Guidebook, O'Reilly Media, 2021.

MMSD 5243 Internet of Things Applications Development

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Describe convergence of technologies and emerging applications of IoT.
- CLO2: Manipulate IoT products, platforms, and applications.
- CLO3: Propose smart IoT applications.

Synopsis:

This course will cover the concepts of the Internet of Things (IoT), its conceptual framework and how the IoT contributes to business and daily life. It will also cover the IoT architecture and gives an overview of the core technologies required for supporting IoT. It also provides knowledge on both the underlying technologies which support IoT and M2M communications, and engages the students in the creative development of simulation scenarios for innovative Internet of Things applications.

References:

1. Rajkumar Buyya & Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms 2016, Elsevier.
2. Arshdeep Bahga, Vijay Madiseti, "Internet of Things – A hands-on approach", Universities Press, 2015.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013.
4. Interconnecting Smart Objects with IP: The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kuffmann, 2010
5. Zakiah Ayop, Nurul Azma Zakaria, Internet Of Things : Real-World Application Of IoT Technology, 2022, Penerbit UTeM

MMSD 5123 User Experience Management and User Interface Design

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Integrate user behavior and cognitive processes to inform UI/UX design decisions
- CLO2: Propose engaging mobile app interfaces to create meaningful user experiences
- CLO3: Adhere to effective communication and collaboration skills for UI/UX design projects

Synopsis:

This course will equip students with the knowledge and skills to create compelling, user-friendly mobile app interfaces. Through theoretical concepts and hands-on practical exercises, students will learn to develop a deep understanding of user behaviour, design intuitive interfaces, and manage the overall user experience. Furthermore, students will be well-prepared to design user-centric mobile app interfaces that meet users' needs and expectations while creating engaging and meaningful experiences.

References:

1. Russ Unger and Carolyn Chandler (2023), A Project Guide to UX Design for User Experience Designers in the Field or in the Making, Pearson Education (ISBN: 9780138188061).
2. Dylan Christian (2022), UX Programming for Beginners - Your First Step Towards Creating the Best UI/UX Designs, Amazon Digital Services (ISBN: 9798848030174).
3. Allen Veronica (2021), "The New 2022 UI/UX for Beginners And Experts: UX/UI Design for Automatic Designers", Amazon Digital Services LLC - Kdp, (ISBN: 9798490026525).
4. Pamala B. Deacon (2020), "UX and UI Strategy: A Step-by-Step Guide on UX and UI Design", Independently Published (ISBN: 9798580234182).

MMSD 5233 Mobile Analytics

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Elaborate the fundamentals of mobile analytic.
- CLO2: Discuss the role of mobile analytics in improving software and app quality.
- CLO3: Demonstrate the application of mobile analytics tool in a sample mobile app case.

Synopsis:

This course introduces the students to analytics incorporated into a mobile app described as in-app analytics. It explains how mobile analytics complement mobile apps testing to help in improving software quality. Using current technologies and tools, students will apply mobile analytics on a sample mobile app to analyze how the app is being used and its performance for the end users. The course will also expose the students to the issues and challenges of mobile analytics as well as how the data collected can be analyzed using data mining for the purpose of descriptive, predictive and prescriptive analysis.

References:

1. Google (2024) Google Analytics, url-
<https://firebase.google.com/docs/analytics>
2. Delen D. (2020) Predictive Analytics: Data Mining, Machine Learning and Data Science

for Practitioners (Pearson Business Analytics Series).

3. Jeffrey D. Camm, James J. (2019). Business Analytics.
4. Harty, J., & Aymer, A. (2016). The Mobile Analytics Playbook: A practical guide to better testing
5. Beer, W (2016). Mobile App Analytics.

MMSD 5143 Mobile Application Testing

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Evaluate risks, as well as to implement a testing solution to assist minimize such risks.
- CLO2: Propose the quality characteristics for a mobile application and identify an appropriate testing approach to address those characteristics.
- CLO3: Prepare the test case, analyze the results, and report the findings effectively.

Synopsis:

This course gives exposure to the students about the mobile application testing concept and focus on process to develop and implement types of mobile testing such as hardware testing, software or application testing. Topics include how to plan and conduct mobile application testing, and how to report results from the testing. In this

course, students will be guide to use mobile application testing tools.

References:

1. Daniel Knott (2022), Hands-On Mobile App Testing - 2nd Edition, Independently published.
2. Dorothy Graham, Rex Black, Erik Van Veenendaal (2020), Foundations of Software Testing : ISTQB certification, BCS, Hampshire, United Kingdom : Cengage Learning EMEA
3. Parveen (2018), Beginner's Guide to Mobile App Testing - Kindle Edition.
4. Vijay Kumar Velu (2016), Mobile Application Penetration Testing, Packt Publishing Ltd.
5. Narayanan Palani (2014), Mobile Software Testing, BecomeShakespeare.com.

MMSD 5153 Mobile Back-end

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the emerging elements in mobile back-end development.
- CLO2: Construct program for back-end application.
- CLO3: Propose a a mobile back-end application by using appropriate tools.

Synopsis:

This course introduces the practices and tools of the mobile back-end development. It covers creating an API for mobile, server to server connection, cloud technology, mobile app back-end services, performance and security. Using current technologies and tools, students will create a basic mobile back-end application. As a whole, the course will expose students to state-of-the-art, tools and techniques to develop mobile back-end application.

References:

1. Amundsen, M. (2022). Restful Web Api Patterns & Practices Cookbook: Connecting and Orchestrating Microservices and Distributed Data. O'reilly Media.
2. Parri, P., Building Node.js REST API with TDD approach : 10 steps complete guide for Node.js, Express.js & MongoDB RESTful service with test-driven development, Independently Published, 2018.
3. Wilkins, M., Learning Amazon Web Services (AWS): a hands-on guide to the fundamentals of AWS cloud, Addison-Wesley, 2020.
4. Brendan, B., Designing Distributed Systems: Patterns and Paradigms for Scalable, Reliable Services, O'reilly, 2018.
5. Kanikathottu, H., Serverless Programming Cookbook, Packt Publishing, 2019.

MSMD 5213 Agile Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the concept of agile project management for any IT projects.
- CLO2: Present on the principles and practices of agile project management in the IT projects.
- CLO3: Demonstrate the standard guideline to produce a project vision and the product roadmap in a collaborative team environment for the purpose of IT project completion.

Synopsis:

This subject introduces the basic concept of agile project management to the student. It covers the agile project management process which includes agile tools and techniques for today knowledge-based projects. A knowledge-based project requires the project manager to manage, optimize and facilitate knowledge as a resource throughout the duration. This subject also covers support areas such as risk management. This subject exposes the student to the transition of a traditional project management into an agile project management.

References:

1. Taylor, T. 2023, Agile Project Management for Beginners 2023, independently published.

2. Stern, T.V. 2020, Lean and Agile Project Management: How to Make Any Project Better, Faster, and More Cost Effective 2e, Taylor & Francis.
3. Edge, J. 2020, Agile: An Essential Guide to Agile Project Management the Kanban Process and Lean Thinking + A Comprehensive Guide to Scrum, Moliva Ab.
4. Wright, J. 2020, Project Management 6 Books in 1: The Complete Guide to Agile Project Management Lean Analytics Scrum Kanban Kaizen and Six Sigma, Josh Wright.
5. Smith, L. 2019, Agile Software Development with C#, Scrum, eXtreme Programming, and Kanban 2e, independently published.

MMSD 5163 Mobile Application Architecture

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Describe the basics, features and requirements of mobile application architecture.
- CLO2: Propose an architecture of mobile application according to best practices and standards.
- CLO3: Compare and defend the architecture design based on case scenarios.

Synopsis:

This course covers a wide range of topics related to mobile application architecture including design principles, architecture patterns, security architecture and architecture processes as well as the best practices and mobile trends. It is designed to provide a comprehensive understanding of mobile application architecture basics, features and requirements include its implementation in different platforms and scenarios in order to build fully structured mobile application based on vendor-specific, industry standards and procedures.

References:

1. Cybellium (2023), "Mastering Enterprise Security Architecture", Cybellium Ltd. (ISBN: 9798859063956)
2. Eric Vennaro (2023), "IOS Development at Scale: App Architecture and Design Patterns for Mobile Engineers", Apress (ISBN: 9781484294550)
3. Petros Efthymiou (2022), Clean Mobile Architecture, Amazon (ISBN: 9786188600706)
4. Mark Richards, Neal Ford (2020), Fundamentals of Software Architecture: An Engineering Approach, O'Reilly Media (ISBN: 9781492043409)
5. Valentino Lee, Heather Schneider, Robbie Schell (2004), "Mobile Application: Architecture, Design and Development", Prentice Hall (ISBN: 9780131172630)

MMSD 5223 Native Mobile Development II

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Describe the process of creating iOS apps and programming best practices.
- CLO2: Construct a mobile application code using iOS programming.
- CLO3: Integrate iOS API features and examine app functionality into properly designed components.

Synopsis:

This course will provide the knowledge of iOS development concepts as well as iOS programming (i.e. Swift) and the Apple toolset through the creation of iOS native applications as reflected in the design of iOS platform (i.e. iPhone, iPad, iTunes), the Model-View-Controller (MVC) paradigm and various high and low-level iOS's frameworks. It also provides basic concepts about designing intuitive and usable interfaces. The course includes live demos and extensive individual lab work.

References:

1. Apple Education, Develop With Swift, Fundamentals (Xcode 13 Edition), Apple Inc., 2021.
2. Apple Education, Develop With Swift, Data Collections (Xcode 13 Edition), Apple Inc., 2021.

3. Raywenderlich Tutorial Team, Rene Cacheaux & Josh Berlin, Advanced iOS App Architecture (First Edition): Real-world app architecture in Swift, Razeware LLC, 2019.
4. Etash Kalra, From Zero to iOS Hero: Swift Development for Kids and Teens, Independently Published, 2019
5. Wallace Wang, 2019 Pro iPhone Development with Swift 5: Design and Manage Top Quality Apps, Apress, 2019.
6. Christian Keur and Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 7th Edition, Big Nerd Ranch Guides, 2019.
7. Darryl Bartlett, Swift Programming in easy steps: Develop iOS apps - covers iOS 12 and Swift 5, In Easy Steps Limited, 2019.

MMSD 5133 Mobile Application Security and Privacy

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the concept of security and privacy for mobile application development.
- CLO2: Practice coherent design strategies for secured mobile applications.
- CLO3: Propose safeguarding mobile solutions

Synopsis:

This course will provide an understanding of security and privacy requirements before building a secure mobile application. It also provides the knowledge to understand the mobile application security and privacy risks especially on mobile device and ways to protect it. Further, the subjects provide the skill to the students to be able to design and develop a safeguarding mobile application application.

References:

1. Guide To Assessment Of Security For Mobile Application Kindle Edition 2021, David Du
2. Security Vulnerabilities In Mobile Operating Systems A Complete Guide - 2020 Edition, Gerardus Blokdyk, Kindle Edition.
3. Handbook of Research on Emerging Developments in Data Privacy, 2019.

MMSD 5314 Project I

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the problems, objectives and scope based on current trends of technologies.
- CLO2: Perform comprehensive literature review and appropriate procedures to complete the project.

CLO3: Explain the suitable key answers to clarify the contribution in application domain.

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of current technologies learnt previously. Besides writing the proposal, student is required to write four chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review, Chapter 3: Research Methodology and Chapter 4: Analysis & Design. In addition, student must accomplish the project design and justify the proposed solution during presentation.

References:

1. Project Guidelines for Master by Taught Course Version 2022, FTMK, UTeM.
2. Nathan R. Durdella, Qualitative Dissertation Methodology: A Guide for Research Design and Methods, 1st Edition, SAGE Publications, 2018.
3. Kirill Dubovikov, Managing Data Science: Effective strategies to manage data science projects and build a sustainable team, Packt Publishing; 1st Edition, 2019.

MMSD 5326 Project II

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Demonstrate the solutions with significance contribution to the application domain.

CLO2: Verify the proposed solutions to understand the strengths, weaknesses and limitations of the study.

CLO3: Defend the proposed solution by articulating the series of processes to achieve the end results of the domain business requirements.

CLO4: Justify the solution and relevant contributions of the application domain.

Synopsis:

This course is the second part of project that show the ability of student in applying the theories and techniques of knowledge and technologies learnt previously. Student must write the second fold of dissertation which consists of three chapters of dissertation i.e. Chapter 5: Implementation, Chapter 6: Evaluation and Chapter 7: Conclusion & Future Works. These chapters must align with the proposed solutions developed as the end product of this project. Student is required to justify the contribution of the proposed solutions throughout the presentation and demonstration sessions.

References:

1. Project Guidelines for Master by Taught Course Version 2022, FTMK, UTeM.
2. Taylor, T. 2023, Agile Project Management for Beginners 2023, independently published.
3. Stern, T.V. 2020, Lean and Agile Project Management: How to Make Any Project Better, Faster, and More Cost Effective 2e, Taylor & Francis.
4. Edge, J. 2020, Agile: An Essential Guide to Agile Project Management the Kanban Process and Lean Thinking + A Comprehensive Guide to Scrum, Moliva Ab.
5. Kirill Dubovikov (2019), Managing Data Science: Effective strategies to manage data science projects and build a sustainable team, Packt Publishing; 1st Edition (November 12, 2019)





MASTER IN SOFTWARE ENGINEERING

Programme Details

The Master of Software Engineering, for short MSWE, is specifically designed to equip students with knowledge and technical skills on software engineering and software engineering management that can meet industry needs.

Programme Educational Objectives (PEO)

Programme Educational Objectives (PEO) are specific goals describing the expected achievement of graduates in their career and professional life after 5 years of graduation.

Below are the PEO for this programme:

- PEO 1:** Computing specialists who have in-depth knowledge and can apply enhanced technical, digital, and numeracy skills with specializations to provide innovative solutions in software engineering.
- PEO 2:** Computing specialists who have leadership, interpersonal, and communication skills to interact with a wide variety of audiences effectively.
- PEO 3:** Computing specialists who engage and advocate lifelong learning activities using scientific methods and have an entrepreneurial mindset.
- PEO 4:** Computing specialists who uphold professional practices ethically and with integrity.

Programme Outcomes (PO)

Programme Outcomes (PO) are statements describing what students are expected to know and be able to perform or attain by the time of graduation. These are related to the Knowledge (K), Skills (S), and Attitude (A) that students acquire throughout the programme.

Below is the list of PO for this programme:

- PO 1:** Integrate advanced knowledge through critical analysis, synthesis, and evaluation to promote computing solutions.
- PO 2:** Recommend innovative solutions that are at the forefront of developments to manage and resolve complex problems or issues in the field of software engineering.
- PO 3:** Construct computing solutions and tools using standardized and specialized research approaches emphasizing functionality, efficiency, and effectiveness.
- PO 4:** Demonstrate effective interaction within a group or with a wide variety of audiences using appropriate methods in discourses related to the field of software engineering.
- PO 5:** Display effective communication within a group and with a wide variety of audiences using appropriate methods in the field of software engineering.
- PO 6:** Practice a wide range of suitable digital technologies to design and plan evaluation activities in computing solutions.
- PO 7:** Apply numerical skills to acquire, interpret, and extend knowledge in computing.
- PO 8:** Demonstrate significant autonomy, independence, responsibility, and leadership skills in providing services related to the field of software engineering.
- PO 9:** Display capabilities of self-advancement through continuous academic and professional development to expand relevant knowledge.
- PO 10:** Display elements of an entrepreneurial mindset effectively to the relevant field.
- PO 11:** Practice professional and ethical codes in conducting research and delivering services related to the relevant fields.

Programme Structure - Full Time

October Intake:

Semester 1 (October)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MSWE 5113	Requirements Engineering	3
MSWE 5123	Software Design	3
MSWE 5163	Secure Software Development	3
MXXX XXXX	Elective 1	3
Total credit		15
Semester 2 (March)		
Course Code	Course	Credit
MSWE 5133	Software Construction	3
MSWE 5143	Software Testing	3
MSWE 5153	Advanced Software Project Management	3
MSWE 5314	Project 1	4
MXXX XXXX	Elective 2	3
MXXX XXXX	Elective 3	3
Total credit		19
Semester 3 (Short Semester)		
Course Code	Course	Credit
MSWE 5326	Project 2	6
Total credit		6

March Intake:

Semester 2 (March)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MSWE 5113	Requirements Engineering	3
MSWE 5123	Software Design	3
MSWE 5153	Advanced Software Project Management	3
MXXX XXXX	Elective 1	3
MXXX XXXX	Elective 2	3
Total credit		18
Semester 3 (Short Semester)		
Course Code	Course	Credit
MSWE 5314	Project 1	4
Total credit		4
Semester 1 (October)		
Course Code	Course	Credit
MSWE 5133	Software Construction	3
MSWE 5143	Software Testing	3
MSWE 5163	Secure Software Development	3
MSWE 5326	Project 2	6
MXXX XXXX	Elective 3	3
Total credit		18

Elective courses - choose THREE (3) only:

Course Code	Course	Credit
MSWE 5223	Software Quality	3
MSWE 5213	Software Development Sustainability	3
MSWE 5233	Software Measurement	3
MMSD 5243	Internet of Things Applications Development	3
MSWE 5243	Software Development Governance	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3
MPSW 5053	Quality System Management	3
MPSW 5033	Engineering & Technology Management	3

Note: Total credit hours = 40 credits

Programme Structure - Part Time

October Intake:

Semester 1 (October)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MSWE 5113	Requirements Engineering	3
MSWE 5123	Software Design	3
Total credit		9
Semester 2 (March)		
Course Code	Course	Credit
MSWE 5153	Advanced Software Project Management	3
MSWE 5133	Software Construction	3
MSWE 5143	Software Testing	3
Total credit		9
Semester 3 (October)		
Course Code	Course	Credit
MSWE 5163	Secure Software Development	3
MSWE 5314	Project 1	4
MXXX XXXX	Elective 1	3
Total credit		10
Semester 4 (March)		
Course Code	Course	Credit
MSWE 5326	Project 2	6
MXXX XXXX	Elective 2	3
MXXX XXXX	Elective 3	3
Total credit		12

March Intake:

Semester 2 (March)		
Course Code	Course	Credit
MSWE 5153	Advanced Software Project Management	3
MSWE 5113	Requirements Engineering	3
MSWE 5123	Software Design	3
Total credit		9
Semester 1 (October)		
Course Code	Course	Credit
MPSW 5013	Research Methodology	3
MSWE 5133	Software Construction	3
MSWE 5143	Software Testing	3
Total credit		9
Semester 2 (March)		
Course Code	Course	Credit
MSWE 5314	Project 1	4
MXXX XXXX	Elective 1	3
MXXX XXXX	Elective 2	3
Total credit		10
Semester 1 (October)		
Course Code	Course	Credit
MSWE 5163	Secure Software Development	3
MSWE 5326	Project 2	6
MXXX XXXX	Elective 3	3
Total credit		12

Elective courses - choose THREE (3) only:

Course Code	Course	Credit
MSWE 5223	Software Quality	3
MSWE 5213	Software Development Sustainability	3
MSWE 5233	Software Measurement	3
MMSD 5243	Internet of Things Applications Development	3
MSWE 5243	Software Development Governance	3
MPSW 5063	Entrepreneurship	3
MPSW 5073	Project Management	3
MPSW 5053	Quality System Management	3
MPSW 5033	Engineering & Technology Management	3

Note: Total credit hours = 40 credits

COURSE DETAILS

MPSW 5013 Research Methodology

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Apply ethical research skills in constructing research questions, objectives and hypothesis (if any) relevant to the research problem.
- CLO2: Synthesize relevant literature to address the knowledge gaps.
- CLO3: Develop research proposal with an improvement of existing knowledge.

Synopsis:

The primary goal of this course is to provide students with the necessary knowledge and skills in preparing for their Master dissertation. In this course, students will be exposed to the important concepts of conducting scientific research and managing ethical research. The course is designed to introduce students to the principles and good practices of conducting research. Activities at each step of the research process will be elaborated in order to develop the skills and competencies required to facilitate a successful research project at postgraduate level. At the end of the course, students are expected to submit a research proposal relevant to their field of

study.

References:

1. Kumar, R., Research methodology: A step-by-step guide for beginners. Sage Publications Limited, 2019.
2. Gray, D. E., Doing research in the business world. Sage Publications Limited, 2019.
3. Creswell, J. W., & Creswell, J. D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches. In Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 2018.
4. Tang, H., Engineering Research: Design, Methods, and Publication. John Wiley & Sons, 2020.
5. Sidek, S., Kamalrudin, M. & Mat Deris, M., Research Survival Toolkit: Writing a winning fundamental research proposal, Melaka: University Publisher, UTeM, 2017.
6. Zobel, J., 3rd Edition, Writing for Computer Science, Springer-Verlag London, 2014.
7. Arkoudas, K., Musser, D., Fundamental Proof Methods in Computer Science: A Computer-Based Approach, MIT Press, 2017.
8. Creswell, J. W., & Poth, C. N., Qualitative inquiry and research design: Choosing among five approaches. Sage publications, 2016.

MPSW 5063 Entrepreneurship

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyse entrepreneurial skills in identifying and exploiting entrepreneurial opportunities.
- CLO2: Apply commercially viable ideas, projects, products prototypes for commercialization within the context of societal framework and to deliver business model canvassing and business value proposition.
- CLO3: Develop creative and viable high tech business models and strategies.

Synopsis:

The objectives of this course are to provide students a robust foundation in theories relevant to the improvement of entrepreneurial behaviour and capabilities in the context of technology ventures and to stimulate them to think and behave like an entrepreneur. First, the course covers fundamental issues such as the influence of risk and uncertainty, the role of technology in entrepreneurship, opportunity recognition, business model creation, life cycle and key stages of the entrepreneurial business and the development of an operational and financial foundation of a technology venture. Second, the course provides students with actionable knowledge by familiarising them with the areas of entrepreneurial expertise necessary in order to found and/or grow a technology venture.

References:

1. Duening, Thomas N., Robert A. Hisrich, and Michael A. Lechter. *Technology Entrepreneurship: Taking Innovation to the Marketplace*. Academic Press, 2020.
2. Sergi, B. S., & Scanlon, C. C. (Eds.), *Entrepreneurship and Development in the 21st Century*. Emerald Publishing Limited, 2019.
3. Bianchi, C., Glavas, C., & Mathews, S., *SME international performance in Latin America: The role of entrepreneurial and technological capabilities*. *Journal of Small Business and Enterprise Development*, 24(1), 176–195, 2017.
4. Patric Van Der Pijl, Justin Lokitz, Lisa Kay Solomon, *Design a Better Business: New Tools, Skills, and Mindset for Strategy and Innovation*. Wiley, 2016.
5. Baldock, R., North, D., & Ullah, F., *New Technology-Based Firms in the New Millennium*. *New Technology Based Firms in the New Millennium*, 11, 203–226, 2015.
6. Alexander Osterwalder & Yves Pigneur, *Value Proposition Design: How to Create Products and Services Customers Want*. Wiley, 2015.
7. Alexander Osterwalder & Yves Pigneur, *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*, Wiley, 2010.

MPSW 5073 Project Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Analyze the core concepts and principles, functions, and process in project management.
- CLO2: Develop a comprehensive & viable project proposal.
- CLO3: Evaluate best practices and methodology in project management.

Synopsis:

This subject focuses on the principles of project management based on Project Management Body of Knowledge (PMBOK). Students will be familiarized with the Project Management process group functions (initiating, planning, executing, controlling and closing) and project knowledge areas (integration, scope, time, cost, quality and human resources). Various tools for supporting the analysis of works in project management will be introduced. Topics including initiating and planning the project, working with the management, project appraisal & sensitivity, work breakdown structure, managing uncertainty, building project plan, implementing and revising project plan, completing the project and contract laws. Microsoft Project (MS Project) will be introduced as project management software tools.

References:

1. Project Management Institute, A Guide to the Project Management Body of Knowledge

(PMBOK® Guide) – Fifth Edition, 2018.

2. Project Management Institute, A Guide to the Project management Body of Knowledge (PMBOK® Guide) – Sixth Edition, 2017.
3. Clifford F. Gray · Erik W. Larson, Project Management the Managerial Process, McGraw Hill, 2021.
4. Meredith, J., Mantel, S. and Mantel, S. Jr., Project Management: A Strategic Managerial Approach. New York, Wiley, 2017.
5. Trevor L Young, Successful Project Management, Kogan Page Publishers, 2016.

MPSW 5033 Engineering Technology Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Identify the principles of engineering management and technology management across different industries.
- CLO2: Apply relevant issues in engineering management and technology management across different industries.
- CLO3: Analysis the impact of relevant issues in the context of engineering management and technology management across different industries.

Synopsis:

The course consists of two components, i.e., Engineering Management and Technology Management. Topics in Engineering Management provide a vehicle for engineers and technical specialist to enhance their knowledge on management, organizational structure and behavior of engineering/technical organizations. Additional topics will enhance the knowledge and competencies in the management of engineering activities such as design, operations, and quality. The Technology Management part of the course will equip students with contemporary views and tools on management of technology and its impact on an organization. It emphasizes management of innovation and new product development as well as managing technology and knowledge. The interaction of technology and the law, particularly the knowledge management and intellectual property will be covered.

References:

1. Paul Trott, Innovation Management and New Product Development (6th Edition) 6th Edition, Pearson; 6 editions, 2016.
2. A. Thomas Roper, Thomas W. Mason, Frederick A. Rossini, Forecasting and Management of Technology, Alan L. Porter, Scott W. Cunningham, Jerry Banks, John Wiley & Sons, 2011.
3. William J Stevenson, Operations Management 13th Edition, McGraw-Hill Education, 2017.
4. by Jim Hall, Tina Scott, Lean Six Sigma: Beginner's Guide to Understanding and Practicing Lean Six Sigma CreateSpace Independent Publishing Platform, 2016.
5. Sharon Armstrong, Barbara Mitchell Weiser, The Essential HR Handbook, 10th Edition: A Quick and Handy Resource for Any Manager or HR Professional , 2019.

MPSW 5053 Quality Systems Management

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain the conceptual understanding of Quality.
- CLO2: Identify Quality System Management information.
- CLO3: Propose Quality System Management techniques and tools in the practice of organizations.

Synopsis:

This course presents the fundamental elements of Quality Management System including the importance of quality as a strategy for continuous improvement in business performance. It explains the strategies for competitive quality in design and manufacture as well as in terms of customer supply chain concept of total quality aspect. Such topics include Management systems ISO, variability, Six Sigma, Taguchi method,

failure mode and effect analysis (FMEA) and quality function deployment. Several quality control tools such as Pareto chart, bar chart and scatter diagram will be cover in statistical data collection, measurement and analysis. Finally, concepts of benchmarking and ISO standards with respect to control elements will be integrated with the Total Quality Management (TQM) as part of quality Management system.

References:

1. S. Thomas Foster, Managing Quality: Integrating the Supply Chain, 6th Edition, Pearson, 2017.
2. Howard S. Gitlow, Richard J. Melnyck and David M. Levine, Guide to Six Sigma and Process Improvement for Practitioners and Students, A: Foundations, DMAIC, Tools, Cases, and Certification, 2nd Edition, 2015.
3. Gitlow, H. S., Quality Management systems: A Practical Guide, St. Lucie Press, 2001.
4. Mukherjee, P. N., Total Quality Management, Prentice Hall, 2006.
5. Manual Procedure for Malaysia Halal Certification, 3rd Revision, Jabatan Kemajuan Islam Malaysia, 2015.

MITU 5213 Project 1

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Formulate the problems, objectives and scope based on complex technology solutions.

CLO2: Perform literature review and appropriate methodology to complete the project.

CLO3: Defend the proposed project solutions in written and verbal forms.

Synopsis:

This course is the first part of project that requires a student to prepare a master research proposal based on the theories and techniques of technologies learnt previously. Student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. Besides writing the proposal, student needs to present and defend his/her proposal. Student is expected to demonstrate ability to identify and propose solutions to the identified problems.

References:

1. Thesis Writing and Guidelines, <http://www.utem.edu.my/pps/>.
2. Cresswell, J. W., and Creswell, J.D., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 5th Edition, California: SAGE Publications, Incorporated, 2020.

MITU 5226 Project 2

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Demonstrate the solutions with significance contribution to the software domain.
- CLO2: Defend the project solutions in written and verbal forms.
- CLO3: Demonstrate the ability to resolve issues or challenges within their field of study, taking into account potential risks and presenting rational justifications for their proposed solution.
- CLO4: Demonstrate adherence to ethical and professional codes of practice in developing software solutions and relevant contributions in software domain.

Synopsis:

This course is the second part of project that show the ability of student in applying the theories and techniques of technologies learnt previously. Student must write the second fold of dissertation which consists of four chapters of dissertation i.e. Chapter 4: Analysis & Design, Chapter 5: Implementation, Chapter 6: Evaluation and Chapter 7: Conclusion & Future Works. These chapters must align with the proposed solution developed as the end product of this project. Student is required to justify the contribution of the proposed solution throughout the presentation sessions.

References:

1. Project Guidelines for Master by Taught Course Version 2019, FTMK, UTeM.
2. Rubin, K.S., 2012, Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley Profesional
3. O'Brien, H. , 2016, Agile : Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management, 3rd Edition, Addison-Wesley.
4. Cresswell, J. W., 2014. Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, California: SAGE Publications, Incorporated.
5. Kirill Dubovikov (2019), Managing Data Science: Effective strategies to manage data science projects and build a sustainable team, Packt Publishing; 1st Edition (November 12, 2019).

MSWE 5123 Software Design

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Determine a suitable software design practical concepts, phases and patterns in software development practice.
- CLO2: Prepare a relevant software design document based on system design, engaging in project discussions and demon-

strating effective interaction with diverse audiences.

CLO3: Explain the software design phases, activities and patterns, demonstrating management skills and responsibility in software design projects.

Synopsis:

This course discusses the fundamentals of software design and different practical concepts used for designing software. Several design phases and activities are also covered including the software architecture, detailed design and construction design. The creational, structural and behavioral design patterns are also covered as part of top down approach. Students will also be exposed to the software design document and other forms of important documentation during the design of software systems.

References:

1. Chenglie Hu, (2023), "An Introduction to Software Design Concepts, Principles, Methodologies, and Techniques", Springer.
2. Martin P. Robillard, (2019), "Introduction to Software Design with Java", Springer.
3. Carlos E. Otero, (2012), "Software Engineering Design Theory and Practice", CRC Press Taylor & Francis Group.
4. Alan Shalloway and James R Trott, (2010), "Design Patterns Explained A New Perspective on Object-Oriented Design 2nd Edition", Addison-Wesley.
5. Eric Braude (2004), "Software Design From Programming to Architecture", John Wiley & Sons, Inc.

MSWE 5133 Software Construction

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Assess the software construction techniques for a software development project.
- CLO2: Demonstrating the ability to produce high-quality software through skillful execution in diverse software development environments.
- CLO3: Implement improvements in the maintainability of software construction to produce high-quality software and sustainable software.

Synopsis:

The Software Construction course provides a comprehensive understanding of essential principles, techniques, and best practices for building high-quality software. It covers fundamental concepts, including design in software construction, class and routine design, and modern construction practices such as modularization and agile methodologies. Core programming topics like variables, data types, control statements, and rare control structures strengthen coding

proficiency. The course also emphasizes managing code quality and collaborative construction, focusing on version control, code reviews, and teamwork. Students will explore evaluating software construction through debugging, testing, and refactoring, alongside strategies for improving code performance and code-tuning techniques for optimization. Finally, managing software construction provides insights into handling large-scale projects efficiently. By the end of the course, students will have the practical skills needed to write efficient, maintainable, and high-quality software, preparing them for industry challenges in modern software development.

References:

1. S. Rylander, Patterns of Software Construction. Apress Berkeley, CA, 2022.
2. S. McConnell, Code Complete - A Practical Handbook of Software Construction, Second Edition. Microsoft Press, 2004.

MSWE 5153 Advanced Software Project Management

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Analyse various methodologies to improve success of a software project.

CLO2: Illustrate software project management activities in a practical way by analyzing case studies.

CLO3: Demonstrate entrepreneurial skills by develop and presenting a software project plan for an identified problem in a selected organization.

Synopsis:

This course involves managing a project from inception to completion and the successful attainment of the project's objectives. The course provides the opportunity to gain the understanding, knowledge and skills necessary for performing the role of project manager in leading a cross-functional team in a certain project. It also exposes students to analyse project methodologies in managing and monitoring people, budget and schedule as well as to manage risks that might occur in a software project.

References:

1. Project Management Institute, A Guide To The Project Management Body Of Knowledge (PMBOK® Guide) 7th Edition, 2021.
2. Anna P. Murray, The Complete Software Project Manager, Wiley. Mastering Technology from Planning to Launch and Beyond, Wiley, ISBN: 978-1119161837, 2016.
3. Jack T. Marchewka, Information Technology Project Management, 4th Edition, Wiley, 2013.

4. Harold R. Kerner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 11th Edition, Wiley, 2012.
5. Salnikov, D., Project management in software development, Our Knowledge Publishing, 2021.

MSWE 5243 Software Development Governance

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Distinguish various software development governance approaches to improve the success of a software development governance.
- CLO2: Adopt various strategic governance and management approaches for controlling development activities towards software development practices.
- CLO3: Evaluate the best-practices for monitoring ethical approaches of multi cross-functional teams in a software development governance.

Synopsis:

This course introduces the principles, frameworks, and practices of software governance, focusing on ensuring that software development and management activities align with an or-

ganization's strategic goals, regulatory requirements, and best practices. It combines key ideas from organisational behaviour, psychology, sociology, and human resource management in order to provide students with a basic understanding, recognising and adopting human dynamics in organisations; including ways of conceptualising organisations and how people behave within them. Students shall further consider the impact of the external environment on organisations, and finally address the needs of organisational change.

References:

1. Governance Software A Complete Guide (2020), Gerardus Blokdyk, ISBN-13: 9780655970569, Publisher: Emereo Publishing
2. Keri E. Pearlson, Carol S. Saunders, Dennis F. Galletta, 2019. Managing and Using Information Systems: A Strategic Approach, 7th Edition, Wiley.
3. Caroline Howard , Kathleen Hargiss, 2017. Strategic Information Systems and Technologies in Modern Organizations, 1st Edition, IGI Global.
4. Bob Hughes and Mike Cotterell (2017), Software Project Management, McGraw-Hill.
5. Joel Henry (2004), Software Project Management: A real-world guide to success, Pearson. Mark Richard, Fundamental of Software Architecture: An Engineering Approach,. 1st Edition. O'Reilly, 2018.

MSWE5113 Requirements Engineering

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Describe the concept of requirements engineering process in software development practice.
- CLO2: Discriminate the best techniques to improve problem understanding, requirements elicitation, analysis, specification and validation.
- CLO3: Prepare quality software requirements specifications ethically and professionally through requirements engineering best practices.

Synopsis:

This course explores the development of requirements, providing a deeper understanding of requirements engineering process. Requirements are a critical factor in the success or failure of software engineering projects. A large proportion of errors detected in released software can be traced back to faulty requirements or a poor understanding of the problem domain. This course will examine the role and impact of requirements on software projects and the techniques and tools for improving problem understanding, requirements analysis and requirements specification.

References:

1. Laplante, Philip. A., Requirements Engineering for Software and Systems, 4th Edition, CRC Press, 2022.
2. James A. Crowder, Curtis W. Hoff, Requirements Engineering: Laying a Firm Foundation, Springer International Publishing, 2022.
3. Bron, Jean-Yves, System Requirements Engineering: A SysML Supported Requirements Engineering Method. First Edition. Wiley-ISTE, 2020.
4. Dick, J., Hull, E., Jackson, K., Requirements Engineering. Springer, 2017
5. Pohl, K., Rupp, C., Requirements Engineering Fundamentals: A Study Guide for the Certified Professional for Requirements Engineering Exam Foundation Level, 2nd Edition, Rocky Nook, 2015.

MSWE 5143 Software Testing

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Recommend a suitable software testing level, types and techniques in software development.
- CLO2: Construct software testing activities and applying numerical skills to software projects.
- CLO3: Demonstrate interpersonal skill in management of testing activities to assure

software quality using appropriate testing techniques and tools.

Synopsis:

This course discusses software faults and techniques to reduce defects and improve software quality. Software systems are some of the most complex human artefacts ever built and some of the most critical means to ensure our safety, wellbeing, and prosperity. This course covers techniques to ensure software systems perform their function correctly. The course will discuss how tests can be derived from requirements and specifications, design artefacts, or the source code, and introduce proper testing tools used in several exercises.

References:

1. Roman, A., A Study Guide to the ISTQB@ Foundation Level 2018 Syllabus-Test Techniques and Sample Mock Exams, Springer, 2018.
2. Galin, D., Software Quality: Concepts and Practice: Concepts and Practice, First Edition, Wiley, 2018.
3. Klaus O., Tauhida P., Rex B., et al., ISTQB Certified Tester Foundation Level Syllabus Version 2018, International Software Testing Qualification Board, 2018.

MSWE 5223 Software Quality

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Explain software quality assurance, standards, metrics and measurements.
- CLO2: Demonstrate personal responsibility and adaptability in exploring current issues related to software quality topics.
- CLO3: Apply appropriate measurement techniques and metrics to analyse and evaluate software quality within a structured assurance plan.

Synopsis:

The course discuss on quality term as a multifaced concept which can be described from many perspectives. It then applies this understanding of quality to the realm of software, where ensuring software quality is a critical aspect of development. Therefore an organization requires planned quality assurance to ensure quality embedded into the software. Software metrics are tools of measurement attributes of a system, component or process possess a given attribute are essential in software engineering. The use of process standards in the entire software development and product standards are also integral part of assuring quality.

References:

1. Claude Y. Laporte Alain April, "Software Qual-

ity Assurance, 1st edition, IEEE Computer Society, IEEE Press, 2018.

2. Tarlinder, A., "Developer Testing: Building Quality into Software, 1st edition, Addison-Wesley Signature Series, 2016.
3. Munta, J. B., "Software Quality and Java Automation Engineer Survival Guide: Basic Concepts, Self Review, Interview Preparation, Everydayon Inc, 2016.
4. Lin, T., "Testing in Scrum: A guide for Software Quality Assurance in the Agile World, 1st edition, Rock Nook Computing, 2014.
5. Jones, C., "The Economics of Software Quality, 1st Edition, Addison-Wesley Professional, 2011.
6. Tian, J., "Software Quality Engineering: Testing, quality assurance, and Quantifiable Improvement, John Wiley & Sons Inc. Publication, 2005.
7. Cloudt, G., What is Software Quality?: Understanding what really matters in software development, Independently Published, 2021.

MSWE 5163 Secure Software Development

Learning Outcomes:

At the end of the course, students should be able to:

CLO1: Evaluate suitable secure software development models, methodologies and

techniques to be used in the software development lifecycle.

CLO2: Assess secure software development activities for software projects using quantitative analysis.

CLO3: Propose appropriate techniques or tools to develop secure software systems, incorporating life-long learning skills.

Synopsis:

This course discusses software faults and techniques to reduce defects and improve software quality. Software systems are some of the most complex human artefacts ever built and some of the most critical means to ensure our safety, wellbeing, and prosperity. This course covers techniques to ensure software systems perform their function correctly. The course will discuss how tests can be derived from requirements and specifications, design artefacts, or the source code, and introduce proper testing tools used in several exercises.

References:

1. Mano Paul, Official (ISC)2 Guide to the CSSLP, CRC Press/Taylor & Francis Group, 2015.
2. Wm. Arthur Conklin and Daniel Shoemaker. CSSLP Certified Secure Software Lifecycle Professional All-in-One Exam Guide, Third Edition. McGraw Hill, 2022.
3. Loren Kohnfelder, (2021). Designing Secure Software: A Guide for Developers. No Starch Press, 2021.

4. Blokdyk, G., Secure Software Development A Complete Guide - 2020 Edition, 5starcooks, 2019.

MSWE 5213 Software Development Sustainability

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Construct a comprehensive strategy using the available approaches in software sustainment solutions.
- CLO2: Explain principles and practices of sustainable software engineering, demonstrating proficiency in digital problem-solving, and the use of tools in a sustainable environment.
- CLO3: Demonstrate professional, and sustainable practices in managing activities in software engineering, applying critical thinking, and effective communication in completing tasks.

Synopsis:

This course is centered on the design of software with a focus on enhancing application efficiency and minimizing the requirements for energy and space consumption. The objective is to reduce the long-term environmental footprint of software infrastructure. The course content will

delve into the principles and practices of sustainable software engineering, equipping you with the skills to create software solutions that are both efficient and environmentally friendly.

References:

1. Building Green Software: A Sustainable Approach to Software Development and Operations (2024), Anne Currie, Sarah Hsu, Sara Bergman, O'Reilly Media.
2. Green Software Engineering: Navigate green technology for sustainable IT solutions (2024), Santiago Fontanarrosa, Packt Publishing.
3. Developing Sustainable and Energy-Efficient Software Systems (2023), Artem Kruglov, Giancarlo Succi, Springer.

MMSD 5243 Internet of Things Applications Development

Learning Outcomes:

At the end of the course, students should be able to:

- CLO1: Discover convergence of technologies and emerging applications of IoT.
- CLO2: Evaluate of IoT products, platforms, and applications.
- CLO3: Design and develop smart IoT applications.

Synopsis:

The student will learn to develop Internet of Things (IoT) applications for various purposes on the latest cloud and mobile phone platforms. The Internet of Things allows billions of devices, sensors, cloud infrastructure and business intelligence tools to come together to enable people to make informed decisions. This helps businesses to drive more innovation and services. Graduates from this course would be in high demand as they would have acquired the right skills to develop smart applications and services to respond to industry's needs. This course covers the concepts of the Internet of Things (IoT), its conceptual framework and how the IoT contributes to business and daily life. It will also cover the IoT architecture and gives an overview of the core technologies required for supporting IoT. It also provides knowledge on both the underlying technologies which support IoT and M2M communications, and engages the students in the creative development of simulation scenarios for innovative Internet of Things applications.

References:

1. Anand Tamboli, Build Your Own IoT Platform: Develop a Fully Flexible and Scalable Internet of Things Platform in 24 Hours, APress, 2019.
2. Simone Cirani, Gianluigi Ferrari, Marco Picone & Luca Veltri, Internet of Things: Architectures, Protocols and Standards, 1st Edition, Wiley, 2018.
3. Giacomo Veneri & Antonio Capasso, Hands-On Industrial Internet of Things: Create a powerful Industrial IoT infrastructure using Industry 4.0, Packt Publishing, 2018.
4. Cameron Kelly Coursey, The Practitioner's Guide to Cellular IoT, Artech House, 2020.



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