

POSTGRADUATE ACADEMIC HANDBOOK

MASTER BY TAUGHT
 COURSE (PART TIME)
 SESSION 2021/2022



FTMK

FACULTY OF INFORMATION & COMMUNICATION TECHNOLOGY
 UNIVERSITI TEKNIKAL MALAYSIA MELAKA

POSTGRADUATE ACADEMIC HANDBOOK

Master by Taught Course (Part Time)

Session 2021/2022



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

Version September 2021

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Penerbit UTeM Press

Published and Printed in Malaysia by

Penerbit UTeM Press

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INTRODUCTION

University's Management



PROF. DR. GHAZALI BIN OMAR

Acting Vice Chancellor



PROF. DR. ZULKIFLIE BIN IBRAHIM

Deputy Vice Chancellor
(Academic & International)



PROF. DR. GHAZALI BIN OMAR

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)

About UTeM

 <p>UNIVERSITI TEKNIKAL MALAYSIA MELAKA</p>	<p>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.</p> <p>UTeM was initially known as Kolej Universiti Kebangsaan Malaysia (KUTKM), established on the 1st of December 2001.</p>
<h3>VISION</h3>	<p>To be one of the world’s leading innovative and creative technical universities.</p>
<h3>MISSION</h3>	<p>UTeM determined to lead and contribute to the wellbeing of the country and the world by:</p> <ol style="list-style-type: none"> 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.
<h3>MOTTO</h3>	<p>Excellence through competency</p>

Education Goals and Objectives

Educational Goals:

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

Objectives:

- 1) To become a creative and innovative learning and knowledge organization that practice and application oriented academic programme in the fields of engineering and technology.
- 2) To lead in research, development, innovation, commercialization and consultancy activities based on the needs of the industry.
- 3) To produce competent graduates with moral who will be the preferred choice by the industry.
- 4) To have competent and highly qualified staff with vast practical experiences.
- 5) To play an effective role as the main impetus to the industrial development of the nation.
- 6) To establish cooperation and smart partnership between the university and the industries.
- 7) To provide infrastructure and conducive environment to generate and maintain excellence.
- 8) To implement comprehensive and extensive usage of ICT in both academic activities and management of the university.

Dean's Message

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. Throughout your undergraduate study, you will be attached to an academic advisor. Your academic advisor will provide guidance and advice in taking appropriate action for you to achieve success.

Apart from having an academic advisor, we at FTMK also provide 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 four major topics, that is, programme educational objectives, facilities and their regulation, academic system 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 Faculty Publication Committee and all parties involved in producing this academic handbook. Together we make a difference.

FTMK Truly World!

All the best and be a **champion** for **today** and **future**!

Faculty Vision, Mission and Objectives

Faculty Vision:

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

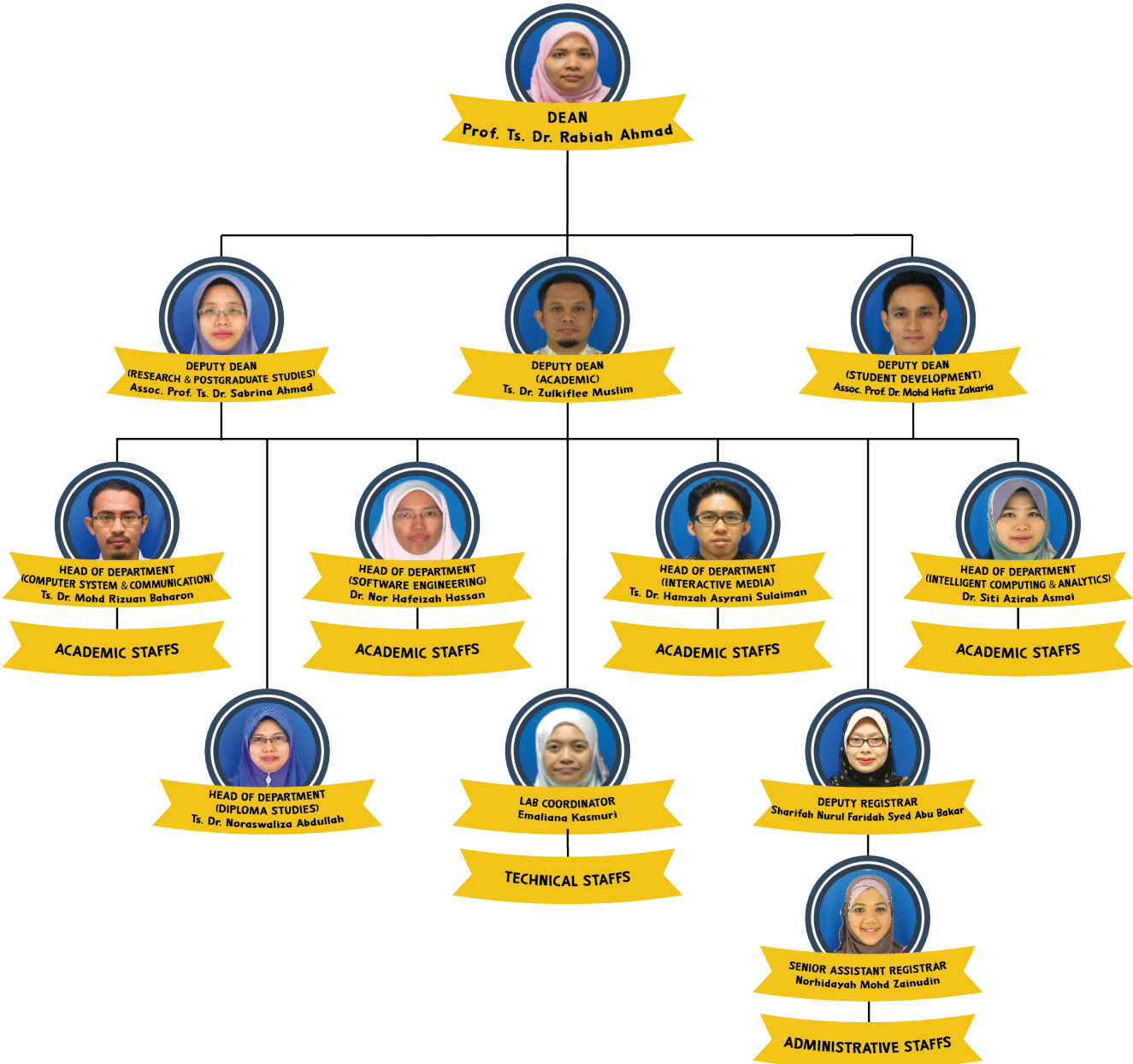
Faculty Mission:

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.

Faculty’s Management



FTMK at a Glance

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

The faculty established five (5) departments as below:

- 1) Department of Software Engineering.
- 2) Department of Computer System and Communication.
- 3) Department of Interactive Media.
- 4) Department of Intelligent Computing and Analytics.
- 5) Department of Diploma Studies.

Department of Software Engineering

Software Engineering is a field of knowledge about computer software development using structured methods, techniques and schemes. In line with this, the Department of Software Engineering offers two bachelor programmes of Computer Science namely Software Development and Database Management. This department plays a major role in producing competent and professional software engineers to design and develop highly sophisticated and complex applications including Intelligent Systems. Our programmes have been designed carefully to produce professionals in software engineering with a combination of various technical aspects, soft skills and ethics.

The graduates are expected to understand the users, software and system requirements, competent in applying emerging software technologies design, manage, perform testing, maintain and develop the system with software engineering methodology. We also ensure that our graduates are equipped with project management skills, work ethics, risk management knowledge and the importance of team work in software development processes. The objective of specialization in Database Management is to produce skilled professionals in Database Management. The course equips the graduates with various skills such as database

analysis, design and development based on the system specifications. The students will also be exposed to data warehouse and data mining techniques. Application oriented approach could also produce highly competitive and creative software engineers in the job market.

Department of Interactive Media

The Department of Interactive Media offers undergraduate and graduate programmes in the area of multimedia. In addition to the basic courses in ICT, the programmes offered by this department focus on the concept of interactivity in the design and development of high quality multimedia products and web sites. This also includes applying the knowledge of interactivity in the area of computer graphics, animation, digital audio video technology, virtual reality and computer games development. With the emphasis on training and hands-on approach, we believe that the graduates are able to fulfill the job markets in the field of multimedia.

Department of Computer System and Communication

Computer System and Communication is a sub field of computer and telecommunication. The Internet is created based on communication systems that produce a complex computer networks which is built for LANs, MANs, WANs, mobile networks and massive global Internet in order to share information and having a human conversation with one another. Due to the necessity of computer networks towards the use of Internet in daily activities, Bachelor of Computer networking and Bachelor of Computer Security are introduced and act as the major bachelor programmes offered by Department of Computer System and Communication, to fulfill the nation's need. Besides, students who have undergo this course are not only be knowledgeable and become expert in the area but also equipped with the professional certification for career advancement such as CompTIA and Cisco Academy certifications. Thus, students are more confident, creative and ready to face the challenges in real life in working environment.

In addition, throughout this programme, students are provided with fundamental of information technology subjects and are exposed with more advanced subjects that comprises of planning, designing, developing, troubleshooting and managing computer systems, computer networks and network security.

Department of Intelligent Computing and Analytics

Malaysia's vision to become a developed country must be supported by the profound knowledge in advanced industrial technology. Hence, the Department of Intelligent Computing and Analytics was established to fulfill such aspiration by focusing on ICT applications in intelligent automation and augmented analytics. Intelligent automation is being used in many fields, from robotics and autonomous vehicles to cognitive computing and controlling quality, efficiency and business functionality that integrates multiple artificial intelligence, as well as machine learning and automation capabilities that tracks and automate business process and workflows. Augmented analytics on the other hand, is the next wave and the future trend to data and analytics. It is an approach that uses machine learning and natural language processing to automate insights by performing activities which includes data preparation, deciphering data pattern and building model as well as distribute and operationalizing data findings. Providing knowledge in both topics therefore prepares the students to stay at par with the needs and trends of the industry.

Department of Diploma Studies

Department of Diploma Studies is aimed to produce trained students in the field of computer technology and commercial computer application to meet the high demands from the government and private sectors. The programme is intended to produce students with knowledge in computer applications and programming. The students will also obtain professional certification as CCNA.

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 binti Salahuddin
- 2) **Master of Computer Science (Database Technology), MITD**
Ts. Noor Azilah Draman@Muda
- 3) **Master of Computer Science (Internetworking Technology), MITI**
Ts. Dr. Syarulnaziah binti Anawar
- 4) **Master of Computer Science (Security Science), MITZ**
Assoc. Prof. Ts. Dr. Siti Rahayu binti 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. Halizah binti Basiron
- 7) **Master of Software Engineering (Mobile Development), MSMD**
Ts. Dr. Abdul Karim bin Mohamad
- 8) **Master of Information System, MIS**
Ts. Dr. Raja Rina binti Raja Ikram

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	<p>Seven (7) research labs for postgraduates students based on faculty's research clusters:</p> <ol style="list-style-type: none">1. Innovative Software System & Services (IS3) Lab2. Information Security Forensics & Computer Networking (INSFORNET) Lab3. Optimization, Modelling, Analytics and Simulation (OptiMAS) Lab4. Computational Intelligence and Technologies (CIT) Lab5. Human Centered Computing and Information Systems Lab (HCC-ISL) Lab6. Pervasive Computing & Educational Technology (PET) Lab7. 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.

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

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*

**MASTER OF TECHNOLOGY
(DATA SCIENCE AND 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 in solving emerging challenges.
- 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, orally 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
MTDS 5113	Fundamental of Data Science	3
MTDS 5133	Applied Statistical Methods	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MTDS 5163	Big Data Analytics and Visualization	3
MTDS 5143	Applied Machine Learning	3
MTDS 5123	Big Data Management	3
Total credit		9
Semester 3 (Short Semester)		
Course Code	Course	Credit
MTPU 5314	Project 1	4
Total credit		4
Semester 4 (September)		
Course Code	Course	Credit
MTDS 5163	Modelling and Decision Making	3
MTDS XXXX	Elective 1	3
MTDS XXXX	Elective 2	3
Total credit		9
Semester 5 (February)		
Course Code	Course	Credit
MTPU 5326	Project 2	6
MPSW 5063	Entrepreneurship	3
Total credit		9

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

Synopsis:

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

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MPSW 5063 Entrepreneurship**Learning Outcomes:**

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

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

Synopsis:

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

with the areas of entrepreneurial expertise necessary in order to found and/or grow a technology venture.

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5. Baldock, R., North, D., & Ullah, F., New Technology-Based Firms in the New Millennium. *New Technology Based Firms in the New Millennium*, 11, 203–226, 2015.
6. Alexander Osterwalder & Yves Pigneur, *Value Proposition Design: How to Create Products and Services Customers Want*. Wiley, 2015.
7. Alexander Osterwalder & Yves Pigneur, *Business Model Generation: A Handbook for Visionaries, Game Changers,*

and Challengers, Wiley, 2010.

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. Chirag Shah, A Hands-On Introduction to Data Science, Cambridge University Press, 1st edition, April 2, 2020.
2. Jeffrey S. Saltz and Jeffrey M. Stanton, An Introduction to Data Science, SAGE Publications, Inc, First edition, October 6, 2017.
3. Samuel Burns, Fundamentals of Data Science: Take the first Step to Become a Data Scientist (Step-by-Step Tutorial For Beginners), Independently published, September 17, 2019.
4. Joel Grus. Data Science from Scratch: First Principles with Python, O'Reilly Media, 2 edition May 16, 2019.
5. Vlad Sozonov, The Fundamentals of Data Science: Big Data, Deep Learning, and Machine Learning: What you need to know about data science and why it matters, Data Science Case Study, November 20, 2019.

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. Big Data Management and Processing. Chapman and Hall/CRC, 2017.

2. Viktor Mayer-Schönberger, Big Data: A Revolution That Will Transform How We Live, Work and Think, Eamon Dolan/-Mariner Books, 2014.
3. Tom White, Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale, 4th Edition, O'Reilly Media, 2015.
4. 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: Analyse solutions for real life statistical problems.
- CLO2: Manipulate solutions for statistical problems using statistical software.
- CLO3: Integrate solution plan to application problems based on available 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 non-metric). It also introduces other longitudinal methods that can handle data with difficult correlations over time.

References:

1. Hair, J. F., Black, W. C., Babin, B. J., Anderson, R. E., & Tatham, R. L., Multivariate Data Analysis. 8th edition. Pearson New International Edition, 2018.
2. Denis D.J., Univariate, Bivariate and Multivariate Statistics Using R – Quantitative Tools for Data Analysis and Data Science, Wiley, 2020.
3. Krispin, R., Hands-On Time Series Analysis with R: Perform time series analysis and forecasting using R., Packt Publishing, 2019.
4. Kabacoff, R.I., R in action: Data Analysis and Graphics with R, Second Edition, Manning Pub. Co., 2015.
5. Schumacker, E. R., Using R with Multivariate Statistics. Sage Publications, Inc., 2016.

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: Formulate 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 emphasizes 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. Patterson, Josh, & Gibson, Adam. Deep Learning: A Practitioner's approach, O'Reilly, Inc., 2017.
3. Brink, Henrik, J. Richards, Mark Fetherolf, Real-world machine learning, Manning, 2017.
4. Goodfellow, Ian, Yoshua Bengio, Aaron Courville, Deep learning, MIT Press, 2016.
5. Witten, Ian H., et al., Data Mining: Practical machine learning tools and techniques, Morgan Kaufmann, 2016.
6. Alpaydin, Ethem, Machine Learning: The new AI, MIT Press, 2016.

MTDS 5153 Big Data Analytics and Visualization

Learning Outcomes:

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

- CLO1: Identify the concepts, fundamentals and methodologies of big data analytics.
- CLO2: Interpret massive volumes of unstructured data using data analytics software.
- CLO3: Construct big data analytics and visualization strategy in a proper and meaningful way using appropriate 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 visual-

ization 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. Lawrence Rabiner and Ronald Schafer. Theory and Applications of Digital Speech Processing (1st. ed.). Prentice Hall Press, USA, 2010.
2. Daniel Jurafsky and James H Martin, Speech and Language Processing, Prentice Hall, 2009.
3. Rafael C. Gonzalez, Richard E. Woods, Digital Image Processing (2nd Edition) 2002, Pearson. (TA1637 G66 2002) – to buy new edition (4th edition), 2018.
4. Dipanjan Sarkar, Text Analytics with Python (2nd Edition), Apress, 2019.
5. Uday Kamath, John Liu, and James Whitaker, Deep Learning for NLP and Speech Recognition, Springer, 2019.
6. Benjamin Bengfort, Rebecca Bilbro and Tony Ojeda, Applied Text Analysis with Python : Enabling Language-aware Data Products with Machine Learning, O'Reilly, 2018.
7. Jan Erik Solem, Programming Computer Vision with Python, O'Reilly, 2012.
8. Daniel Jurafsky, James H Martin, Speech and Language Processing, Prentice Hall, 2009.
9. Alexandru C. Telea, Data Visualization: Principles and Practice, 2nd Edition, CRC Press, 2015.
10. Ben Jones, Communicating Data with Tableau: Designing, Developing, and Delivering Data Visualizations, O'reilly, 2014.
11. Atmajitsinh Gohil, R Data Visualization Cookbook, Packt Publishing, 2015.
12. Cole Nussbaumer Knaflitz, 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: Diagnose knowledge of modelling and prescriptive analytics with data science for data-driven and evidence-based decision making.
- CLO2: Choose appropriate and relevant modelling and prescriptive analytics technique using Big data input to solve complex decision problems.
- CLO3: Demonstrate prescriptive models and solutions using appropriate software tools and analysis of Big data, and communicate the results.

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. H. Paul Williams, Model Building in Mathematical Programming. 5th Edition. Wiley, 2013.
3. Frederick S. Hillier, Mark S, Hillier, Introduction to Management Science: A Modelling and Case Studies Approach, McGraw Hill, 2014.
4. Hamdy A. Taha, Operations Research: An Introduction. 10th Edition. Pearson, 2017.
5. John D. Sterman, Business Dynamics System Thinking and Modeling for a Complex World. McGraw-Hill Education, 2000.

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: 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. Jeff Collman and Sorin Adam Matei, Ethical Reasoning in Big Data: An Exploratory Analysis, Springer, 2016.
2. Sharavi Tamane, Vijender Kumar Solanki, Nilanjan Dey, Privacy and Security Policies in Big Data, Information Science Reference, 2017.
3. Daniel T. Larose, Chantal D. Larose, Data Mining and Predictive Analytics, 2nd Edition, 2015.
4. Kuan-Ching Li, Hai Jiang, Albert Zomaya, Big Data Management and Processing, Chapman and Hall/CRC, 2017.
5. Deborah Nolan, Duncan T. Lang, Data Science in R: A Case Studies Approach to Computational Reasoning and Problem Solving, 2015.
6. Hwaiyu Geng, Internet of Things and Data Analytics Handbook, John Wiley-Blackwell, 2017.
7. Alasdair Gilchrist, Industry 4.0: The Industrial Internet of Things, Apress, 2016.

MTDS 5223 Manufacturing Analytics**Learning Outcomes:**

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

- CLO1: Illustrate analytics use cases in manufacturing systems.
- CLO2: Formulate analytics models for manufacturing systems.
- CLO3: Manipulate 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 emphasizes 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, Serop, Steven R. Schmid, Manufacturing Engineering and Technology, Person Education, 2018.
2. Zhang, Yingfeng, Fei Tao, Optimization of Manufacturing Systems Using the Internet of Things, Academic Press, 2016.
3. Diego Galar Pascual, Pasquale Daponte, Uday Kumar. Handbook of Industry 4.0 and SMART Systems, CRC Press, 2019.
4. Isak Karabegovi, Ahmed Kovaevi, Lejla Banjanovi-Mehmedovi, Predrag Dai. Handbook of Research on Integrating Industry 4.0 in Business and Manufacturing, IGI Global, 2020.
5. Seider, Warren D., Junior D. Seader, Daniel R. Lewin, Product and Process Design Principles: Synthesis, Analysis And Evaluation, John Wiley & Sons, 2016.
6. Felix Liao, Smart Data Discovery Using SAS Viya: Powerful Techniques for Deeper Insights, SAS Institute, 2020.

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: Choose appropriate solution steps for social media data analysis based on text mining methods.
- 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. Matthew A. Russell, Mining the Social Web: Data Mining Facebook, Twitter, LinkedIn, Google+, GitHub, and More, 3rd Edition, 2019.
2. Thushan Ganegedara, Natural Language Processing with TensorFlow. Packt Publishing, 2018.
3. Marco Bonzanini, Mastering Social Media Mining with Python. Packt Publishing, 2016.
4. Helen Kennedy, Post, Mine, Repeat: Social Media Data Mining Becomes Ordinary, Palgrave Macmillan, Springer Nature, 2016.
5. Siddhartha Chatterjee, Michal Krystyanczuk, Python Social Media, 2017.

MTDS 5243 Geospatial Analytics

Learning Outcomes:

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

- CLO1: Analyse geospatial analytics approaches on various geospatial data.
- CLO2: Integrate required knowledge and skills to solve real-world geospatial analytics problems.
- CLO3: Construct multi-step workflows in variety of geospatial analytics applications.

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 interpret-

ing 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. Rafael C. Gonzalez, Richard E. Woods, Steven L. Eddins, Digital Image Processing Using MATLAB, McGraw Hill Education, 2013.
5. Joel Lawhead, Learning Geospatial Analysis with Python: Understand GIS Fundamentals and Perform Remote Sensing Data Analysis using Python 3.7, 3rd Edition, Packt Publishing, 2019.
6. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, 4th Edition, Pearson, 2018.

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: Evaluate 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, stu-

dents 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: Evaluate each one of the concepts in tourism analytics.
- CLO2: Construct 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: Demonstrate analytics use cases in customer behaviour and financial systems.
- CLO2: Determine analytics models for customer behaviour and financial systems.
- CLO3: Organise 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.
4. Kirill Dubovikov, Managing Data Science: Effective strategies to manage data science projects and build a sustainable team, Packt Publishing; 1st Edition, November 12, 2019.

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 Professional, 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.
4. Kirill Dubovikov, Managing Data Science: Effective strategies to manage data science projects and build a sustainable team, Packt Publishing; 1st Edition, November 12, 2019.

**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:** Ability to apply independent and lifelong learning skills to keep up with latest relevant knowledge and cutting-edge technologies in mobile application development, 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 5043	Research Methodology	3
MSMD 5113	Native Mobile Development I	3
MSMD XXXX	Elective 1	3
Total credit		9
Semester 2 (February)		
Course Code	Course	Credit
MSMD 5133	User Experience Design & User Interface Practice	3
MSMD 5153	Mobile Testing	3
MSMD XXXX	Elective 2	3
Total credit		9
Semester 3 (Short Semester)		
Course Code	Course	Credit
MTPU 5314	Project 1	4
Total credit		4
Semester 4 (September)		
Course Code	Course	Credit
MSMD 5123	Internet of Things Development	3
MPSW 5063	Entrepreneurship	3
MSMD 5143	Mobile Analytic	3
Total credit		9
Semester 5 (February)		
Course Code	Course	Credit
MTPU 5326	Project 2	6
MSMD 5163	Mobile Back-end	3
Total credit		9

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 Entrepreneurship**Learning Outcomes:**

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

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

Synopsis:

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

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

References:

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

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 hardware.

Synopsis:

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

References:

1. 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 Maricano, 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 Dast-

jerdi, 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, Site-Point, 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 guided 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: Explain the emerging elements in mobile backend development.
- CLO2: Construct program for backend application.
- CLO3: Propose a high-level system design by using appropriate system architecture.

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 Continuous 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 Maricano, 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, Raze-ware 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.

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 Invisibil-
- ity: 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.

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