UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ULANG TAHUN

POSTGRADUATE ACADEMIC HANDBOOK

MASTER BY TAUGHT COURSE

SESSION 2020/2021

FTMK

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

POSTGRADUATE ACADEMIC HANDBOOK

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Session 2020/2021

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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INTRODUCTION

UTeM's Senior Management

PROF. DATUK WIRA DR. RAHA BINTI ABDUL RAHIM

Vice Chancellor

PROF. DR. ZULKIFILIE BIN IBRAHIM

Performing the function of Deputy Vice Chancellor (Academic & International)

PROF. DR. ZULKIFILIE BIN IBRAHIM

Deputy Vice Chancellor (Research & Innovation)

ASSOC. PROF. DR. NURULFAJAR BIN ABD MANAP

Deputy Vice Chancellor (Student Affairs)

ASSOC. PROF. IR. DR. MD NAZRI BIN OTHMAN

Assistant Vice Chancellor (Industry & Community)

ASSOC. PROF. Ts. MOHD RAHIMI BIN YUSOFF

Assistant Vice Chancellor (Development & Facility Management)

UTeM
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
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

Education 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.

FOREWARD BY THE DEAN

Prof. Ts. Dr. Rabiah Ahmad
Dean,
Faculty of
Information and Communication Technology

Assalamualaikum W.R.T. and Greetings,

On behalf of the Faculty members, I would like to welcome all of you to the Faculty of Information and Communication Technology, FTMK, Universiti Teknikal Malaysia Melaka, UTeM. It has been a privilege that you have chosen FTMK and we look ahead to support your success.

As the Dean of FTMK, it is my pleasure to serve you and enhance your learning experiences driven by industrial demand, practical oriented and professional certifications. It is important to note that you will gain much information and knowledge in related fields extracted from the curriculum and programmes offered.

As for guidance throughout your studies, we at FTMK have provided structured information and it is documented in this academic handbook. The handbook will be your major reference in preparing your study plan and it is structured into five major topics, that is, basic information about the University and the Faculty, facilities and their regulation, academic system, programme educational objectives and curriculum structure.

At the university, you are encouraged to have creative and critical thinking skill. In addition, you are also advised to focus and strive for academic success by actively engaging with classroom activities. These will help you survive in your working life. Moreover, you will receive great support and valuable experiences from the Faculty, which will aid you in facing global challenges as ICT leader in the future.

As a final note, I would like to express my appreciation to the Postgraduate Coordinator, Faculty Publication Committee and all parties involved in producing this academic handbook. Together we make a difference.

FTMK Truly World!
All the best and Good Luck!

Faculty Vision

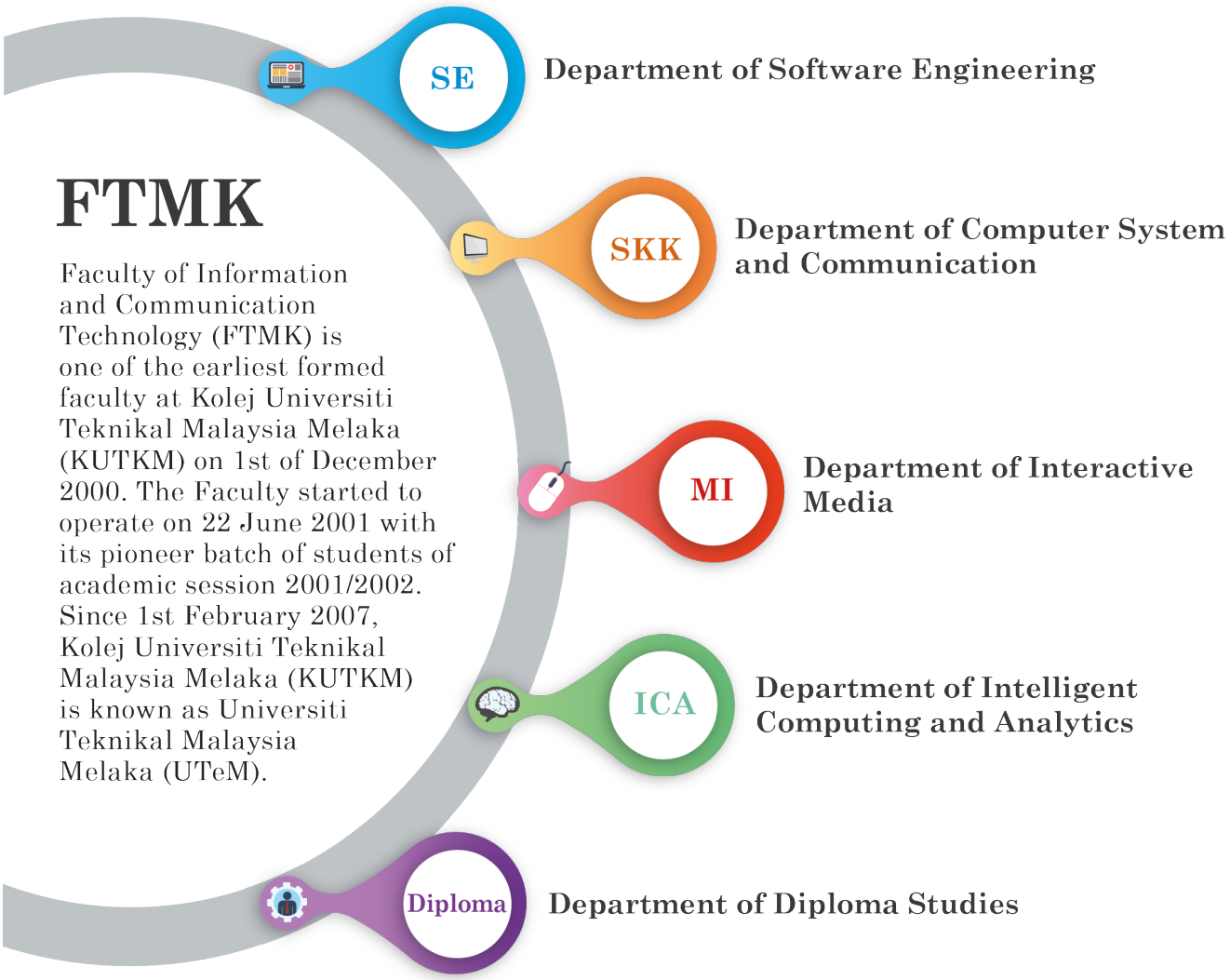
To become a creative, innovative and world class centre of excellence in education, research and services of information and communication technology field.

Faculty Mission

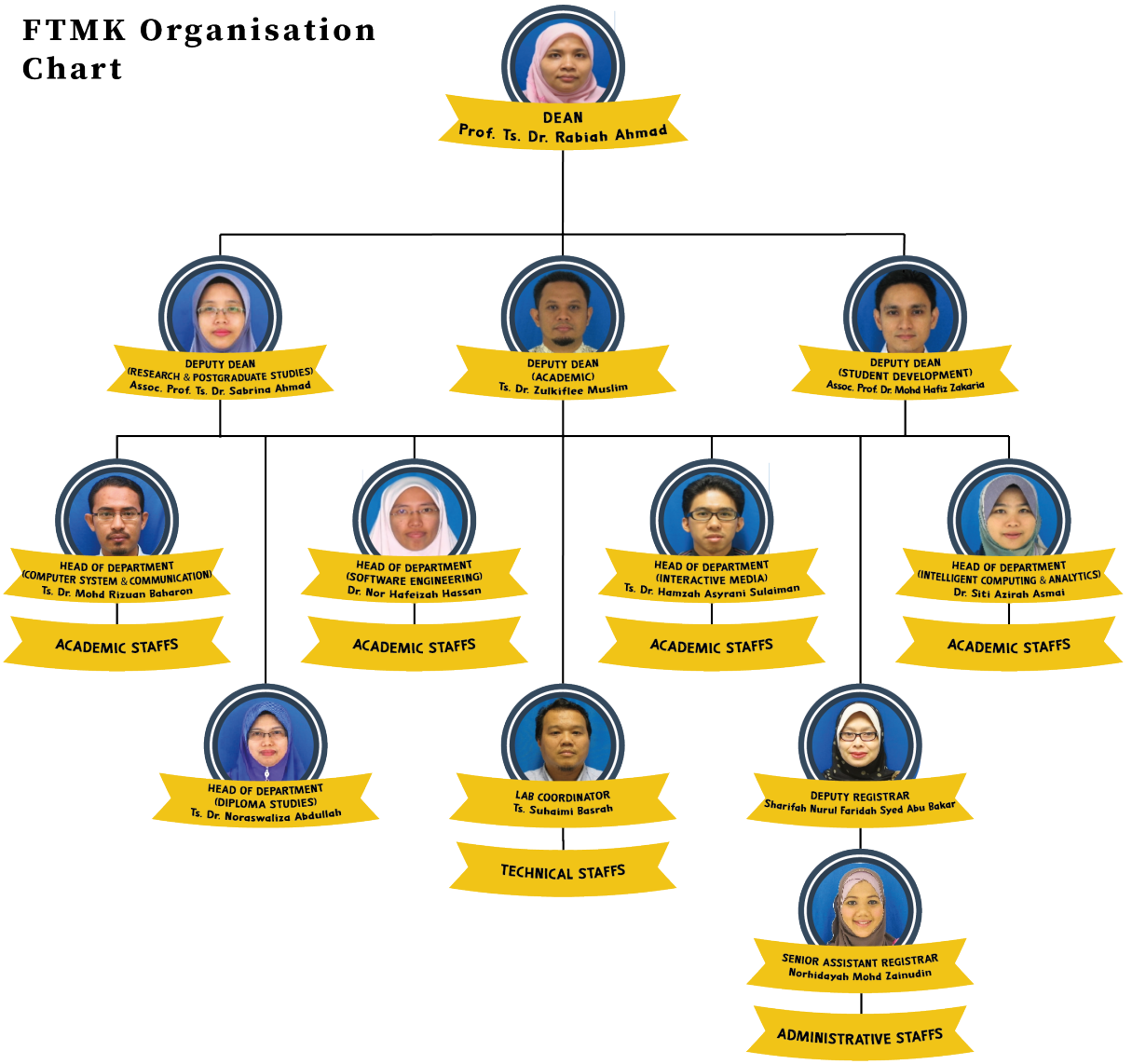
To develop highly competent professionals with outstanding personalities through a world class technical education on the basis of **application-oriented teaching, learning** and **research** with smart partnership with industry and university.

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.


SE
Department of Software Engineering
FTMK
Faculty of Information and Communication Technology (FTMK) is one of the earliest formed faculty at Kolej Universiti Teknikal Malaysia Melaka (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 Malaysia Melaka (KUTKM) is known as Universiti Teknikal Malaysia Melaka (UTeM).
SKK
Department of Computer System and Communication
MI
Department of Interactive Media
ICA
Department of Intelligent Computing and Analytics
Diploma
Department of Diploma Studies

FTMK Organisation Chart



Postgraduate Coordinator & Programme Coordinators

Postgraduate Coordinator:

Assoc. Prof. Ts. Dr. Siti Rahayu Selamat

Programme Coordinators:

1) **Master of Computer Science (Software Engineering), MITS**
   Ts. Dr. Lizawati Salahuddin

2) **Master of Computer Science (Database Technology), MITD**
   Mr. Abdul Razak Hussain

3) **Master of Computer Science (Internetworking Technology), MITI**
   Dr. Zurina Saa'ya

4) **Master of Computer Science (Security Science), MITZ**
   Assoc. Prof. Ts. Dr. Siti Rahayu Selamat

5) **Master of Computer Science (Multimedia Computing), MCSM**
   Ts. Dr. Sarni Suhaila binti Rahim

6) **Master of Technology (Data Science & Analytics), MTDS**
   Ts. Dr. Zeratul Izzah Mohd Yusoh

7) **Master of Software Engineering (Mobile Development), MSMD**
   Ts. Maslita Abd Aziz

8) **Master of Information System, MIS**
   Prof. Dr. Mohd Khanapi Abd Ghani

Facilities

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 application oriented 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 loan the lab equipment to complete their assignments or projects on time. The equipments that are allowed to be used are wireless equipment, video camera, digital camera, biometric tool and others.

Lab Operational Hours

During Semester:

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

During Semester Break:

Monday to Thursday	8:00am to 5:00pm
Friday	8:00am to 12:15pm
	2:45pm to 5:00pm
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 Room No. 12 with each room for 60 pax
Recording Capture System (ReCap)	Mini Theatre for interactive learning environment for 114 pax
Collaborative Learning Lab (CLeAR)	A collaborative learning lab with 60 pax capacity
Mini Theatre	The theatre room for student animation presentation for 15 pax
Virtual Reality Studio	Lab for motion capture and games development
Photography / Recording Studio	Multimedia recording and editing studio
University-Industry Lab	Coordinated Malware Eradication and Remediation Project (CMERP) Satellite Lab – collaboration with Cyber Security Malaysia
Research Labs	Seven (7) research labs for postgraduates students based on faculty's research clusters under Centre for Advanced Computing Technology (C-ACT): 1. Innovative Software System & Services (IS3) Lab 2. Information Security Forensics & Computer Networking (INSFORNET) Lab 3. Optimization, Modelling, Analytics and Simulation (OptiMAS) Lab 4. Computational Intelligence and Technologies (CIT) Lab 5. Human Centered Computing and Information Systems Lab (HCC-ISL) Lab

6. Pervasive Computing & Educational Technology (PET) Lab
7. Biomedical and Engineering (BIOCORE) Lab

Teaching Labs

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

Other Facilities

1. Visiting Professor Rooms
2. Executive Lab
3. Administration Office – Level 2 & 3
4. FTMK Club Room (FICTS)
5. Surau or Prayer Room
6. Lobby Area
7. Parking Area for students and staffs

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. Don't 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. Students must report immediately to lecturer or Assistant Engineers on duty if there is any lab equipment that is lost or broken prior to the students' usage.
19. Research labs are for post graduates' students ONLY. Post-graduate students can get the access by referring to their supervisor.
20. Any matters related to lab usage after teaching and learning must be directed to Lab Coordinator of FTMK.

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

Entry Requirements

University General Requirements:

a) Bachelor of Computer Science (honours) with good grades (minimum CGPA of 2.75 or equivalent) from UTeM or any other institutions of higher learning recognised by the Senate; OR

b) Any other qualification that are approved equivalent to a Bachelor of Computer Science (Hons) or other qualifications and experience recognized by the Senate; OR

c) Candidates with Bachelor's degree whose CGPA is between 2.74 and 2.00, relevant work experience in the related fields will be considered. ONE (1) year relevant experience will be considered as equivalent to 0.1 CGPA;

d) Candidates with diploma qualification and minimum work experience of TEN (10) years in the relevant field of interest will be considered together with UTeM's Accredited Prior Experiential Learning (APEL) where MQA APEL application should be made directly to the MQA and approval must first be obtained before applying to UTeM programme.

Language Requirements:

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

a) Minimum score is 520 for the Test of English as a Foreign Language (TOEFL) or minimum score is 5.0 for the International English Language Testing System (IELTS) or minimum band 3.0 for Malaysian University English Test (MUET).

b) Applicants without TOEFL/IELTS or for those who obtained a score below the requirement above are required to undergo and pass the English language programme conducted by UTeM prior to commencement of the postgraduate programme.

c) Exemption may be given to those who have undertaken regular programmes of studies and graduated from universities that use English as the medium of instruction or who has graduated from UTeM in a programme with English as the medium of instruction.

****Programme's Specific Requirements:**

a) A Bachelor's Degree (honours) in area focusing on numeracy skills including computing, engineering, mathematics, physical sciences and other fields that have sound statistical and computing background, with good grades (minimum CGPA of 2.75 or equivalent) from UTeM or any other institutions of higher learning recognised by Senate.

b) Candidates without a computing degree need to complete bridge/prerequisites courses prior to the enrollment into the programme.

c) Waiver to bridge/prerequisites courses may be granted if an equivalent course has already been successfully completed, or prove of relevant work experience, that are recognised by the Senate

*** only apply for Master of Technology, Master of Software Engineering and Master of Information System*

Duration of Studies

	Minimum	Maximum
Duration of studies (Full Time)	1 year (2 normal semesters and 1 short semesters)	3 years (6 normal semesters and 2 short semesters)
Duration of studies (Part Time)	2 years (4 normal semesters and 2 short semesters)	4 years (8 normal semesters and 4 short semesters)

Academic 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

MASTER OF COMPUTER SCIENCE (SOFTWARE ENGINEERING)

MASTER OF COMPUTER SCIENCE (SOFTWARE ENGINEERING)

The Master of Computer Science (Software Engineering), for short MITS, 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:

PEO1: Practice in-depth and specialist knowledge and skills of Computer Science in Software Engineering to support organizational goals.

PEO2: Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Have in-depth skills and strong mastery knowledge in Computer Science (Software Engineering);

PO2: Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;

PO3: Ability to consistently explore and expand contemporary knowledge in targeted discipline (Software Engineering);

PO4: Ability to gain employment for career development in related Computer Science field (Software Engineering);

PO5: Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;

PO6: Ability to apply expertise in working environment; and

PO7: Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure

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
MITP XXXX	Elective 1	3
MITP 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
MITP XXXX	Elective 3	3
MITP 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
MITP 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
MITP 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
MITP 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

Core Courses - choose FOUR (4) only:

Course Code	Course	Credit
MITP 5243	Advanced Software Project Management	3
MITP 5253	Software Quality	3
MITP 5213	Advanced Software Engineering	3
MITP5233	Requirements Engineering	3
MITP 5263	Software Testing	3
MITP 5273	Secure Software Development	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
- CLO2: Identify the problem area for research and focusing on a specific topic.
- CLO3: Develop a cohesive and robust research proposal on a chosen topic.
- CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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

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. Latorre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multimodal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MITU 5213 Project 1

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: Construct literature review and appropriate methodology to

complete the project.

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

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of technologies learnt previously. Besides writing the proposal, student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. In addition, student must present and justify the findings during presentation.

References:

1. Thesis Writing and Guidelines, http://www.utem.edu.my/pps/.

MITU 5226 Project 2

Learning Outcomes:

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

CLO1: Develop solutions to the proposed project.

CLO2: Evaluate 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. and 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/.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

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

CLO1: Adapt algorithm design paradigms and method of analysis.
CLO2: Analyse algorithms efficiency in terms of the amount of resources in terms of time and storage space required to execute the algorithm.
CLO3: Design algorithms based on problem types.

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 and Greedy Algorithms 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 understood.

References:

1. Sen, S. and Kumar, A., Design and Analysis of Algorithms: A Contemporary Perspective, 1st Edition, Cambridge University Press, 2019.
2. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
3. Levitin, A., Introduction to the Design and Analysis of Algorithm, 3rd Edition, Addison Wesley, 2012.
4. Mohan, I. C., Design and Analysis of Algorithms, Prentice Hall of India Private Limited, 2008.
5. Cormen, T.H, Leiserson, C.E, Rivest, R.L & Stein, C., Introduction to Algorithms, 3rd Edition, MIT Press and McGraw-Hill, 2009.
6. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, 3rd Edition, Addison-Wesley, 2000.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

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

CLO1: Construct the theory of data communications related with the network models in current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends 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. K. G. Srinivasa, Siddesh G. M. and Srinidhi H., Network Data Analytics: A Hands-On Approach for Application Development (Computer Communications and Networks), 1st Edition, Springer, 2018.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
4. Massoud Moussavi, Data Communication and Networking: A Practical Approach, 1st Edition, Cengage Learning, 2014.
5. Ajit Pal, Data Communication and Computer Network, PHI Learning Private limited, 2014.
6. Bahaman, Nazrulazhar, Hamid, Erman and Mat Ariff, Azman, Data Communications and Networking: Practical Approach, 1st Edition, Venton, 2008.
7. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2016.

MITS 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.

MITP 5243 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: Evaluate the best-practices for cross-functional teams in a software project.
CLO3: Develop a risk management plan for managing risk activities on a software project.

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 various methodologies in managing and monitoring people, budget and schedule as well as to manage risks that might occur in a software project.

References:

1. Harold R. Kerzner, Project Management: A Systems Approach to Planning, Scheduling, and Controlling, 12th Edition, Wiley, 2017.
2. Jack T.Marchewka, Information Technology Project Management, 5th Edition, Wiley, 2016.
3. Jack R. Meredith, Project Management: A Managerial Approach, 10th Edition International Student Version, Wiley, 2017.
4. Project Management Institute, A Guide To The Project Management Body Of Knowledge (PMBOK® Guide), 6th Edition, 2017.

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: Analyze the current scenario or issues related to software quality topics.
CLO3: Propose 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. Khan, RA., Mustafa K., Ahson, SI., Software Quality: Concepts and Practices, Alpha Science, 2006.
2. Nina S Goodbole, Software Quality Assurance; Principle and Practice, 2nd Edition, Alpha Science, 2016.
3. Daniel Galin, Software Quality: Concepts and Practices, 1st Edition, Wiley-IEEE Computer Society Press, 2018.

MITP 5213 Advanced Software Engineering

Learning Outcomes:

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

CLO1: Differentiate the fundamental concepts and develop a contemporary knowledge of software engineering.

CLO2: Apply software engineering methodology or model with the appropriate concepts in an efficient and ethical manner.

CLO3: Analyze different software engineering methodology or models for problem solving applications.

Synopsis:

This course provides students with software engineering methodology, knowledge, skills and discipline in developing application software. The course exposes student to Enterprise Architecture approach in software engineering process including software development process and technique, requirement engineering, software testing and quality, and software cost estimation. At the end of the course the student should be able to manage a software development project effectively and systematically, and produce a software product in a quality manner.

References:

1. Pressman, R.S, Software Engineering a Practitioner's Approach, 8th Edition, McGraw-Hill, 2019.

2. Sommerville, I, Software Engineering, 10th Edition, Pearson, 2015.
3. Ghezzi C, Jazayeri M, Mandrioli D, Fundamentals of Software Engineering. 2nd Edition, Prentice Hall, 2003.
4. Bern Oestereich, Developing Software with UML Object oriented Analysis and Design Practice, 2nd Edition, Addison-Wesley, 2002.
5. Col Perks, Tony Beveridge, Guide to Enterprise IT Archicture, Springer, 2003.
6. Scott A. Bernard, An Introduction to Enterprise Architecture, 3rd Edition, AuthorHouse, 2012.

MITP 5233 Requirements Engineering

Learning Outcomes:

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

CLO1: Apply the process of requirements engineering in software development practice.

CLO2: Revise techniques for improving problem understanding, requirements elicitation, analysis, specification and validation.

CLO3: Evaluate and measure the role and impact of good or bad requirements in software projects.

Synopsis:

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. The aim of this course is to explore the development of requirements, to provide a deeper understanding of requirements engineering process, 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. Pohl, K., Requirements Engineering; Fundamentals, Principles, and Techniques, Springer, 2012.
2. Laplante, Philip. A., Requirements Engineering for Software and Systems, 3rd Edition, CRC Press, 2017.
3. Hull, E., Jackson, K., Dick, J., Requirements Engineering, 4th Edition, Springer, 2017.
4. 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.
5. Lamsweerde, A.van, Requirements Engineering: From System Goals to UML Models to Software Specifications, John Wiley & Sons, 2010.
6. Berenbach, B., Paulish, D.J., Kazmeier, J., Rudorfer, A., Software& Systems Requirements Engineering: In Practice, McGraw Hill, New York, 2009.

MITP 5263 Software Testing & Quality

Learning Outcomes:

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

CLO1: Analyse and choose a suitable methods used in testing in software development.
CLO2: Develop software testing and quality activity in real software projects.
CLO3: Manage testing phase to assure software quality by using techniques and tools that full fill current requirement.

Synopsis:

This course discusses software faults and techniques to reduce faults and improve software quality. Software systems are some of the most complex human artifacts 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 artifacts, or the source code, and introduce proper testing tools that will be used in a number of ad-hoc exercises.

References:

1. Black, R., Veenendaall, E. V., Graham, D., Foundations of Software Testing ISTQB Certification. 4th Edition, Cengage Learning, 2020.
2. Syed Naimatullah Hussin and Ahmad Tasnim Siddiqui, Software Quality Assurance, LAP LAMBERT Academic Publishing, 2019.
3. John Watkins, Testing IT – An Off-the-Shelf Software Testing Process, 2nd Edition, Cambridge University Press, 2010.
4. Glenford J. Myers, The Art of Software Testing, 3rd Edition, John Wiley & Sons, 2011.
5. Norman Fenton, James Bieman, Software Metrics: A Rigorous & Practical Approach., 3rd Edition, Chapman & Hall., PWS Publishing Company, 2014.

MITP 5273 Secure Software Development

Learning Outcomes:

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

CLO1: Analyse the secure software development life cycle methodologies and models.
CLO2: Evaluate secure software systems.
CLO3: Apply secure software development principles and models throughout the software development life cycle.

Synopsis:

This course provides students in-depth knowledge on secure software development methodology, skills and discipline in developing secure software systems. The course exposes student to the Security Development Lifecycle (SDL) phases: Requirements, Design, Implementation, Verification, Deployment and Response. At the end of the course, students should be able to provide a solution how security should be incorporated in software development.

References:

1. Deogun, D., Johnsson, D. B. & Sawano, D., Secure By Design, 1st Edition, Manning Publications, 2019.
2. Talukder, A. K., & Chaitanya, M., Architecting secure software systems, CRC Press/Taylor & Francis Group, 2008.
3. Howard, M., & Lipner, S., SDL: A process for developing demonstrably more secure software, Microsoft Press, 2006.
4. Richardson, T., & Thies, C., Secure software design, Jones & Bartlett Learning, 2013.
5. Axelrod, C. W., Engineering Safe and Secure Software Systems (Artech House Information Security and Privacy), 1st Edition, Artech House, 2012.
6. Merkow, M. S., & Raghavan, L., Secure and resilient software development, CRC Press/Auerbach Publications, 2010.

MASTER OF COMPUTER SCIENCE (DATABASE TECHNOLOGY)

MASTER OF COMPUTER SCIENCE (DATABASE TECHNOLOGY)

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:

PEO1: Practice in-depth and specialist knowledge and skills of Computer Science in Database Technology to support organizational goals.

PEO2: Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Have in-depth skills and strong mastery knowledge in Computer Science (Database Technology);

PO2: Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;

PO3: Ability to consistently explore and expand contemporary knowledge in targeted discipline (Database Technology);

PO4: Ability to gain employment for career development in related Computer Science field (Database Technology);

PO5: Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;

PO6: Ability to apply expertise in working environment; and

PO7: Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure

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
MITP XXXX	Elective 1	3
MITP 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
MITP XXXX	Elective 3	3
MITP 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
MITP XXXX	Elective 1	3
MITP 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
MITP 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
MITP 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

Core Courses - choose FOUR (4) only:

Course Code	Course	Credit
MITP 5543	Distributed Database	3
MITP 5523	Database Administration and Security	3
MITP 5353	Spatial Database	3
MITP 5553	Data Warehousing and Data Mining	3
MITP 5343	Data Integration	3
MITP 5563	Advanced Database System Principles	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
- CLO2: Identify the problem area for research and focusing on a specific topic.
- CLO3: Develop a cohesive and robust research proposal on a chosen topic.
- CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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, 3rd Edition, Writing for Computer Science, Springer-Verlag London, 2014.
8. Siti Uzairiah Mohd Tobi, Qualitative Research and Nvivo 10 Exploration, Aras Publication, 2014.

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. Latorre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multimodal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MITU 5213 Project 1

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: Construct literature review and appropriate methodology to

complete the project.

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

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of technologies learnt previously. Besides writing the proposal, student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. In addition, student must present and justify the findings during presentation.

References:

1. Thesis Writing and Guidelines, http://www.utem.edu.my/pps/.

MITU 5226 Project 2

Learning Outcomes:

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

CLO1: Develop solutions to the proposed project.

CLO2: Evaluate 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. and 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/.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

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

CLO1: Adapt algorithm design paradigms and method of analysis.
CLO2: Analyse algorithms efficiency in terms of the amount of resources in terms of time and storage space required to execute the algorithm.
CLO3: Design algorithms based on problem types.

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 and Greedy Algorithms 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 understood.

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1. Sen, S. and Kumar, A., Design and Analysis of Algorithms: A Contemporary Perspective, 1st Edition, Cambridge University Press. 2019.
2. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing,2017.
3. Levitin, A., Introduction to the Design and Analysis of Algorithm, 3rd Edition, Addison Wesley, 2012.
4. Mohan, I. C., Design and Analysis of Algorithms, Prentice Hall of India Private Limited, 2008.
5. Cormen, T.H, Leiserson, C.E, Rivest, R.L & Stein, C., Introduction to Algorithms, 3rd Edition, MIT Press and McGraw-Hill, 2009.
6. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, 3rd Edition, Addison-Wesley, 2000.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

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

CLO1: Construct the theory of data communications related with the network models in current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends 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. K. G. Srinivasa, Siddesh G. M. and Srinidhi H., Network Data Analytics: A Hands-On Approach for Application Development (Computer Communications and Networks), 1st Edition, Springer, 2018.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
4. Massoud Moussavi, Data Communication and Networking: A Practical Approach, 1st Edition, Cengage Learning, 2011.
5. Ajit Pal, Data Communication and Computer Network, PHI Learning Private limited, 2014.
6. Bahaman, Nazrulazhar, Hamid, Erman and Mat Ariff, Azman, Data Communications and Networking: Practical Approach, 1st Edition, Venton, 2008.
7. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2016.

MITS 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.

MITP 5543 Distributed Database

Learning Outcomes:

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

CLO1: Design horizontal, vertical, and hybrid fragmentations.
CLO2: Analyse query performance over distributed database.
CLO3: Distinguish synchronous vs. asynchronous replication and distributed recovery techniques.

Synopsis:

The course will deal with both classical material and some of the advanced developments in the area of distributed database management systems. Classical topics covered include, but are not necessarily limited to: distributed DBMS architectures, distributed design (fragmentations, allocation, and replication), distributed data control (view management, data security and semantic integrity control), distributed query processing and optimization, and distributed transaction processing (concurrency control algorithm, replica control protocols, and reliability protocols). More advanced and current topics include: query processing and advanced transaction models for multidatabases, mobile databases, and peer databases.

References:

1. M. Tamer Ozsu & Patrick Valduriez, Principles of Distributed Database Systems, 4th Edition, Springer, 2019.
2. Gerardus Blokdyk, Distributed Database Management System: A Complete Guide, 5STARCooks, 2018.
3. Alex Petrov, Database Internals: A Deep-Dive into How Distributed Data Systems Work, O'Reilly, 2019.
4. Stefano Ceri & Giuseppe Pelagatti, Distributed Databases: Principles and Systems, 1st Edition, McGraw Hill India, 2017.
5. Saeed K. Rahim & Frank S. Haug, Distributed Database Management Systems: A Practical Approach, 1st Edition, Wiley-IEEE Computer Society, 2010.

MITP 5523 Database Administration and Security

Learning Outcomes:

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

CLO1: Analyze database administration and security concepts and issues in creating, designing and managing various database structures.

CLO2: Investigate information security concept and architecture including data confidentiality, integrity and availability.

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

Synopsis:

This course covers foundation in basic database administration and security. Students will gain knowledge on database administration techniques and practices. Students will also learn how to properly manage the database various structures in an effective and efficient manner including performance monitoring, user management, and backup/recovery techniques. The subject also provides strong foundation in database security. Topics included are data availability, integrity and security, security architecture, database application security models, virtual private databases and database auditing. Students will also be exposed to various database and data security issues in several areas.

References:

1. Aatif Jamshed, Namrata, Krishna Kant Agrawal & Mukesh K. Mohanty, Fundamental of Database Administration: DBA, 2019.
2. Craig S. Mullins, Database Administration: The Complete Guide to Practices and Procedures, 2nd Edition, Addison-Wesley, 2012.
3. Hassan A. Afyouni, Database Security and Auditing: Protecting Data Integrity and Accessibility, Cengage India, 2013.
4. Scott Gaetjen, David Knox & William Maroulis, Oracle Database 12c Security, Oracle Press, 2015.
5. Natan R, B, How To Secure and Audit Oracle 10g and 11g, CRC Press, 2009.
6. Ignatius Fernandez, Beginning Oracle Database 12c Administration: From Novice to Professional, 2nd Edition, Apress, 2015.
7. Ignatius Fernandez, Beginning Oracle Database 11g Administration: From Novice to Professional, 2nd Edition, Apress, 2009.

MITP 5353 Spatial Databases

Learning Outcomes:

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

CLO1: Design well formed spatial database models using an appropriate techniques.

CLO2: Develop a conceptual design of spatial databases for a specific applied problem as well as to answer geographic questions.

CLO3: Manipulate spatial databases through a variety of spatial analysis, query and information production procedures.

Synopsis:

Geographic Information System (GIS) are used to organize, display and analyze data pertinent to land/ resources management and planning activities. In order to make use of specialized capabilities of GIS effectively, an in-depth understanding is required of the procedures that are used to create and maintain spatial databases. This course provides students with advanced knowledge in computer and information science. Specifically, it offers the student to study and critically examine the state-of-the-art spatial data management system (SDBMS). The students will gain a basic understanding of terminology, fundamental and design principles, and also issues facing by spatial database managers and analysts in the design and implementation of well-conceived spatial databases. It requires students to analyze fundamental theoretical knowledge about information systems and the unique demands created by geographic information. The topics covered in this course including Basic Database System Concepts which generally and specifically for spatial databases, data modelling and knowledge representation for spatial data, database schemas and models and architectural principles for GIS. The other topics cover Structured Query Language (SQL), Simple Features for SQL (SFSQL), spatial data standards, metadata, spatial indexes and some legal issues.

References:

1. Paul Bolstad, GIS Fundamentals: A First Text on Geographic Information Systems, 6th Edition, XanEdu Publishing Inc., 2019.
2. Bradley A. Shellito, Discovering GIS and ArcGIS, 2nd Edition, W.H. Freeman, 2019.
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.

MITP 5553 Data Warehousing and Data Mining

Learning Outcomes:

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

CLO1: Apply the concepts, components and purpose of data warehousing and data mining.
CLO2: Design data warehouses based on the data warehousing model and lifecycle.
CLO3: Formulate data mining techniques in data warehouse application.

Synopsis:

This course 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: Analyse query processing requirements for data integration.
CLO3: Distinguish data integration models.

Synopsis:

Data integration problems arise whenever data from separate sources needs to be combined as the basis for new applications. The availability of integrated data from multiple independent, heterogenous data sources is crucial for many applications. The course introduces the fundamental 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. Gerardus Blokdyk, Web Data Integration A Complete Guide - 2020 Edition, 5STARCooks, 2020.
2. John R. Talburt & Yinle Zhou, Entity Information Life Cycle for Big Data: Master Data Management and Information Integration, 1st Edition, Morgan Kaufmann, 2015.
3. AnHai Doan, Alon Halevy & Zachary Ives, Principles of Data Integration, Morgan Kaufmann Publishers, 2012.
4. Serge Abiteboul, et al., Web Data Management, Cambridge University Press, 2012.
5. Felix Naumann, An Introduction to Duplicate Detection, Morgan & Claypool, 2012.
6. Peter Christen, Data Matching - Concepts and Techniques for Record Linkage, Entity Resolution, and Duplicate Detection, Springer, 2012.

MITP 5563 Advanced Database System Principles

Learning Outcomes:

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

CLO1: Formulate the application of advanced data modeling concepts in analysis, design and implementation of database systems.

CLO2: Analyse the problems in developing and implementing efficient database system.

CLO3: Investigate 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, 12th Edition, Course Technology, 2017.
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.

MASTER OF COMPUTER SCIENCE (INTERNETWORKING TECHNOLOGY)

MASTER OF COMPUTER SCIENCE (INTERNETWORKING TECHNOLOGY)

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:

PEO1: Practice in-depth and specialist knowledge and skills of Computer Science in Internetworking Technology to support organizational goals.

PEO2: Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Have in-depth skills and strong mastery knowledge in Computer Science (Internetworking Technology);

PO2: Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;

PO3: Ability to consistently explore and expand contemporary knowledge in targeted discipline (Internetworking Technology);

PO4: Ability to gain employment for career development in related Computer Science field (Internetworking Technology);

PO5: Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;

PO6: Ability to apply expertise in working environment; and

PO7: Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure

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
MITP XXXX	Elective 1	3
MITP 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
MITP XXXX	Elective 3	3
MITP 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
MITP XXXX	Elective 1	3
MITP 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
MITP 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
MITP 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
MITS 5513	Parallel Processing	3
MITS 5323	Advanced Scalable Internetworking	3
MITS 5213	Distributed Computing Systems	3
MITS 5333	Advanced High Performance Networks	3
MITS 5523	Advanced Mobile Computing	3
MITS 5343	Advanced Network Design and Diagnostics	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
CLO2: Identify the problem area for research and focusing on a specific topic.
CLO3: Develop a cohesive and robust research proposal on a chosen topic.
CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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

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, 1st 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. Latorre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multimodal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MITU 5213 Project 1

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: Construct literature review and appropriate methodology to

complete the project.

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

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of technologies learnt previously. Besides writing the proposal, student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. In addition, student must present and justify the findings during presentation.

References:

1. Thesis Writing and Guidelines, http://www.utem.edu.my/pps/.

MITU 5226 Project 2

Learning Outcomes:

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

CLO1: Develop solutions to the proposed project.

CLO2: Evaluate 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. and 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/.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

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

CLO1: Adapt algorithm design paradigms and method of analysis.
CLO2: Analyse algorithms efficiency in terms of the amount of resources in terms of time and storage space required to execute the algorithm.
CLO3: Design algorithms based on problem types.

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 and Greedy Algorithms 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 understood.

References:

1. Sen, S. and Kumar, A., Design and Analysis of Algorithms: A Contemporary Perspective, 1st Edition, Cambridge University Press, 2019.
2. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
3. Levitin, A., Introduction to the Design and Analysis of Algorithm, 3rd Edition, Addison Wesley, 2012.
4. Mohan, I. C., Design and Analysis of Algorithms, Prentice Hall of India Private Limited, 2008.
5. Cormen, T.H, Leiserson, C.E, Rivest, R.L & Stein, C., Introduction to Algorithms, 3rd Edition, MIT Press and McGraw-Hill, 2009.
6. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, 3rd Edition, Addison-Wesley, 2000.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

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

CLO1: Construct the theory of data communications related with the network models in current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends 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. K. G. Srinivasa, Siddesh G. M. and Srinidhi H., Network Data Analytics: A Hands-On Approach for Application Development (Computer Communications and Networks), 1st Edition, Springer, 2018.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
4. Massoud Moussavi, Data Communication and Networking: A Practical Approach, 1st Edition, Cengage Learning, 2011.
5. Ajit Pal, Data Communication and Computer Network, PHI Learning Private limited, 2014.
6. Bahaman, Nazrulazhar, Hamid, Erman and Mat Ariff, Azman, Data Communications and Networking: Practical Approach, 1st Edition, Venton, 2008.
7. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2016.

MITS 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.

MITS 5513 Parallel Processing

Learning Outcomes:

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

CLO1: Explain parallel computing models and concepts.
CLO2: Compare the matrix and taxonomies of parallel systems
CLO3: Build efficient parallel application scripts.

Synopsis:

This course introduces the fundamental concepts of parallel and distributed processing, performance modeling, matrix and graph algorithm and pipelining. Topics also include scheduling and load balancing, fast fourier transforms and performances measurement. Students will also able to calculate the performance and analyze the efficient parallel program techniques.

References:

1. Quan Chen, Task Scheduling for Multi-core and Parallel Architectures: Challenges, Solutions and Perspectives, Springer, 2018.
2. Vivek Kale, Parallel Computing Architectures and APIs: IoT Big Data Stream Processing, Chapman and Hall/CRC, 2019.
3. Maciej Drozdowski, Scheduling for Parallel Processing, Springer, 2009.
4. T. J. Fountain, Parallel Computing: Principles and Practice, Cambridge University Press, 2006.
5. Bharat Bhusnan at el, Computer Architecture and Parallel Processing, Laxmi Publications Pvt Ltd., 2009.
6. Behrooz Parhami, Introduction to Parallel Processing: Algorithms and Architectures, Springer: Series in Computer Science, 2013.

MITS 5323 Advanced Scalable Internetworking

Learning Outcomes:

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

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

Synopsis:

This course emphasizes the theory of building advanced scalable network. It also involves the use of security architecture and network equipment. The theory and technique on routing protocol, security mechanism and remote access technologies will be emphasized to build a secure and scalable internetwork. The hands-on covers the configuration of routing protocol, security Infrastructure and network monitoring tools. In addition, it exposes WAN technologies including analog IPSEC, VPN, and Frame Relay.

References:

1. Cisco System, Inc. Scaling Network v6 Companion Guide, (Cisco Networking Academy Program), Cisco Press. 2017.
2. Kevin Wallace, David Hucaby, Cristian Matei & Wendell Odom, CCNP Routing and Switching v2.0 Official Cert Guide Library, Cisco Press, 2015.
3. Rick Graziani, IPv6 Fundamentals: A Straightforward Approach to Understanding IPv6, Cisco Press, 2017.
4. Bongsik Shin, A Practical Introduction to Enterprise Network and Security Management, Auerbach Publications, 2017.
5. Benoit Claise & Ralf Wolter, Network Management: Accounting and Performance Strategies, Cisco Press, 2007.
6. Adrian Farrel, Network Management Know It All, Morgan Kaufmann, 2008.
7. William Stalling, Network Security Essentials Applications and Standards, Pearson, 2016.

MITS 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 computing system.
CLO2: Display knowledge about the main components in the distributed computing system architecture.
CLO3: Propose solution on distributed heterogeneous 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 operating system concepts are covered such as coverage of large-scale applications, fault modelling and fault tolerance, models of system execution, distributed multimedia systems and security related to other technologies.

References:

1. Taunenbaum, A., Steen M. V. Distributed Systems: Principles and Paradigms, 2nd Revised Edition. Pearson Education, 2013.
2. Coulouris G., J. Dollimore, and T. Kindberg. Distributed Systems: Concepts and Design, 5th Edition, Addison Wesley, 2011.
3. Stallings, W. Operating Systems: Internals and Design Principals, 9th Edition, Prentice Hall, 2018.
4. Hennesey, J.L., Patterson, D.A. Computer Architecture: A Quantitative Approach, 5th Edition, Morgan Kauffman, 2011.
5. Kshemkalyani, A. D., Singhal, M. Distributed Computing: Principles, Algorithms, and Systems, Cambridge University Press, 2011.
6. Haddad et. al., Distributed Systems Design And Algorithm, Wiley, 2011.
7. Carlos A. Varela and Gul Agha, Programming Distributed Computing Systems: A Foundational Approach, The MIT Press, 2013.

MITS 5333 Advanced High Performance Networks

Learning Outcomes:

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

CLO1: Propose the main techniques and mechanism of buffer/queue management that provide high quality of service.

CLO2: Fix the problems created by poorly designed network utilizing efficient queuing algorithm and dynamic traffic control scheme.

CLO3: Evaluate the framework of data transmission with guaranteed QoS, particularly in a saturated/congested networks.

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. Stalling, W, High-Speed Networks and Internets Performance and Quality of Service, 2nd Edition, Prentice Hall, 2002.
2. Ramji Balakrishnan, Advanced QoS for Multi-Service IP/MPLS Networks, Wiley, 2008.
3. Vinod Joseph, Deploying QoS for Cisco IP and Next Generation Networks: The Definitive Guide, Morgan Kaufmann, 2009.
4. Barreiros Miguel, QoS enabled networks: tools and foundations, 2nd Edition, Hoboken NJ, John Wiley & Sons, 2016.
5. Hassan Y. A. Abu Tair, Performance Evaluation of IEEE 802.11e MAC layer protocols: Under Real-Time Applications, LAP Lambert Academic Publishing, 2011.
6. Vinod Joseph, S. Mulugu, Network Convergence: Ethernet Appliactions and Next Generation Packet Transport Architectures, Morgan Kaufmann, 2013.
7. Ilya Grigorik, High Performance Browser Networking: What Every Web Developer Should Know about Networking and Web Performance, O'Reilly Media, 2013.

MITS 5523 Advanced Mobile Computing

Learning Outcomes:

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

CLO1: Elaborate the concept of mobile and distributed computing.
CLO2: Identify the technology in wireless, telecommunication and mobile technologies.
CLO3: Construct application for mobile devices.

Synopsis:

This course introduces to students the fundamental concept of mobile computing and mobile application development. Mobile computing will be discussed from perspectives mobile technology, application development, and user interaction. The course wills 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. The course

will look at some current research in mobile computing.

References:

1. Koushik Sinha, Sasthi C. Ghosh, and Bhabani P. Sinha, Wireless Networks and Mobile Computing, Chapman and Hall/CRC, 2016.
2. Raj Kamal, Mobile Computing, 3rd Edition, Oxford University Press, 2019.
3. Prasant Kumar Pattnaik, and Rajib Mall, Fundamentals of Mobile Computing, PHI Learning, 2015.
4. Kumkum, Mobile Computing: Theory and Practice, Pearson Education India, 2009.
5. BCS, Mobile Computing: Securing Your Workforce, The Chartered Institute, BCS Charted Institute, 2011.
6. Reza B'Far, Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML, Cambridge University Press, 2004.

MITS 5343 Advanced Network Design And Diagnostics

Learning Outcomes:

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

CLO1: Design networks that meet a customer's business and technical goals.

CLO2: Explain the processes and tools used in order to understand traffic flow, protocol behaviour and internetworking technologies.

CLO3: Demonstrate 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 the diagnostics for requirement analysis and flow analysis. The technology choices, interconnection mechanism and network management and security will be covered in logical design. Some issue on network design will be included in physical design and addressing and routing.

References:

1. Oppenheimer, P., Top Down Network Design, 3rd Edition, Cisco Press, 2010.
2. Saboowala, H. and Abid, M. and Modali, S., Network Designing Networks

and Services for the Cloud: Delivering business-grade cloud applications and services, Cisco Press, 2013.

3. Thomatis, C., Network Design Cookbook: Architecting Cisco Networks, Lulu Enterprises Incorporated, 2016.
4. McCabe, J.D., Network Analysis, Architecture, and Design, Elsevier Science, 2010.
5. Geier, J., Designing and Deploying 802.11 Wireless Networks: A Practical Guide to Implementing 802.11n and 802.11ac Wireless Networks For Enterprise-Based Applications (Networking Technology), Cisco Press, 2015.
6. Solomon, M.G. and Kim, D., Fundamentals of Communications and Networking, Jones & Bartlett Learning, LLC, 2014.
7. Hummel, S.L., Network Design Fundamentals, CreateSpace Independent Publishing Platform, 2013.

MASTER OF COMPUTER SCIENCE (SECURITY SCIENCE)

MASTER OF COMPUTER SCIENCE (SECURITY SCIENCE)

This programme is specifically designed to equip students with security elements in information and communication technology related to management, data and infrastructure.

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:

PEO1: Practice in-depth and specialist knowledge and skills of Computer Science in Security Science to support organizational goals.

PEO2: Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Have in-depth skills and strong mastery knowledge in Computer Science (Security Science);

PO2: Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;

PO3: Ability to consistently explore and expand contemporary knowledge in targeted discipline (Security Science);

PO4: Ability to gain employment for career development in related Computer Science field (Security Science);

PO5: Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;

PO6: Ability to apply expertise in working environment; and

PO7: Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure

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
MITP XXXX	Elective 1	3
MITP 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
MITP XXXX	Elective 3	3
MITP 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
MITP XXXX	Elective 1	3
MITP 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
MITP 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
MITP 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
MITS 5413	Public Key Infrastructure	3
MITS 5423	Computer Forensics	3
MITS 5433	Systems and Network Hacking	3
MITS 5443	Cryptography and Data Security	3
MITS 5453	Intrusion Detection and Prevention	3
MITS 5463	Security Management Practices (CISSP)	3
MITS 5473	Watermarking	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
CLO2: Identify the problem area for research and focusing on a specific topic.
CLO3: Develop a cohesive and robust research proposal on a chosen topic.
CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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.

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, 1st Edition, Springer, 2019.
2. Angela B. S. and George W. S., Introduction to Computational Science: Modelling 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. Latorre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multimodal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MITU 5213 Project 1

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: Construct literature review and appropriate methodology to

complete the project.

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

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of technologies learnt previously. Besides writing the proposal, student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. In addition, student must present and justify the findings during presentation.

References:

1. Thesis Writing and Guidelines, http://www.utem.edu.my/pps/.

MITU 5226 Project 2

Learning Outcomes:

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

CLO1: Develop solutions to the proposed project.

CLO2: Evaluate 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. and 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/.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

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

CLO1: Adapt algorithm design paradigms and method of analysis.
CLO2: Analyse algorithms efficiency in terms of the amount of resources in terms of time and storage space required to execute the algorithm.
CLO3: Design algorithms based on problem types.

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 and Greedy Algorithms 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 understood.

References:

1. Sen, S. and Kumar, A., Design and Analysis of Algorithms: A Contemporary Perspective, 1st Edition, Cambridge University Press, 2019.
2. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
3. Levitin, A., Introduction to the Design and Analysis of Algorithm, 3rd Edition, Addison Wesley, 2012.
4. Mohan, I. C., Design and Analysis of Algorithms, Prentice Hall of India Private Limited, 2008.
5. Cormen, T.H, Leiserson, C.E, Rivest, R.L & Stein, C., Introduction to Algorithms, 3rd Edition, MIT Press and McGraw-Hill, 2009.
6. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, 3rd Edition, Addison-Wesley, 2000.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

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

CLO1: Construct the theory of data communications related with the network models in current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends 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. K. G. Srinivasa, Siddesh G. M. and Srinidhi H., Network Data Analytics: A Hands-On Approach for Application Development (Computer Communications and Networks), 1st Edition, Springer, 2018.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
4. Massoud Moussavi, Data Communication and Networking: A Practical Approach, 1st Edition, Cengage Learning 2011.
5. Ajit Pal, Data Communication and Computer Network, PHI Learning Private limited, 2014.
6. Bahaman, Nazrulazhar, Hamid, Erman and Mat Ariff, Azman, Data Communications and Networking: Practical Approach, 1st Edition, Venton, 2008.
7. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2016.

MITS 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.

MITS 5413 Public Key Infrastructure

Learning Outcomes:

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

CLO1: Explain the issues related to the successful deployment of digital certificates to meet business and security requirements.

CLO2: Elaborate an insight and strategy into an effective use of PKI in the context of working policies that govern the use, administration, and management of certificates, and design the digital certificate according to the standard format.

CLO3: Demonstrate how PKI establishes digital trust and maintains that level of assurance built through a complex web of social, legal, national, international, and business interactions, and the future trend of PKI.

Synopsis:

This course highlights the principles of Public Key Infrastructure, Digital Signature Law and the related Cyber Laws. The course will not only cover public key algorithms in electronic communications but also the certificate authority and related arrangements as well as. This course aims to give a broader view to the Electronic Commerce transaction to the students.

References:

1. Desmedt, Yvo G., Secure Public Key Infrastructure: Standards, PGP and Beyond: Advances in Information Security, Springer, 2013.
2. Menezes, Alfred; van Oorschot, Paul; Vanstone, Scott, Handbook of Applied Cryptography Boca Raton, Florida: CRC Press, 2010.
3. Adams, Carlisle and Lloyd, Steve, Understanding PKI: Concepts, Standards, and Deployment Considerations, 2nd Edition, Addison-Wesley Professional, 2010.
4. Housley, Russ and Polk, Tim, Planning for PKI: Best Practices Guide for Deploying Public Key Infrastructure, John Wiley, 2003.
5. Brands, Stefan A., The Rethinking Public Key Infrastructures and Digital Certificates: Building in Privacy, MIT Press, 2000.
6. Trček, Denis, Managing information systems security and privacy, Birkhauser, 2006.
7. Vacca, Jhn R., Public key infrastructure: building trusted applications and Web services, CRC Press, 2019.

MITS 5423 Computer Forensics

Learning Outcomes:

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

CLO1: Explain the emerging field of computer forensics in obtaining and analyzing the evidence from computers.

CLO2: Manipulate the components and tools of computer forensics.

CLO3: Organize the investigation procedures for investigating the computer crime.

Synopsis:

This course introduces the fundamentals of computer forensic technology. Emphasis will be placed on identifying the threats to, and vulnerabilities of, computer systems and how to minimize them. The subject also focuses on identifying the victims, executing the attack, and determining various methods that used to gain access to computer systems. The theory and technique on identifying the legal and ethical issues that are involved in computer forensics and methods on investigating the crime are also explored. The hands-on covers the process of investigating the computer crime using computer forensics tools.

References:

1. Nelson B., Philips A., Enfinger F. and Steuart C., Guide To Computer Forensics and Investigations, 6th Edition, Thomson Course Technology, 2018.
2. Jason T. Luttgens and Matthew Pepe, Incident Response & Computer Forensics, 3rd Edition, McGraw-Hill Education, 2014.
3. Davis, Cowen, and Philipp, Hacking Exposed Computer Forensics, 3rd Edition, McGraw-Hill Education, 2016.
4. Keith J. Jones and Richard Bejtlich, Real Digital Forensics: Volume 2, 1st Edition, Addison-Wesley Professional, 2018.
5. Casey E., Digital Evidecnce and Computer Crime, 3rd Edition, Academic Press, 2014.

MITS 5433 Systems and Network Hacking

Learning Outcomes:

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

CLO1: Explain the fundamentals steps that a hacker performs and common tools hackers use in conducting attacks.

CLO2: Identify the major types of malicious codes and software security design

flaws and provide best practices for defending against attacks.

CLO3: Formulate the tools and methods of protecting computers and networks against hacker attacks.

Synopsis:

In this course, students will study and gain experience with the role of defending hosts and networks from attack as well as learning how the hacker uses tools to attack and penetrate networks. Students will be able to use several open software tools that will analyze host and networks for vulnerabilities and be exposed to the hacker technique of "thinking outside the box". It will immerse the student into an interactive environment where they will be shown how to scan, test, hack and secure their own systems. The lab intensive environment gives each student in-depth knowledge and practical experience with the current essential security systems. Students will begin by understanding how perimeter defenses work and then be lead into scanning and attacking their own networks, no real network is harmed. Students then learn how intruders escalate privileges and what steps can be taken to secure a system. Students will also learn about Intrusion Detection, Policy Creation, Social Engineering, DDoS Attacks, Buffer Overflows, Race Conditions, Trojans and Viruses.

References:

1. Stuart McClure, Joel Scambray and George Kurtz, Hacking Exposed (Network Security Secrets & Solutions), 7th Edition, McGraw Hill Osborne Media, 2012.
2. Kevin D. Mitnick, William L. Simon, The Art of Deception, John Wiley & Sons, 2003.
3. Robert Muchamore,Maximum Security, Simon Pulse, 2014.
4. Stuart McClure, Saumil Shah and Shreeraj Shah, Web Hacking: Attacks and Defense, 1st Edition, Addison Wesley, 2002.
5. Kevin Beaver,Hacking for Dummies, 6th Edition, For Dummies, 2018.
6. Boyle, Randall J., and Raymond R. Panko, Corporate Computer Security, 3rd Edition, Prentice Hall, 2013.
7. Charles P. Pfleeger, Security in Computing, 5th Edition, Prentice Hall, 2018.

MITS 5443 Cryptography and Data Security

Learning Outcomes:

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

CLO1: Explain how to use cryptography in support of security services.
CLO2: Describe the basic theory and practice of secure systems, and the types of security services needed for computer and network security.
CLO3: Demonstrate some aspect of cryptography in depth.

Synopsis:

This course explore the methods, algorithms, techniques, and tools of cryptography and data security. After studying the theoretical aspects of cryptographic algorithms and protocols, we show how these techniques can be integrated to solve particular data and communication security problems. This course material is of use to computer and communication engineers who are interested in embedding security into an information system, and thus, providing confidentiality, integrity and authenticity of the documents and the communicating parties.

References:

1. W. Stalling, Cryptography and Network Security: Principles and Practices, 7th Edition, Pearson India, 2018.
2. C. Swenson,Modern Cryptanalysis: Techniques for Advanced Code Breaking, 1st Edition, Wiley, 2008.
3. D. Denning, Cryptography and Data Security, Addison Wesley, 2009.
4. A.J. Menezes, P.C. van Ooorschot, S.A. Vanstone, Handbook of Applied Cryptography, CRC Press, 1996.
5. F. Piper, S. Murphy, Cryptography: A Very Short Introduction, Oxford University Press, 2014.

MITS 5453 Intrusion Detection and Prevention

Learning Outcomes:

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

CLO1: Explain the various types of intrusions and attacks on a network.
CLO2: Determine the mechanism or tools which can be used to detect and prevent the intrusions by integration of technique and technology of security management.
CLO3: Demonstrate intrusion detection system for preventing the illegal intrusion.

Synopsis:

This course highlights the concepts of computer security related to intrusion attacks and prevention. It involves the network-based and host-based platform. Various technique and technology on detection and prevention for security management is emphasized to build a secure network environment. The hands-on covers the configuration of intrusion detection system using detection and prevention tools.

References:

1. Eric C. Thompson, Cybersecurity Incident Response: How to Contain, Eradicate, and Recover from Incidents, Apress, 2018.
2. Sébastien Ziegler, Internet of Things Security and Data Protection, Springer, 2019.
3. Kwangjo Kim, Muhamad Erza Aminanto, Harry Chandra Tanuwidjaja, Network Intrusion Detection using Deep Learning: A Feature Learning Approach, Springer, 2018.
4. Yuri Diogenes, Dr. Erdal Ozkaya, Cybersecurity Attack and Defense Strategies: Infrastructure security with Red Team and Blue Team tactics, Packt Publishing Ltd, 2018.
5. Amos N. Guioro, Cybersecurity: Geopolitics, Law, and Policy, CRC Press, 2017.
6. William (Chuck), Computer Security Fundamentals, Pearson IT Certification, 2019.
7. Al-Sakib Khan Pathan, The State of Art in Intrusion Prevention and Detection, Auerbach Publications, 2014.

MITS 5463 Security Management Practices (CISSP)

Learning Outcomes:

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

CLO1: Perform risk assessments in information security, and implement protection and control efforts.
CLO2: Manage an information security program.
CLO3: Design the requirement of regulatory, standards and best practices and apply them in the working environment.

Synopsis:

This course covers the principles of information security management and technique to formulate, plan, manage, implement and maintain information security strategies, policies and procedures. The

course focus on two main discipline of information security management; first is strategic which covers theoretical view of information security management issues that range from national to international levels, and second is on organizational security management. In the later, students are taught on issues and challenges surrounding the implementation of best security practices, process and the application of well-known information security standards as practiced by the industry. In addition, the student will be exposed to professional element in managing security.

References:

1. James M. Stewart, Mike Chapple and Darril Gibson, CISSP: Certified Information Systems Security Professional Study Guide, 8th Edition, Sybex, 2018.
2. Tim Prenzler, Policing and Security in Practice: Challenges and Achievements (Crime Prevention and Security Management), Palgrave Macmillan, 2012.
3. John Warsinske, Mark Graff, Kevin Henry, Christopher Hoover et. al., The Official (ISC)2 Guide to the CISSP CBK Reference, 5th Edition, Wiley, 2019.
4. H.F. Tipton & M. Crause. Information Security Management Handbook Series, 6th Edition, Auerbach Publications, 2009.
5. Shon Harris, Fernando Maymi. CISSP All-In-One Exam Guide, 8th Edition, McGraw-Hill Education, 2018.
6. Shon Harris, Jonathan Ham, CISSP Practice Exams, 5th Edition. McGraw-Hill Education, 2018.

MITS 5473 Watermarking

Learning Outcomes:

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

CLO1: Determine the theoretical background needed to develop and implement basic techniques and algorithms in Digital Watermarking.
CLO2: Explain the categorization of digital watermarking techniques based on characteristics as well as applications.
CLO3: Demonstrate the mechanism of current and future intellectual property management and protection of multimedia.

Synopsis:

The subject explores the mechanism for protecting audio, video, and data. It will also cover basic tools on protecting and

distributing content and multimedia products on e-commerce. The theory and technique on identifying the legal and technical issues that are involved in digital watermarking and methods on the mechanism of current and future intellectual property management and protection of multimedia are also explored.

References:

1. Peter Wayner, Disappearing Cryptography, Information Hiding: Steganography and Watermarking, 3rd Edition, Morgan Kaufmann, 2008.
2. Frank Y. Shih, Digital Watermarking and Steganography: Fundamentals and Techniques, CRC Press, 2017.
3. Hans Georg Schaathun, Machine Learning in Image Steganalysis, Wiley-IEEE Press, 2012.
4. Jessica Fridrich, Steganography in Digital Media: Principles, Algorithms, and Applications, Cambridge University Press, 2009.
5. Mahmoud Hassaballah, Digital Media Steganography: Principles, Algorithms, and Advances, Academic Press, 2020.
6. Abdelrahman Desoky, Noiseless Steganography: The Key to Covert Communications, Auerbach Publications, 2016.

MASTER OF COMPUTER SCIENCE (MULTIMEDIA COMPUTING)

MASTER OF COMPUTER SCIENCE (MULTIMEDIA COMPUTING)

This programme is specifically designed to equip students with security elements in information and communication technology related to management, data and infrastructure.

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:

PEO1: Practice in-depth and specialist knowledge and skills of Computer Science in Multimedia Computing to support organizational goals.

PEO2: Demonstrate higher-order thinking skills and sustained learning in adapting to a constantly changing field through professional development, research and life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Have in-depth skills and strong mastery knowledge in Computer Science (Multimedia Computing);

PO2: Gain a substantial knowledge of entrepreneurship in Information and Communication Technology area;

PO3: Ability to consistently explore and expand contemporary knowledge in targeted discipline (Multimedia Computing);

PO4: Ability to gain employment for career development in related Computer Science field (Multimedia Computing);

PO5: Demonstrate the ability to identify, analyze and implement efficient solutions to problems with effective communication;

PO6: Ability to apply expertise in working environment; and

PO7: Demonstrate the ability to lead, manage and coordinate effectively and ethically as an individual or a team player.

Programme Structure

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
MITP XXXX	Elective 1	3
MITP 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
MITP XXXX	Elective 3	3
MITP 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
MITP XXXX	Elective 1	3
MITP 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
MITP 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
MITP 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 Profesional Ethics	3
MITM 5233	Computer Graphics & 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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
CLO2: Identify the problem area for research and focusing on a specific topic.
CLO3: Develop a cohesive and robust research proposal on a chosen topic.
CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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.

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. Latorre, New Trends on Human-Computer Interaction: A Research, Development, New Tools and Methods, Springer, 2009.
4. Niels Ole Bernsen and Laila Dybkjaer, Multimodal Usability, Springer, 2009.
5. Dov Te'eni, Jane Carey and Ping Zhang, Human Computer Interaction: Developing Effective Organizational Information Systems, John Wiley & Sons, 2007.

MITU 5213 Project 1

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: Construct literature review and appropriate methodology to

complete the project.

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

Synopsis:

This course is the first part of project that contains the results based on the theories and techniques of technologies learnt previously. Besides writing the proposal, student is required to write three chapters of dissertation i.e. Chapter 1: Introduction, Chapter 2: Literature Review and Chapter 3: Research Methodology. In addition, student must present and justify the findings during presentation.

References:

1. Thesis Writing and Guidelines, http://www.utem.edu.my/pps/.

MITU 5226 Project 2

Learning Outcomes:

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

CLO1: Develop solutions to the proposed project.

CLO2: Evaluate 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. and 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/.

MITP 5113 Algorithm Analysis and Design

Learning Outcomes:

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

CLO1: Adapt algorithm design paradigms and method of analysis.
CLO2: Analyse algorithms efficiency in terms of the amount of resources in terms of time and storage space required to execute the algorithm.
CLO3: Design algorithms based on problem types.

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 and Greedy Algorithms 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 understood.

References:

1. Sen, S. and Kumar, A., Design and Analysis of Algorithms: A Contemporary Perspective, 1st Edition, Cambridge University Press, (2019).
2. Arora, A., Analysis and Design of Algorithms, 3rd Edition, Cognella Academic Publishing, 2017.
3. Levitin, A., Introduction to the Design and Analysis of Algorithm, 3rd Edition, Addison Wesley, (2012).
4. Mohan, I. C., Design and Analysis of Algorithms, Prentice Hall of India Private Limited, 2008.
5. Cormen, T.H, Leiserson, C.E, Rivest, R.L & Stein, C., Introduction to Algorithms, 3rd Edition, MIT Press and McGraw-Hill, 2009.
6. Sara Baase, Computer Algorithms: Introduction to Design and Analysis, 3rd Edition, Addison-Wesley, 2000.

MITS 5313 Advanced Data Communications and Network

Learning Outcomes:

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

CLO1: Construct the theory of data communications related with the network models in current technologies.

CLO2: Manipulate the implementation in managing network infrastructure and services with the emerging trends 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. K. G. Srinivasa, Siddesh G. M. and Srinidhi H., Network Data Analytics: A Hands-On Approach for Application Development (Computer Communications and Networks), 1st Edition, Springer, 2018.
2. Forouzan, Behrouz A., Data Communications and Networking, 5th Edition, McGraw-Hill, 2013.
3. William Stallings, Data and Computer Communications, 10th Edition, Pearson, 2014.
4. Massoud Moussavi, Data Communication and Networking: A Practical Approach, 1st Edition, Cengage Learning, 2011.
5. Ajit Pal, Data Communication and Computer Network, PHI Learning Private limited, 2014.
6. Bahaman, Nazrulazhar, Hamid, Erman and Mat Ariff, Azman, Data Communications and Networking: Practical Approach, 1st Edition, Venton, 2008.
7. Curt M. White, Data Communications and Computer Networks, 8th Edition, Cengage Learning, 2016.

MITS 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 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 the 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. Carole Rich, Writing and Reporting News: A Coaching Method, 8th Edition, Cengage Learning, 2015.
4. Patricia Bellia, Paul Berman, Brett Frischmann & David Post, Cyberlaw: Problems of Policy and Jurisprudence in the Information Age, West Academic

Publishing, 2018.
5. Larry P. Gross, John Stuart Katz & Jay Ruby, Image Ethics in Digital Edge, University of Minnesota Press, 2003.
6. Khaw, L. T., Copyright Law in Malaysia, 6th Edition, Lexis Nexis, 2016.
7. Smedinghoff, T. J., Online Law, Addison Wesley, 1996.

MITM 5233 Computer Graphics & 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. William Vaughan, Digital Modeling, New Riders, 2012.
3. Steven Gortler, Foundation of 3D Computer Graphics, MIT Press, 2012.
4. Jonas Gomes, Luiz Velho, Computer Graphics: Theory and Practice, A K Peters/CRC Press, 2012.
5. Sumanta Guha, Computer Graphics through OpenGL, Chapman and Hall/CRC, 2019.
6. Colin Ware, Information Visualization Perception for Design (Interactive Technologies), 4th Edition, Morgan Kaufmann, 2019.

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. Andy Beane, 3D Animation Essentials, Sybex, 2012.
2. David Rodriquez, Animation Methods: The Only Book You'll Ever Need,

CreateSpace Independent Publishing Platform, 2012.
3. Ami Copine, 3D Art Essentials: The Fundamentals of 3D Modeling, Texturing and Animation, Focal Press, 2011.
4. Rick Parent, Computer Animation Algorithms and Techniques, 3rd Edition, Morgan Kauffmann, 2012.
5. Oliver Villar, Learning Blender: A Hands-On Guide to Creating 3D Animated Characters, 2nd Edition, Addison-Wesley Professional, 2017.
6. Tina O'Hailey, Rig it Right! Maya Animation Rigging Concepts, 2nd Edition, Routledge, 2018.

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 websites, 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. Ian McLoughlin, Applied Speech and Audio Processing with MATLAB Examples, Cambridge University Press, 2009.
5. Walter Fischer, Digital Video and Audio Broadcasting Technology: A Practical Engineering Guide (Signals and Communication Technology), 3rd Edition, Springer, 2010.
6. Kaichen Hu, The Effects of Digital Video Technology On Modern Film, Drexel University, 2016.

MASTER OF TECHNOLOGY
(DATA SCIENCE & ANALYTICS)

MASTER OF TECHNOLOGY (DATA SCIENCE AND ANALYTICS)

The Master of Technology (Data Science and Analytics), for short MTDS, is aimed at recent graduates and industry practitioners from various academic disciplines with strong analytical and computing skills or experiences. The programme is designed to equip students with fundamental and applied knowledge, technical skills, and current technologies in Data Science and Analytics area. These include the fundamental principles of data science, the capability to analyse a diversity of big data, the skills of using data science tools and the capability to apply the data analytics techniques to various domains, as well as the capability to present the analytics results to intended audience. The programme's delivery modes are through lectures, lab sessions, and industrial projects, that emphasize on state-of-the-practice techniques, tools and technology, and recognised methodology through university-industry collaborations.

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:

PEO1: Practice in-depth and specialist knowledge, technology and skills of Science and Analytics, and related disciplines to effectively support complex organizational decision making.

PEO2: Demonstrate business acumen in solving complex problems and sustain intellectual curiosity through life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Ability to integrate Data Science and Analytics knowledge for excellent practice as a Data Scientist and Data Analyst.

PO2: Apply knowledge, technology and skills of Data Science and Analytics to provide potential hidden information, knowledge and insights for data-driven and well-informed decision making.

PO3: Apply critical and creative thinking and conduct systematic investigations into complex Big Data, analytics and decisions problems to generate innovative solutions and extend knowledge in Data Science and Analytics.

PO4: Effectively communicate, verbally and in writing, Data Science and Analytics solutions to peers, superiors, clients and experts and participate in multidisciplinary teams either as a competent leader or a group member.

PO5: Apply independent and life-long learning skills to keep up with latest relevant knowledge and cutting edge technologies in Data Science and Analytics, and build up further professional and information management skills.

PO6: Work and function effectively in community and multidisciplinary teams either as a leader or a group member, demonstrate respect for cultural diversity and contribute to their organization and society.

PO7: Prepare, publish and present technical materials to a diverse audience, applying ethics, values, attitude and professionalism.

PO8: Demonstrate entrepreneurial and management skills.

Programme Structure

September Intake:

Semester 1 (September)		
Course Code	**Course**	**Credit**
MPSW 5013	Research Methodology	3
MPSW 5063	Entrepreneurship	3
MTDS 5113	Fundamental of Data Science	3
MTDS 5123	Big Data Management	3
MTDS 5133	Applied Statistical Methods	3
MTDS 5143	Applied Machine Learning	3
	Total credit	**18**
Semester 2 (February)		
Course Code	**Course**	**Credit**
MTPU 5314	Project 1	4
MTDS 5163	Big Data Analytics and Visualization	3
MTDS 5163	Modelling and Decision Making	3
MTDS XXXX	Elective 1	3
MTDS XXXX	Elective 2	3
	Total credit	**16**
Semester 3 (Short Semester)		
Course Code	**Course**	**Credit**
MTPU 5326	Project 2	6
	Total credit	**6**

February Intake:

Semester 1 (February)		
Course Code	**Course**	**Credit**
MPSW 5013	Research Methodology	3
MTDS 5113	Fundamental of Data Science	3
MTDS 5123	Big Data Management	3
MTDS 5133	Applied Statistical Methods	3
MTDS 5143	Applied Machine Learning	3
MTDS 5163	Big Data Analytics and Visualization	3
	Total credit	**18**
Semester 2 (Short Semester)		
Course Code	**Course**	**Credit**
MTPU 5314	Project 1	4
MPSW 5063	Entrepreneurship	3
	Total credit	**7**
Semester 3 (September)		
Course Code	**Course**	**Credit**
MTPU 5326	Project 2	6
MTDS 5163	Modelling and Decision Making	3
MTDS XXXX	Elective 1	3
MTDS XXXX	Elective 2	3
	Total credit	**15**

Elective courses - choose TWO (2) only:

Course Code	Course	Credit
MTDS 5213	Special Topics in Applied Data Science	3
MTDS 5223	Manufacturing Analytics	3
MTDS 5233	Social Media Analytics	3
MTDS 5243	Geospatial Analytics	3
MTDS 5253	Healthcare Analytics	3
MTDS 5263	Tourism Analytics	3
MTDS 5273	Customer and Financial Analytics	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
- CLO2: Identify the problem area for research and focusing on a specific topic.
- CLO3: Develop a cohesive and robust research proposal on a chosen topic.
- CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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 Enterpreneurship

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 constrains 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.

MTDS 5113 Fundamentals of Data Science

Learning Outcomes:

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

CLO1: Describe what Data Science is and analyze the skill sets needed to be a data scientist.
CLO2: Identify the Data Analytic Life-cycle and how its components interact.
CLO3: Construct computer program to carry out basic statistical modeling and analysis.

Synopsis:

The course provides an introduction to data science, which is the study of the generalizable extraction of knowledge from data. Being a data scientist requires an integrated skill set spanning mathematics, statistics, machine learning, databases and other branches of computer science along with a good understanding of the craft of problem formulation to engineer effective solutions. This course provides an overview of today's Big Data environment, the rationale and opportunity for a new approach to analytics, the roles required, including the Data Scientist, and representative examples

of big data analytics in industry. This course introduces students to the fundamental principles of data science that underlie the algorithms, processes, methods, and data-analytic thinking. It also introduces students to algorithms and tools based on these principles, and frameworks to support problem-focused data-analytics thinking. The course ends by examining students understanding on integration and synthesis of concepts and their application to solving problems.

References:

1. F. Provost and T. Fawcett, Data Science for Business, O'Reilly Media, 2013.
2. F. Provost and T. Fawcett, Data Science and its Relationship to Big Data and Data-Driven Decision Making. Data Sci. Big Data, vol. 1, no. 1, pp. 51–59, 2013.
3. D. Donoho, 50 Years of Data Science, R Software, 2015.
4. J. Saltz & J. Stanton, An Introduction to Data Science, SAGE Publications, Inc., 2017.
5. Nina Zumel & John Mount, Practical Data Science with R, Manning Publication, 2017.

MTDS 5123 Big Data Management

Learning Outcomes:

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

CLO1: To distinguish the requirements of traditional data management and big data management.
CLO2: To compare the characteristics of big data solutions in the market.
CLO3: To build a big data management application using selected big data solutions.

Synopsis:

In this course, students are exposed to the concepts and principles of big data management, and technologies for BDM. Topics covered shall include the types, characteristics, storage systems of Big data, data modelling for big data, big data quality management, and introduction to BDM tools and technologies (NoSQL, Hadoop, In-database, PLSQL, HBase). At the end of the course, students should be able to design a plan for BDM that is able to support Big Data Analytics and discoveries of actionable hidden knowledge, for effective and timely business decisions.

References:

1. Kuan-Ching Li, Hai Jiang, Albert Zomaya

(2017). Big Data Management and Processing. Chapman and Hall/CRC.
2. Jim Gray, The Fourth Paradigm: Data-Intensive Scientific Discovery. Microsoft, Edited by Tony Hey, et al., 2009.
3. Viktor Mayer-Schönberger, Big Data: A Revolution That Will Transform How We Live, Work and Think, Eamon Dolan/Mariner Books, 2009.
4. Tom White, Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale, 4th Edition, O'Reilly Media, 2009.
5. John W. Foreman, Data Smart: Using Data Science to Transform Information into Insight, 1st Edition, Wiley, 2013.
6. Edward Capriolo, Dean Wampler, Jason Rutherglen, Programming Hive: Data Warehouse and Query Language for Hadoop, O'Reilly Media Inc, 2017.

MTDS 5133 Applied Statistical Methods

Learning Outcomes:

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

CLO1: Develop solutions to real life or industry-based statistical problems.

CLO2: Test the validity of statistical arguments or conclusions that derived from a set of real or simulated data.

CLO3: Propose solution plan to industry problems based on available set of valid and current data.

Synopsis:

This course covers the discovery and exploration of complex multivariate relationships among variables. They are Predictive Models, which include generalized linear models (such multiple regression, logistic regression, Poisson regression, model adequacy and survival analysis), discriminant function analysis (both linear and quadratic), time series modelling, Latent Variable Models such as factor analysis (principal components, exploratory and confirmatory factor analysis), correspondence analysis, and multidimensional scaling (metric and nonmetric). It also introduces other longitudinal methods that can handle data with difficult correlations over time.

References:

1. Kabacoff, R.I., R in action: Data Analysis and Graphics with R, 2nd Edition. Manning Pub. Co., 2015.
2. Westfall, P., Henning, K.S.S.,

Understanding Advanced Statistical Methods, CRC Press Taylor & Francis Group, 2013.

3. Ciaccio, A.D., Coli, M., Ibanez, J.M.A., Advanced Statistical Methods for Analysis of Large Data Sets: Studies in Theoretical and Applied Statistics, Springer Publishing Company, 2012.
4. Kabacoff, R.I., Advanced Statistics, 2014, Available online:[http://www.statmethods.net/advstats/. Accessed on: 19 January 2017].

MTDS 5143 Applied Machine Learning

Learning Outcomes:

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

CLO1: Evaluate different machine learning techniques in terms of their applicability to different Machine Learning problems.

CLO2: Manipulate appropriate tools to apply suitable machine learning techniques to the data set given to solve the problem.

CLO3: Propose a systematic approach to conduct scientific experimental investigations and assessment.

Synopsis:

Machine learning is a rapidly growing field at the intersection of computer science and statistics, which concerns about finding patterns in real data. The learning evolved from the study of pattern recognition and computational learning theory in artificial intelligence to explore the construction of algorithms for making prediction on data. This course aims to provide practical skills in applying machine learning algorithms on real applications. It emphases on the implementation and evaluation of machine learning systems. The main focus will be placed on applying machine learning model for problem solving more than the fundamental understanding of learning algorithm. Students will be exposed to the tasks on design, implementation, training and evaluation of a machine learning systems. Topics of discussion include: introduction to machine learning; real-world data; feature engineering; classification techniques; predicting continuous target variables; model evaluation, parameter tuning; clustering analysis; association analysis; ensemble learning; reinforcement learning; deep learning; and scaling machine learning workflows.

References:

1. Kelleher, John D., Brian Mac Namee, Aoife D'Arcy, Fundamentals of machine learning for predictive data analytics: algorithms, worked examples, and case studies, MIT Press, 2015.
2. Brink, Henrik, J. Richards, Mark Fetherolf, Real-world machine learning, Manning, 2014.
3. Goodfellow, Ian, Yoshua Bengio, Aaron Courville, Deep learning, MIT Press, 2016.
4. Witten, Ian H., et al., Data Mining: Practical machine learning tools and techniques, Morgan Kaufmann, 2016.
5. Alpaydin, Ethem, Machine Learning: The new AI, MIT Press, 2016.
6. Gollapudi, Sunila, Practical machine learning, Packt Publishing Ltd., 2016.
7. RapidMiner Documentation, http://docs.rapidminer.com/
8. SAS Documentation, https://support.sas.com/documentation/
9. Tensorflow Tutorials, https://www.tensor-flow.org/tutorials/

MTDS 5153 Big Data Analytics and Visualization

Learning Outcomes:

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

CLO1: Demonstrate understanding the concepts, fundamentals and methodologies of big data analytics.

CLO2: Analyze massive volumes of unstructured data using data analytics software.

CLO3: Construct big data analytics and visualize in a proper and meaningful way using appropriate statistical techniques.

Synopsis:

This course consists of two parts: Big Data Analytics and Data Visualization. In the first part, the course brings together several key information technologies used in manipulating, storing, and analyzing big data especially unstructured data. The unstructured data are text, images, videos, audio/speech. R or Python or other tools will be used as the tool for analysing the unstructured data. In the second part of this course, data visualization is covered to enables multi-level analysis of data. The

fundamental concepts in data visualization will be covered, including the various types of data visualization according to input types, different approaches in determining good data visualization techniques and methods, good practices for amplifying cognition, revealing better insights and unveiling underlying structure. Students will also learn how to develop interactive visualizations and applications, use various data exploratory functions and how to present the data.

References:

1. Gergely Daroczi, Mastering Data Analysis with R, Packt Publishing, 2017.
2. Wes McKinney, Python for Data Analysis, O'Reily, 2012.
3. Dipanjan Sarkar, Text Analytics with Python, Apress, 2016.
4. Jan Erik Solem, Programming Computer Vision with Python, O'Reily, 2012.
5. Daniel Jurafsky, James H Martin, Speech and Language Processing, Prentice Hall, 2009.
6. Alexandru C. Telea, Data Visualization: Principles and Practice, 2nd Edition, CRC Press, 2014.
7. Ben Jones, Communicating Data with Tableau: Designing, Developing, and Delivering Data Visualizations, O'reilly, 2014.
8. Cole Nussbaumer Knaflic, Storytelling with Data: A Data Visualization Guide for Business Professionals, John Wiley & Sons, 2017.

MTDS 5163 Modelling and Decision Making

Learning Outcomes:

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

CLO1: Integrate knowledge of modelling and prescriptive analytics with data science for data-driven and evidence-based decision making.

CLO2: Develop prescriptive models and solutions using appropriate software tools and analysis of Big Data, and communicate the results.

CLO3: Apply appropriate relevant modelling and prescriptiveanalytics technique using Bid Data input to solve complex decision problems.

Synopsis:

In Data Science, prescriptive analytics is the final frontier of analytics, which entails the application of mathematical modelling, simulation, optimization and computational

intelligence to suggest decision options, taking advantage of the results from the earlier analytic stages of descriptive and predictive analytics. Prescriptive analytics optimizes decision making and able to suggest or prescribe what actions to take in order to maximize output, given constraints and key objectives, and shows the implication of each decision option. In this course, students are exposed to operations research modelling, and meta-heuristics and soft computing based optimizations, and showed how to exploit them to solve real-world decision problems. The course covers the arts of decision making, decision making and modelling process, decision analysis and method of decision science which involves the application of selected operations research and optimization (hard and soft) techniques, to strategic and managerial decision problems. The focus is to impart analytical systems level thinking and problem solving skills in complex decision making contexts. At the end of the course students will have exposure and deep understanding on how organizational decisions are made in the present of Big data, what appropriate and relevant modelling and analytics solutions should be provided to support well-informed, in-time and effective decision making.

References:

1. Rudolf Grunig and Richard Kuhn, Successful Decision-Making: A Systematic Approach to Complex Problems, Springer, 2013.
2. Frederick S. Hillier, Mark S, Hillier, Introduction to Management Science: A Modelling and Case Studies Approach, McGraw Hill, 2011.
3. Williams, H.P., Model Building in Mathematical Programming, 5th Edition, Wiley, 2013.
4. Dursun Delen, Prescriptive Analytics: The Final Frontier for Evidence-Based Management and Optimal Decision Making, 2017.

MTDS 5213 Special Topics in Applied Data Science

Learning Outcomes:

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

CLO1: Analyze emerging technologies in data science.
CLO2: Integrate new data science concepts and skills by adhering to professional ethics.
CLO3: Evaluate the usage of data science in industries and communicate data science results to various stakeholders.

Synopsis:

The course provides a comprehensive examination of data science as it is applied to real organizations and processes. Students will be introduced to real-world examples and have the opportunity to learn from industry case studies on organizations that have successfully applied data science to their advantage. This course will also provide the students with an understanding of the use of emerging technologies in data science. Communicating data science results to various stakeholders is also emphasized in this course. The course ends by examining current legal structures in Malaysia and related international legal practices, as they apply to Big Data. Ethical issues are discussed such that students able to develop insights for identifying when data science processes could lead to breaches in legal or ethical parameters, whenever such issues are encountered in their professional lives. Discussions on ethics are important as data science practices are moving forward faster than legal and organizational structures can keep pace.

References:

1. Daniel T. Larose, Chantal D. Larose, Data Mining and Predictive Analytics, 2nd Edition, 2015.
2. Kuan-Ching Li, Hai Jiang, Albert Zomaya, Big Data Management and Processing, Chapman and Hall/CRC, 2017.
3. Deborah Nolan, Duncan T. Lang, Data Science in R: A Case Studies Approach to Computational Reasoning and Problem Solving, 2015.

MTDS 5223 Manufacturing Analytics

Learning Outcomes:

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

CLO1: Justify analytics use cases in manufacturing systems.
CLO2: Formulate analytics models for manufacturing systems.
CLO3: Reorganise appropriate tools to implement analytics model for manufacturing use cases.

Synopsis:

Manufacturing analytics aims to analyse the production data to generate added value. The analytics models are purpose-built to improve decision-making and boost production performance. Manufacturers take advantage of the actionable insights to

reduce process flaws, increase performance, save time and cost. This course aims to provide a general overview of implementing analytics in manufacturing domain. It emphases on practical issues and application of advanced analytics on manufacturing challenges. The main focus will be placed on designing the manufacturing use cases using analytics tools toward actionable intelligence. Topics of discussion include: introduction to manufacturing analytics; the return of investments in manufacturing analytics; product design analysis; the manufacturing process; automation and computer-aided manufacturing; IoT-enabled manufacturing system; manufacturing performance management, performances analysis method, and production scheduling system; and the human side of analytics in manufacturing industry.

References:

1. Kalpakjian, Serope, Steven R. Schmid, Manufacturing Engineering and Technology, Person Education, 2013.
2. Zhang, Yingfeng, Fei Tao, Optimization of Manufacturing Systems Using the Internet of Things, Academic Press, 2016.
3. Davenport, Thomas H., Enterprise analytics: Optimize performance, process and decisions through big data, Pearson Education,2013.
4. Davenport, Thomas H., Big data at work: dispelling the myths, uncovering the opportunities, Harvard Business review Press, 2014.
5. Seider, Warren D., Junior D. Seader, Daniel R. Lewin, Product and Process Design Principles: Synthesis, Analysis And Evaluation, John Wiley & Sons, 2017.
6. Sarma, Kattamuri S., Predictive modeling with SAS Enterprise Miner: Practical solutions for business applications, SAS Institute, 2013.
7. Saha, Dipankar, Mahalakshmi Syamsunder, Sumanta Chakraborty, Manufacturing Performance Management using SAP OEE: Implementing and Configuring Overall Equipment Effectiveness, Apress, 2016.
8. Tableau Support, https://www.tableau.com/support/help/
9. SAS Documentation, https://support.sas.com/documentation/

MTDS 5233 Social Media Analytics

Learning Outcomes:

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

CLO1: Analyze the fundamentals and concepts of social media data mining.

CLO2: Identify solution steps in solving problems for social media mining using mathematical and geometrical models.

CLO3: Construct computer program based on appropriate text mining methods for practical uses in social media analytics.

Synopsis:

This course will introduce social media content analytics. Text data mining, especially data from social media has been gaining attention as the available volume of online social media information grows at a rate that is by far higher than our human capacity to handle and process such a huge volume of data from the web. Topics that will be covered in this course includes overview of social media data mining, practices of social media data mining, retrieving twitter data, mining twitter data, text mining fundamentals, blog summarization, analysing Facebook data and content analysis.

References:

1. Helen Kennedy, Post, Mine, Repeat: Social Media Data Mining Becomes Ordinary, Palgrave Macmillan, Springer Nature, 2016.
2. Banchs, R. E., Text Mining with MATLAB®, Springer Science & Business Media, 2012.
3. Zafarani R., Abbasi M.A., Liu H., Social Media Mining: An Introduction, Cambridge University Press, 2014.
4. Matthew A. Russell, Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More, 2nd Edition, 2014.
5. Miner, G., Practical text mining and statistical analysis for non-structured text data applications, Academic Press, 2012.

MTDS 5243 Geospatial Analytics

Learning Outcomes:

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

CLO1: Assess the strengths and weaknesses of remote sensing instruments and platforms for a variety of geospatial analytics scenarios.

CLO2: Solve multi-step remote sensing workflows to solve problems in a variety of geospatial applications.

CLO3: Organise acquired knowledge and critical thinking skills to solve a real-world geospatial problem with appropriate remote sensing data and processing methods.

Synopsis:

Geospatial analytics offers revolutionary approaches in discovering how and why location matters in problem solving and decision-making. This course elaborates the acquisition, processing, analysis and interpretation of objects, areas and phenomena by utilising geospatial analysis for various domains, such as environmental sustainability, urban planning, agriculture and natural resources. It aims to provide knowledge and skill in geospatial analysis particularly by making use of remotely sensed data captured from sensors mounted on airborne and space borne platforms. In order to understand an object, area or phenomenon, students will be integrating knowledge and skills in image processing that involves the use of fundamental and advanced algorithms, analysing, visualizing and interpreting of geospatial data for problem solving and decision making.

References:

1. John R.Jensen, Introductory Digital Image Processing: A Remote Sensing Perspective. Pearson Series in Geographic Information Science, 4th Edition, Pearson, 2015.
2. De Smith, Goodchild, Longley, Geospatial Analysis: A Comprehensive Guide to Principles, Techniques and Software Tools, The Winchelsea Press, 2018.
3. Eric Cheng, Aerial Photography and Videography Using Drones, Peachpit Press, 2015.
4. Hassan A. Karimi & Bobak Karimi, Geospatial Data Science Techniques and Applications, CRC Press, 2017.

MTDS 5253 Healthcare Analytics

Learning Outcomes:

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

CLO1: Construct solution in healthcare analytics through simple modelling and simulation.
CLO2: Design a concept of healthcare analytics to support the data sciences analysis and design.
CLO3: Formulate the healthcare analytics in solving problems data science problems.

Synopsis:

This course covers the transformation of big data by creating enormous opportunities for companies, researchers and other related area in healthcare to improve patient outcomes. Healthcare analytics powers data-driven transformations that combine strategy, big data and advanced analytics, and implementation processes to change the way healthcare companies especially think, decide, and act. The four areas within healthcare are considered as a case study; claims and cost data (retail purchases e.g. data captured in running stores), pharmaceutical and research and development (R & D) data, clinical data (collected from electronic medical records (EHRs)), and patient behaviour and sentiment data (patient behaviours and preferences). By the end of this course, students are able to design, analyse and implement the healthcare analytics concepts in data sciences.

References:

1. J. Burke, Health Analytics: Gaining the Insights to Transform Health Care, Wiley, 2013.
2. J. Schrom, Machine Learning for Healthcare: Case Studies and Algorithms for Working with Data, 1st Edition, O'Reilly, 2016.
3. S. Dua, U. R. Acharya, P. Dua, Machine Learning in Healthcare Informatics (Intelligent Systems Reference Library), Springer, 2014.
4. K. Marconi, H. Lehmann, Big Data and Health Analytics, 1st Edition, CRC Press, 2015.
5. L. B. Madsen, Data-Driven Healthcare: How Analytics and BI are Transforming the Industry, Wiley, 2014.

MTDS 5263 Tourism Analytics

Learning Outcomes:

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

CLO1: Demonstrate understanding of the concept of tourism analytics.

CLO2: Reproduce solutions for tourism application problems using analytics software.

CLO3: Solve tourism application problems using appropriate analytics method.

Synopsis:

The course includes introduction to analytics in tourism design, predicting tourist demand using Big Data, travel demand modelling with behavioural data, methods of measuring human senses and the touristic experience, implications of quantified traveller for smart tourism development, tourism intelligence and visual media analytics for destination management organizations and a few more topics that are relevant.

References:

1. Xiang, Z., Fesenmaier, D. R., Analytics in Smart Tourism Design: Concepts and Methods, Springer International Publishing Switzerland, 2017.
2. Stephen L. J Smith, Tourism Analysis: A Handbook, 2nd Edition, London: Routledge Taylor & Francis Group, 2016.
3. Uysal, M., Schwartz, Z., Sirakaya-Turk, E., Management Science in Hospitality and Tourism: Theory, Practice, and Applications, Apple Academic Press, 2016.
4. F. Provost, T. Fawcett, Data Science for Business, O'Reilly Media, 2013.
5. Marianna Sigala, Roya Rahimi & Mike Thelwall, Big Data and Innovation in Tourism, Travel, and Hospitality: Managerial Approaches, Techniques, and Applications, Springer, 2019.

MTDS 5273 Customer and Financial Analytics

Learning Outcomes:

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

CLO1: Justify analytics use cases in customer behaviour and financial systems.

CLO2: Formulate analytics models for customer behaviour and financial systems.

CLO3: Reorganise appropriate tools to implement analytics model for customer behaviour and financial use cases.

Synopsis:

Customer analytics is a process by which data from customer behaviour is used to help make key business decisions via market segmentation and predictive analytics. This information is used by businesses for direct marketing, site selection, and customer relationship management. Marketing provides services in order to satisfy customers. With that, the productive system is considered from its beginning at the production level, to the end of the cycle at the consumer. Customer analytics plays a very important role in the prediction of customer behaviour today. Financial analytics explores how financial statement data and non-financial metrics can be linked to financial performance. In this course, students will learn how data is used to assess what drives financial performance and to forecast future financial scenarios.

References:

1. Art Weinstein, Superior Customer Value: Strategies for Winning and Retaining Customers, 3rd Edition, CRC Press, 2016.
2. Michael Munson,Customer Analysis, Mc Graw Hill, 2014.
3. Ron S. Kenett, Silvia Salini, Modern Analysis of Customer Surveys: with Applications using R, 1st Edition, Wiley, 2012.
4. John C Lee, Cheng F Lee, Financial Analysis, Planning & Forecasting: Theory and Application, 3rd Edition, World Scientific, 2016.
5. Stephen Bloomfield, Understanding and Interpreting Company Accounts: A practical guide to published accounts for non-specialists, Robinson, 2016.
6. Clifford S. Ang, Analyzing Financial Data and Implementing Financial Models Using R, Springer, 2016.
7. Tableau Support, https://www.tableau.com/support/help/

8. SAS Documentation, https://support.sas.com/documentation/

MTPU 5314 Project 1

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: Construct comprehensive literature review and appropriate procedures to complete the project.

CLO3: Justify 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. Rubin, K.S., Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley Profesional, 2012.
2. O'Brien, H., Agile : Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management, 3rd Edition, Addison-Wesley, 2016.
3. Cresswell, J.W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, California: SAGE Publications, Incorporated, 2014.

MTPU 5326 Project 2

Learning Outcomes:

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

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

CLO2: Evaluate 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.

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. Rubin, K.S., Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley Profesional, 2012.
2. O'Brien, H., Agile : Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management, 3rd Edition, Addison-Wesley, 2016.
3. Cresswell, J. W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition. California: SAGE Publications, Incorporated, 2014.

MASTER OF SOFTWARE ENGINEERING (MOBILE DEVELOPMENT)

MASTER OF SOFTWARE ENGINEERING (MOBILE DEVELOPMENT)

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:

PEO1: Practice in-depth and specialist knowledge, technology and skills of Mobile Development, and related disciplines to effectively support complex organizational decision making.

PEO2: Demonstrate business acumen in solving complex problems and sustain intellectual curiosity through life-long learning.

PEO3: Demonstrate effective leadership and communication to a wide variety of audiences or multi-disciplinary teams, tolerate and value different global perspectives and cultures.

PEO4: Practice professional, ethical and societal responsibilities, and show adaptability in different roles and surroundings in contributing to the community.

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:

PO1: Integrate software and application development knowledge for effective and excellent practice as a mobile application developer and designer.

PO2: Apply knowledge, technology and skills of software and app developer to provide knowledge to design and develop innovative and quality mobile applications.

PO3: Apply critical and creative thinking and conduct systematic investigations into complex mobile application development and decisions problems to generate innovative solutions and extend knowledge in software and app development.

PO4: Ability to effectively communicate, verbally and in writing, software and application development solutions to peers, superiors, clients and experts and participate in multidisciplinary teams either as a competent leader or a group member.

PO5: Effectively communicate, orally and in writing, software and app development solutions to peers, superiors, clients and experts.

PO6: Work and function effectively in community and multidisciplinary teams either as a leader or a group member, demonstrate respect for cultural diversity and contribute to their organization and society.

PO7: Prepare, publish and present technical materials to a diverse audience, applying ethics, values, attitude and professionalism.

PO8: Demonstrate entrepreneurial and management skills.

Programme Structure

September Intake:

Semester 1 (September)		
Course Code	**Course**	**Credit**
MPSW 5043	Research Methodology	3
MPSW 5063	Entrepreneurship	3
MSMD 5113	Native Mobile Development I	3
MSMD 5123	Internet of Things Development	3
MSMD XXXX	Elective 1	3
	Total credit	**15**
Semester 2 (February)		
Course Code	**Course**	**Credit**
MTPU 5314	Project 1	4
MSMD 5133	User Experience Design & User Interface Practice	3
MSMD 5143	Mobile Analytic	3
MSMD 5153	Mobile Testing	3
MTDS XXXX	Elective 2	3
	Total credit	**16**
Semester 3 (Short Semester)		
Course Code	**Course**	**Credit**
MTPU 5326	Project 2	6
MSMD 5163	Mobile Back-end	3
	Total credit	**9**

February Intake:

Semester 1 (February)		
Course Code	**Course**	**Credit**
MPSW 5043	Research Methodology	3
MPSW 5063	Entrepreneurship	3
MSMD 5133	User Experience Design & User Interface Practice	3
MSMD 5143	Mobile Analytic	3
MSMD 5153	Mobile Testing	3
MSMD XXXX	Elective 1	3
	Total credit	**18**
Semester 2 (Short Semester)		
Course Code	**Course**	**Credit**
MTPU 5314	Project 1	4
MSMD 5163	Mobile Back-end	3
	Total credit	**7**
Semester 3 (September)		
Course Code	**Course**	**Credit**
MTPU 5326	Project 2	6
MSMD 5113	Native Mobile Development I	3
MSMD 5123	Internet of Things Development	3
MSMD XXXX	Elective 2	3
	Total credit	**15**

Elective courses - choose TWO (2) only:

Course Code	Course	Credit
MSMD 5213	Agile Project Management	3
MSMD 5223	Mobile App Architecture	3
MSMD 5233	Native Mobile Development II	3
MSMD 5243	Mobile Security and Privacy	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
- CLO2: Identify the problem area for research and focusing on a specific topic.
- CLO3: Develop a cohesive and robust research proposal on a chosen topic.
- CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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 Enterpreneurship

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 constrains 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.

MSMD 5113 Native Mobile Development I

Learning Outcomes:

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

CLO1: Demonstrate understanding of the concept and fundamentals of native mobile application and development.

CLO2: Develop an application using android native language.

CLO3: Integrate the application with existing API services available on the internet and devices hardwares.

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. John Horton, Android Programming with Kotlin for Beginners: Build Android apps starting from zero programming experience with the new Kotlin programming language, Packt Publishing, 2019.
2. Dawn Griffiths & David Griffiths, Head First Kotlin: A Brain-Friendly Guide, O'Reilly Media, 2019.
3. Bill Phillips, Chris Stewart & Kristin Marsicano, 2018 Android Programming, 4th Edition, Big Nerd Ranch Guides, 2018.
4. Mark Wickham, Practical Android, 1st Edition, Apress, 2018.
5. Neil Smyth, Android Studio 3.0 Development Essentials - Android, 8th Edition, CreateSpace Independent Publishing Platform, 2018.

MSMD 5123 Internet of Things 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:

In this course, students 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 subject 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. Rajkumar Buyya & Amir Vahid Dastjerdi, Internet of Things: Principles and Paradigms, Elsevier, 2016.
5. Arshdeep Bahga & Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015.

MSMD 5133 User Experience Design & User Interface Practice

Learning Outcomes:

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

CLO1: Analyse successful practices in emerging interface design.
CLO2: Identify suitable design to ensure a good user experience.
CLO3: Design effective prototypes and wireframes using an iterative methodology

Synopsis:

This course introduces the students to advanced practices and tools of the User Experience (UX) / User Interface (UI) design for mobile applications. It covers history of user experience, information design, elements of user experience, wireframing, mockup, prototype and guidelines in guiding students to build a mobile application through individual and group work. Using current technologies and tools, students will create a basic mobile application by applying mobile interface guidelines. As a whole, the course will expose students to state-of-the-art, advanced UX/UI tools and techniques and prepare them to design good and realistic interface.

References:

1. Will Grant, 101 UX Principles: A definitive design guide, Packt Publishing, 2019.
2. Brad Nunnally & David Farkas, UX Research: Practical Techniques for Designing Better Products, 1st Edition, O'Reilly Media, 2016.
3. ZenZen Studios, 2018 Dot Grid UI and UX Notebook: A Planning Notebook for Developers, Independently published, 2016.
4. Cao J. Zieba & Ellis M., Guide to Wireframing/Prototyping/Mockups, SitePoint, 2016.
5. Scott Faranello, Practical UX Design, Packt Publishing, 2016.

MSMD 5143 Mobile Analytic

Learning Outcomes:

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

CLO1: Analyze the relationship between mobile testing and mobile analytics.
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. Hwaiyu Geng, Internet of Things and Data Analytics Handbook, Wiley, 2017.
2. Thirukkumaran Haridass & Eric Brown, Learning Google BigQuery: A beginner's guide to mining massive datasets through interactive analysis, Packt Publishing, 2017.
3. Julian Harty & Antoine Aymer, The Mobile Analytics Playbook: A practical guide to better testing to Master Data Analytics, 2016.
4. Feras Alhlou, Shiraz Asif & Eric Fettman, Google Analytics Breakthrough: From

Zero to Business Impcat, John Wiley & Son, 2016.

MSMD 5153 Mobile Testing

Learning Outcomes:

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

CLO1: Demonstrate understanding of the concept and fundamentals of testing and mobile application testing.

CLO2: Comparing and contrasting testing types to appropriate contexts and scenarios for the audiences of interest as well as their strengths and weaknesses.

CLO3: Construct 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. Rex Black, Mobile Testing, BCS, The Chartered Institute for IT, 2018.
2. Vijay Kumar Velu, Mobile Application Penetration Testing, Packt Publishing, 2016.
3. Unmesh Gundecha & Satya Avasarala, Selenium WebDriver 3 Practical Guide: End-to-end automation testing for web and mobile browsers with Selenium WebDriver, 2nd Edition, Packt Publishing, 2018.
4. Eran Kinsbruner, Continuous Testing for DevOps Professionals: A Practical Guide From Industry Experts, 1st Edition, CreateSpace Independent Publishing Platform, 2018.
5. Boni Garcia, Mastering Software Testing with JUnit 5: Comprehensive guide to develop high quality Java applications, Packt Publishing, 2017.

MSMD 5163 Mobile Back-End

Learning Outcomes:

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

CLO1: Apply knowledge, technology and skills of mobile back-end.

CLO2: Evaluate back-end application and technology.

CLO3: Develop mobile back-end application.

Synopsis:

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

References:

1. Julian Gramm, AWS: The Complete Guide From Beginners To Advanced For Amazon Web Services, Amazon, 2019.
2. Michael S. S. Cuppett, DevOps, DBAs, and DBaaS Managing Data Platforms to Support Continuos Integration, Apress, 2017.
3. Peter Sbarski, Serverless Architectures on AWS: With examples using AWS Lambda 1st Edition. Manning Publications, 2017.
4. Wim Deblauwe, Practical Guide to Building an API Back End with Spring Boot, Lulu.com, 2019.
5. Azat Mardan, Practical Node.js: Building Real-World Scalable Web Apps, 2nd Edition, APress, 2018.

MSMD 5213 Agile Project Management

Learning Outcomes:

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

CLO1: Apply the concept of agile project management for any IT projects.

CLO2: Work on the principles and practices of agile project management in the IT projects.

CLO3: Follow 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. Jeff Cohn, Scrum Mastery + Agile Leadership: The Essential and Definitive Guide to Scrum and Agile Project Management, Independently Published, 2019.
2. Jeff Cohn, Scrum Fundamentals: A Beginner's Guide to Mastery of The Scrum Project Management Methodology (Scrum Mastery), Independently Published, 2019.
3. Henry O'Brien, Agile: Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management!, 3rd Edition, Addison-Wesley, 2016.
4. Anusha Hewage, Becoming a Scrum Master: Everything you should know to be a GREAT Scrum Master, Independently Published, 2019.
5. iCertify Training, The Scrum Master Training Manual: The Definitive Guide for Professional Scrum Master - PSM Certification, Independently Published, 2018.

MSMD 5223 Mobile App Architecture

Learning Outcomes:

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

CLO1: Classify and distinguish the basic platforms and technology trends of handheld devices.
CLO2: Recognise and differentiate the mobile architecture components and its functionalities.
CLO3: Demonstrate the ability to design mobile application architecture based on requirements gathered.

Synopsis:

This course covers the theoretical and technical knowledge and skills necessary to design the mobile application architecture. The components of the architecture, the platforms and infrastructure are discussed and elaborated. The concepts of client user interface and data transfer are also covered in this subject.

References:

1. Bill Phillips, Chris Stewart, Kristin Marsicano, Android Programming: The Big Nerd Ranch Guide, 4th Edition, Big Nerd Ranch Guides, 2019.
2. Raywenderlich Tutorial Team, Yun Cheng & Aldo Olivares Domínguez, Advanced Android App Architecture (First Edition): Real-world app architecture in Kotlin 1.3, Razeware LLC, 2019.
3. Raywenderlich Tutorial Team, Rene Cacheaux & Josh Berlin, Advanced iOS App Architecture (First Edition): Real-world app architecture in Swift, Razeware LLC, 2019.
4. Jakob Iversen, Michael Eierman, Mobile App Development for iOS and Android, Edition 2.0, Prospect Press, 2017.
5. Rebecca Roke, Mobitecture: Architecture on the Move, Phaidon Press, 2017.

MSMD 5233 Native Mobile Development II

Learning Outcomes:

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

CLO1: Demonstrate the process of creating iOS apps and programming best practices.

CLO2: Compare well-written code from poorly-written code.

CLO3: Explain 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. Raywenderlich Tutorial Team, Rene Cacheaux & Josh Berlin, Advanced iOS App Architecture (First Edition): Real-world app architecture in Swift, Razeware LLC, 2019.

2. Etash Kalra, From Zero to iOS Hero: Swift Development for Kids and Teens, Independently Published,

3. Wallace Wang, 2019 Pro iPhone Development with Swift 5: Design and Manage Top Quality Apps, Apress, 2019.

4. Christian Keur and Aaron Hillegass, iOS Programming: The Big Nerd Ranch Guide, 7th Edition, Big Nerd Ranch Guides, 2019.

5. Darryl Bartlett, Swift Programming in easy steps: Develop iOS apps - covers iOS 12 and Swift 5, In Easy Steps Limited, 2019.

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MSMD 5243 Mobile Security and Privacy

Learning Outcomes:

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

CLO1: Discover and understand the concept of security and privacy for mobile application development.

CLO2: Form a coherent design strategy for usable, friendly security in mobile applications whilst minimising the risk to users.

CLO3: Develop a safeguarding application of a mobile.

Synopsis:

Mobile phones have had a very significant impact on individuals and businesses over the past ten years and their influence continues to grow. Their technologies are being incorporated into a variety of other mobile systems. For both the development of new functionality and the emergence of new security threats, these mobile platforms are the center of attention, hence, ensuring and maintaining the mobile security and privacy is importance to the developers. This course provides an understanding of security and privacy requirements before building a secure

mobile application. It also provides the knowledge to understand the mobile security and privacy risks of a 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.

References:

1. Brian Walker, Cyber Security: Comprehensive Beginners Guide to Learn the Basics and Effective Methods of Cyber Security, Independently Published, 2019.
2. Nancy R. Mead & Saeed Abu-Nimeh, Security and Privacy Requirements Engineering, Handbook of Research on Emerging Developments in Data Privacy, 2019.
3. Man Ho Au & Raymond Choo, 2016 Mobile Security and Privacy: Advances, Challenges and Future Research Directions, Syngress, 2016.
4. Kevin Mitnick, Mikko Hypponen & Robert Vamosi, The Art of Invisibility: The World's Most Famous Hacker Teaches You How to Be Safe in the Age of Big Brother and Big Data, Little, Brown and Company, 2017.
5. Steve Krantz, Cyber Security for Seniors, Independently Published, 2019.

MTPU 5314 Project 1

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: Construct comprehensive literature review and appropriate procedures to complete the project.
CLO3: Justify 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. Rubin, K.S., Essential Scrum: A Practical

Guide to the Most Popular Agile Process, Addison-Wesley Profesional, 2012.
2. O'Brien, H., Agile: Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management, 3rd Edition, Addison-Wesley, 2016.
3. Cresswell, J.W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, California: SAGE Publications, Incorporated, 2014.

MTPU 5326 Project 2

Learning Outcomes:

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

CLO1: Formulate the solutions with significance contribution to the application domain.
CLO2: Evaluate 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.

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. Rubin, K.S., Essential Scrum: A Practical Guide to the Most Popular Agile Process, Addison-Wesley Profesional, 2012.
2. O'Brien, H., Agile: Agile Project Management, A QuickStart Beginners 's Guide To Mastering Agile Project Management, 3rd Edition, Addison-Wesley, 2016.
3. Cresswell, J.W., Research Design: Qualitative, Quantitative, and Mixed Methods Approaches, 4th Edition, California: SAGE Publications, Incorporated, 2014.

MASTER OF INFORMATION SYSTEM

MASTER OF INFORMATION SYSTEM

Master of Information Systems program is offered for developing high-level information systems. Graduates will be equipped with the latest knowledge and skills in the field of management and implementation of information systems specializing in the fields of study chosen.

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:

PEO1: Having important knowledge in the field of Information Technology including thinking skills that can be shown in the context of its use.

PEO2: Adapting the technology changes through research or continuing education activities.

PEO3: Understand and appreciate the emergence of effective skills, cooperation and leadership roles in their careers.

PEO4: Identify and able to demonstrate ethical behaviors in conducting professional activities.

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:

PO1: Synthesize knowledge and contribute to original research that broadens the frontier of knowledge in the relevant industry.

PO2: Adapt practical skills leading to innovative ideas in the relevant industry and able to communicate effectively.

PO3: Provide expert advice to society in the relevant industry.

PO4: Conduct research independently and adhere to legal, ethical and professional codes of practice.

PO5: Display leadership and entrepreneurship qualities through communicating and working effectively with peers and stakeholders.

PO6: Appraise problems in the relevant field critically using scientific skills and

PO7: Carry out continuous self-learning to acquire knowledge and skills.

Programme Structure

September Intake:

Semester 1 (September)		
Course Code	**Course**	**Credit**
MPSW 5043	Research Methodology	3
MPSW 5063	Entrepreneurship	3
MISP 5013	Information Systems Development	3
MISP 5023	Data Center Management	3
MISP 5033	Data Analytics	3
	Total credit	**15**
Semester 2 (February)		
Course Code	**Course**	**Credit**
MISP 5043	Business Information Systems	3
MISP 5053	Database Systems Management	3
MISP 5063	Information Systems Project Management	3
MISP XXXX	Elective 1	3
MISP XXXX	Elective 2	3
	Total credit	**15**
Semester 3 (Short Semester)		
Course Code	**Course**	**Credit**
MISP 5073	Project Paper	10
	Total credit	**10**

February Intake:

Semester 1 (February)		
Course Code	**Course**	**Credit**
MPSW 5043	Research Methodology	3
MPSW 5063	Entrepreneurship	3
MISP 5013	Information Systems Development	3
MISP 5023	Data Center Management	3
MISP 5033	Data Analytics	3
	Total credit	**15**
Semester 2 (Short Semester)		
Course Code	**Course**	**Credit**
MISP 5043	Business Information Systems	3
MISP 5053	Database Systems Management	3
MISP 5063	Information Systems Project Management	3
	Total credit	**9**
Semester 3 (September)		
Course Code	**Course**	**Credit**
MISP XXXX	Elective 1	3
MISP XXXX	Elective 2	3
MISP 5073	Project Paper	10
	Total credit	**16**

Elective courses - choose TWO (2) only:

Course Code	Course	Credit
MISP 5083	Information Architecture and Design	3
MISP 5093	Special Topic in Information System	3
MISP 5103	Configuration Management and Maintenance	3
MISP 5113	Information Security and Governance	3
MISP 5123	Healthcare Information System	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: Explain the conceptual understanding of 'Research', 'Research Activities' and 'Types of Research'.
- CLO2: Identify the problem area for research and focusing on a specific topic.
- CLO3: Develop a cohesive and robust research proposal on a chosen topic.
- CLO4: Implement/select research methodology techniques and tools within the Research Proposal.
- CLO5: Develop an awareness of important ethical and societal issues and carries out his or her research at the highest ethical standards.

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 Enterpreneurship

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 constrains 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.

MISP 5013 Information System Development

Learning Outcomes:

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

CLO1: Analyze technical requirements for system development.
CLO2: Develop an information system.
CLO3: Manage the information system.

Synopsis:

Systems development is one of the most challenging activities in the computing industry. In this subject, students will be introduced to the fundamental concepts of information systems, their use in business and the impact on the world. This subject is suitable for students who have no background in computers or information systems and systems development. It emphasises on the technical components such as hardware, software, network, and security. Students will also learn how information systems can be used to improve business related to globalization, intellectual privacy and future trends of information systems.

References:

1. Mohammed Seyam, Agile methodologies in Information system development: how

to be agile, without losing the disciplines of being traditional, Lambert, 2010.
2. Curtis, G., Cobham, D., Business Information Systems: Analysis, Design and Practice, 6th Edition, Pearson Education Limited, 2008.
3. Bourgeois, D. T., Information Systems for Business and Beyond, Lulu.com, 2014.
4. Tahir Ahmed & Julian Cox, Developing Information Systems: Practical Guidance for IT Professionals, BCS, The Chartered Institute for IT, 2014.
5. Paul Beynon-Davies, Business Information Systems, Red Globe Press, 2019.
6. Paul Bocij, Andrew Greasley & Simon Hickie, Business Information Systems: Technology, Development and Management for the Modern Business, 6th Edition, Pearson, 2019.

MISP 5023 Data Center Management

Learning Outcomes:

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

CLO1: Explain in detail the key themes and principles of data center management and be able to apply these principles in designing solutions to managing data center effectively.

CLO2: Demonstrate how to apply the principles of data center management in a variety of contexts.

CLO3: Analyse the interrelationship between the various elements of managing data center and its role in protecting data center.

Synopsis:

A data center is a facility used to house computer systems and associated components, such as telecommunications, computer servers, operating systems and storage systems to upkeep crucial data/information. In this course students will learn to manage telecommunication infrastructure, computer servers' management, storage system management. These include

batch programs run, backup and restore procedure, redundant or backup power supplies, data communications connections, environmental controls (e.g., air conditioning, fire suppression) and various security devices.

References:

1. Hwaiyu Geng, Data Center Handbook, John Wiley & Sons, 2015.
2. Mauricio Arregoces and Maurizio Portolani, Data Center Fundamentals, Cisco Press, 2004.
3. Hubbert Smith, Data Center Storage: Cost Effective Strategies, Implementation and Management, CRC Press, 2011.
4. William Stallings, 6th Edition, Cryptography and Network Security: Principles and Practice, Pearson International Edition, 2016.
5. William Stallings & Lawrie Brown, Computer Security: Principles and Practice, 4th Edition, Pearson, 2017.
6. Dr. Mohammad Nawaz, Data Center Management: Your guide to efficient Data Center operation, Independently published, 2019.

MISP 5033 Data Analytics

Learning Outcomes:

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

CLO1: Analyze the requirements for data analytics system for an organizational requirements.

CLO2: Demonstrate necessary data analytics tools or functions for big data.

CLO3: Formulate an effective strategy to implement a successful data analytics project.

Synopsis:

This course will discuss data analytics techniques, which is very crucial to transform organisations. As organisations become more dependent on increasingly accurate information, Data Analytics system could provide the necessary information derived the massive information that is readily available today. But Systems are always as good as they are designed for. It is therefore very important that Data Analytics systems are properly designed and implemented for the intended use. This course aims to cover both aspects of the understanding and the design and implementation of data analytics systems.

References:

1. Dursun, D., From Real-World Data

Mining: Applied Business Analytics and Decision Making, Pearson Education, 2015.
2. Michael, W., Big Data Analytics, Wiley Publications, 2013.
3. Luis T., Data Mining with R: Learning with Case Studies, 2nd Edition, Chapman and Hall/CRC, 2017.
4. Liam D., Data Analytics: A Comprehensive Beginner's Guide to Learn the Realms of Data Analytics, Independently published, 2019.

MISP 5043 Business Information System

Learning Outcomes:

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

CLO1: Analyze fundamental business process and their integrative nature.
CLO2: Discuss the role of enterprise systems in supporting business process.
CLO3: Demonstrate the integrative nature of an enterprise system in a sample organization case.

Synopsis:

This course is a reflection on how real world business processes are managed and executed in a practical and accessible format The aim is to establish a fundamental understanding of how business operates and the enterprise system they use to accomplish their task. It deals with the key processes that are common in most companies and illustrates how enterprise systems enable companies to execute those processes quickly and efficiently. The course is divided in two parts. The first part will focus on foundational concepts which include the integrated business processes and basic concepts in financial and management

accounting. The second part will discuss the organizational data associated with the business process and subsequently examines each process in detail.

References:

1. Graham Curtis, David Cobham, Business Information System Analysis, Design and Practice, 6th Edition, Prentice Hall, 2008.
2. Simha R. Magal, Jeffrey Word, Essentials of Business Processes and Information Systems, Wiley John Wiley & Sons, Inc, 2010.
3. Simha R. Magal, Jeffrey Word, Integrated Business Processes with ERP System, Wiley John Wiley & Sons, Inc, 2011.
4. Jane P. Laudon, Kenneth C. Laudon, Management Information Systems Managing the Digital Firm, 16th Edition, Pearson, 2019.

MISP 5053 Database Systems Management

Learning Outcomes:

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

CLO1: Analyse and adapt database concepts, particularly the concepts of relational databases.
CLO2: Design database using top-down and bottom-up techniques .
CLO3: Compare the use of the Structured Query Language - DDL, DML and DCL.

Synopsis:

In many business information systems, database approaches are fundamental. In order to embrace Knowledge Management and Business Intelligence (BI), Customer Relationship Management (CRM), ERP packages (e.g., SAP), e-commerce and on-line transaction processing understanding on the need for data integration and enterprise-wide data management is crucial. Business managers and information systems professionals require understanding on managing databases systems to design, build and maintain effective information systems for today's business organizations. The

objective of this course is to provide the prospective business or information systems professional with fundamental concepts and skills in data modeling (conceptual, logical and physical), as well as in designing, building and managing the data layer to support business applications. In addition to data modeling, some proficiency with Structured Query Language (SQL) will be provided. Although object-oriented, and other database approaches will be discussed, the course focuses primarily on the use of state-of-the-art of relational databases.

References:

1. Connolly, T. & Begg, C., Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition, 2015.
2. Bao, D., Trajcevski, G., Chang, L. & Hua, W., Database Systems for Advanced Applications, DASFAA 2017 Proceedings, 2017.
3. Coronel, C. M., Morris, S. & Rob, P., Database Systems: Design, Implementation, and Management, 9th Edition, Boston: Cengage Learning, 2011.
4. Mullins, Craig, S., Database Administration – The Complete Guide to Practices and Procedures, 2nd Edition, Addison-Wesley, 2012.
5. McCullough-Dieter, Carol, Oracle9i Database Administrator – Implementation and Administration, Thomson Learning, 2003.

MISP 5063 IS Project Management

Learning Outcomes:

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

CLO1: Describe and apply a systematic activities and scopes that involved in managing IS project.
CLO2: Produce IS development project charter in order to organize IS development project effectively.
CLO3: Analyse project requirements and choose appropriate software development model (approaches) in managing IS project.

Synopsis:

IS Project Management refers to activities responsible for planning, coordinating, measuring, monitoring, controlling, and documenting all the development tasks, either during or after the project. Within IS development management, quality can be understood as the efficient, effective and

comfortable usage, by part of a group of users, of a software system for a set of valid functionalities and under some given conditions. In order to provide a better IS project, software maintenance shall take into consideration for this subject. The main aim of this course is related on management and quality of software and is meant to provide students with the methodic skills to control and plan the IS development activities, to obtain with a systematic, disciplined and quantifiable approach solutions that finally could ensure the success of the project.

References:

1. Kathy Schwalbe, Information Technology Project Management, 9th Edition, Cengage Learning, 2018.
2. David Olson, Information Systems Project Management, Business Expert Press, 2014.
3. Ralph Stair & George Reynolds, Principles of Information System, 12th edition, 2015.
4. Kenneth C. Laudon And Jane P. Laudon, Management Information Systems: Managing the Digital Firm (14th edition), Pearson, 2015.
5. Ian Sommerville, Software Engineering, 10th edition, Addison-Wesley, 2015.
6. Mark A. Fuller, Joseph S. Valacich, Joey F. George & Christoph Schneider, Information Systems Project Management: A Process and Team Approach, Prospect Press, 2017.

MISP 5073 Project Paper

Learning Outcomes:

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

CLO1: Conduct the research findings and output that has the research value.
CLO2: Present and defend the proposal.
CLO3: Organize information to produce a formal piece of writing and aims at presenting and discussing the result of depth study.

Synopsis:

This course harnessing the knowledge, skills and attitudes acquired in the programme and applying them to solve information systems-related research problems, create new knowledge or develop new information system products or services is an essential part of the programme. In this respect, each student is mentored by a staff member in an information systems project lead to comprehensive project paper. The project can be in any information systems.

References:

1. Thesis Writing And Guidelines http://www.utem.edu.my/pps

MISP 5093 Special Topics In Information System

Learning Outcomes:

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

CLO1: Explain the knowledge and understanding of theoretical concepts, issues, challenges, and trends of selected topic in Information and Communication Technology.

CLO2: Analyze the state-of-the-art of the selected topic in terms of technological implementation and trade off, societal impact and market perspectives.

CLO3: Apply the knowledge in current trend of information system.

Synopsis:

This course covers different current topics in Information system. It provides students an opportunity to explore and appreciate the emerging computer technologies, industry-specific information and communication technology. Students will analyze the current developments, issues, challenges and opportunities in this area. The content and format of this subject will vary depending on the topic being selected by the faculty and the instructor with emphasis on current information system trends and developments.

References:

1. Fei Hu, Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations, 1st Edition, CRC Press, 2016.
2. John Rossman, The Amazon Way on IoT: 10 Principles for Every Leader from the World's Leading Internet of Things Strategies, Clyde Hill Publishing, 2016.
3. Peter Waher, Learning Internet of Things, Packt Publishing, 2015.
4. Robert Stackowiak, Art Licht, Venu Mantha and Louis Nagode, Big Data and The Internet of Things: Enterprise Information Architecture for A New Age, 1st Edition, Apress, 2015.
5. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.

6. Vijay Madisetti and Arshdeep Bahga,Internet of Things (A Hands-on-Approach), 1st Edition. VPT, 2014.
7. Andrian McEwen and Hakim Cassimally, Designing the Internet of Things, 1st Edition, John Wiley and Sons, Ltd., 2014.
8. Francis daCosta, Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1st Edition. Apress Publications, 2013.

MISP 5103 Configuration Management and Maintenance

Learning Outcomes:

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

CLO1: Explain in detail the key themes and principles of configuration management and maintenance and be able to apply these principles in designing solutions to manage configuration and maintenance effectively.

CLO2: Demonstrate how to apply the principles of configuration management and maintenance in a variety of contexts.

CLO3: Analyse the interrelationship between the various elements of configuration management and maintenance and its role in information systems.

Synopsis:

This course covers the principles of configuration management and maintenance and is suitable for those who are looking for an in-depth understanding of information system in medium to large organisations. Concentrate on configuration management and maintenance that are used in information system. The needs of configuration management and maintenance have been spurred by the pervasive use of computer-based applications such as information systems, databases, and the Internet.

References:

1. Joey F. George and Joseph S. Valacich, Modern Systems Analysis and Design, 9th Edition, Pearson, 2019.
2. Jon M. Quigley and Kim L. Robertson, Configuration Management: Theory, Practice, And Application, Auerbach Publications, 2015.
3. Heikki Topi, Allen Tucker, Computing Handbook, 3rd Edition: Information Systems and Information Technology, Chapman and Hall/CRC, 2014.

4. Peter Lake and Robert Drake, Information Systems Management in the Big Data Era (Advanced Information and Knowledge Processing), Springer, 2015.
5. Keri E. Pearlson and Carol S. Saunders, Managing and Using Information System, 7th Edition, Wiley, 2019.

MISP 5113 Information Security and Governance

Learning Outcomes:

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

CLO1: Explain in detail the key themes and principles of information security and be able to apply these principles in designing solutions to managing security risks effectively.
CLO2: Demonstrate how to apply the principles of information security in a variety of contexts.
CLO3: Demonstrate the interrelationship between the various elements of information security and its role in protecting organizations.

Synopsis:

The course covers the principles of applied information security management and is suitable for those who are looking for an in-depth understanding of security management in medium to large organizations. Concentrate on information security that are used in protecting both the information present in computer storage as well as information traveling over computer networks. Interest in information security has been spurred by the pervasive use of computer-based applications such as information systems, databases, and the Internet. Information security has also emerged as a national goal in Malaysia and in other countries with national defense and homeland security implications. Information security is enabled through securing data, computers, and networks.

References:

1. Michael Goodrich, and Roberto Tamassia, Introduction to Computer Security , Pearson, 2013.
2. W. Stallings, Network Security Essentials: Applications and Standards, 6th edition, Pearson, 2016.
3. C.P. Pfleeger, S. L. Pfleeger, Analyzing Computer Security: A Threat/Vulnerability/Countermeasure Approach, 1st Edition, Prentice Hall International, Inc., 2011.
4. D. Gollmann, 3rd Edition, Computer Security, John Wiley & Sons, Inc., 2011.

5. J.M. Stewart, E.Tittel and M.Chapple, Certified Information Systems Security Professional Study Guide, Sybex, 2011.
6. Mark Ciampa, Security+ Guide to Network Security Fundamentals, Cengage Learning, 2011.
7. William Stallings, 5th Edition, Cryptography and Network Security: Principles and Practice, Pearson International Edition, 2010.
8. EC-Council, Disaster Recovery, 1st Edition, 2010.

MISP 5123 Healthcare Information System

Learning Outcomes:

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

CLO1: Explain in detail the key themes and principles of healthcare information system and be able to apply these principles in designing solutions to healthcare system effectively.

CLO2: Demonstrate how to apply the principles of healthcare information system in a variety of contexts.

CLO3: Analyse of the interrelationship between the various elements of managing healthcare information system and its role in improving healthcare services.

Synopsis:

This course aims to provide a broad understanding of Information Systems (IS) focused from a management perspective, within the healthcare environment. The module addresses the role of IS and technology in providing the necessary infrastructure needed to support organisations and workers in healthcare decision-making. The course is divided into three main areas: the business context, managing IS and implementing IS in healthcare system. Theoretical concepts introduced in the course include information systems theory, the organisation and environment, information systems modelling, planning and strategy, systems development, evaluation, technical foundations and data protection, standardisation and security of patient electronic medical records.

References:

1. Enrico Coiera, Guide to Health Informatics 3rd Edition, CRC Press, 2015.
2. Karen A. Wager and Frances Wickham Lee, Health Care Information Systems: A Practical Approach for Health Care Management, 3rd Revised Edition, John

Wiley & Sons, 2013.
3. Joseph Tan, e-Health Care Information Systems: An Introduction for Students and Professionals, John Wiley & Sons, 2005.
4. Anastasius Moumtzoglou, Design, Development, and Integration of Reliable Electronic Healthcare Platforms (Advances in Healthcare Information Systems and Administration), Medical Information Science Reference, 2016.
5. McCormick KA, Gugerty B, Mattison JE., Healthcare information technology exam guide for CHTS and CAHIMS certifications, 2017.

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For further information, please browse through our websites:

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- UTeM: `https://www.utem.edu.my/`

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