FACULTY OF COMPUTER SCIENCE AND INFORMATION TECHNOLOGY

Undergraduate Programme Offered:

Bachelor programme

1. *Bachelor of Computer Science (Computer System)*

2. *Bachelor of Computer Science (Multimedia)*

3. *Bachelor of Computer Science (Computer Network)*

4. *Bachelor of Software Engineering*

STUDY SCHEME (BACHELOR OF COMPUTER SCIENCE-COMPUTER SYSTEM)

Notes : L = Lecture , L/T = Laboratory/Tutorial								
1ST YEAR								
1ST SEMESTER				**2ND SEMESTER**				
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**	
SSK3100	Computer Programming I	3	1	SSK3101	Computer Programming II	3	1	
SSK3003	Discrete Structures	3	0	SSK3207	Computer Organization and Assembly Language	3	0	
SKP2101	Malaysian Nationhood	3	0	SIM3251	Statistics for Computer Science	3	0	
SKP2203	Asian and Islamic Civilizations	2	0	SKR3200	Computer Network and Communication	3	0	
BBI2422	Reading for Academic Purposes	2	1	PRT2008	Agriculture and Man	2	0	
	Co-curriculum	0	1		**Co-curriculum**	0	1	
				CEL2102	Effective Listening and Speaking			
				LAX (6 points)				
	TOTAL	16			**TOTAL**	16		
2ND YEAR								
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**	
SSK3118	Data Structures and Algorithms	3	0	SSK3313	Operating System	2	1	
SSK3408	Database Application Development	3	1	SSK4401	Database Systems	3	0	
SSE3001	Introduction to Software Engineering	3	0	SSK4602	Intelligent Computing	3	0	
SKP2204	Ethnic Relations	2	0	SSE3202	Human-Computer Interaction	3	0	
BBI2423	Academic Interaction and Presentation	2	1	SIM4207	Ethics in Computing	3	0	
				BBI2424	Academic Writing	2	1	
	TOTAL	15			**TOTAL**	18		
3RD YEAR								
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**	
SSK3102	Embedded Systems Programming	2	1	SSK4407	Business Analytics	3	0	
SSK4505	Computer System Security	3	0	SKR4307	Mobile Application	2	1	
SSE4300	Software Project Management	3	0	SSK4949A	Bachelor Project	0	2	
	Electives	9	0		**Electives**	9	0	
LAX (12 points)				CEL2103	Writing Academic Texts			
	TOTAL	18			**TOTAL**	17		
4TH YEAR								
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**	
SSK4949B	Bachelor Project	0	4	SSK4901	Industrial Training	0	12	
	Electives	12	0					
CEL2105/ CEL2106/ CEL2107								
LAX (6 points)								
	TOTAL	16			**TOTAL**	12		

STUDY SCHEME (BACHELOR OF COMPUTER SCIENCE-MULTIMEDIA)

Notes : L = Lecture , L/T = Laboratory/Tutorial							
1ST YEAR							
1ST SEMESTER				**2ND SEMESTER**			
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSK3100	Computer Programming I	3	1	SSK3101	Computer Programming II	3	1
SSK3003	Discrete Structures	3	0	SSK3207	Computer Organization and Assembly Language	3	0
SKM3001	Multimedia Technology	3	0	SKR3200	Computer Network and Communication	3	0
BBI2422	Reading for Academic Purposes	2	1	SKP2101	Malaysian Nationhood	3	0
SKP2204	Ethnic Relations	2	0	SKM3300	Multimedia Application Development	3	0
	Co-curriculum	0	1		**Co-curriculum**	0	1
				CEL2102	Effective Listening and Speaking		
				LAX (6 points)			
TOTAL		**16**		**TOTAL**		**17**	
2ND YEAR							
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSK3313	Operating System	2	1	SIM4207	Ethics in Computing	3	0
SSK3118	Data Structures and Algorithms	3	0	SKM3200	Computer Graphics	2	1
SSK3408	Database Application Development	3	1	SSE3001	Introduction to Software Engineering	3	0
SKM4212	Audio Visual Digitisation	2	1	SSK4401	Database Systems	3	0
SKP2203	Asian and Islamic Civilizations	2	0	SKM4213	Digital Image Processing	2	1
BBI2423	Academic Interaction and Presentation	2	1	BBI2424	Academic Writing	2	1
TOTAL		**18**		**TOTAL**		**18**	
3RD YEAR							
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SKM4400	Multimedia Project Management	3	0	SKM4204	Artificial Intelligence in Computer Games	3	0
SSE3202	Human- Computer Interaction	3	0	SSK4505	Computer System Security	3	0
PRT2008	Agriculture and Man	2	0	SKM4949A	Bachelor Project	0	2
	Electives	9	0		**Electives**	9	0
LAX (12 points)				CEL2103	Writing Academic Texts		
TOTAL		**17**		**TOTAL**		**17**	
4TH YEAR							
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SKM4949B	Bachelor Project	0	4	SKM4901	Industrial Training	0	12
	Electives	9	0				
CEL2105/ CEL2106/ CEL2107							
LAX (6 points)							
TOTAL		**13**		**TOTAL**		**12**	

STUDY SCHEME (BACHELOR OF COMPUTER SCIENCE-COMPUTER NETWORK)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

CODE	COURSE	L	L/T	CODE	COURSE	L	L/T
1ST SEMESTER				**2ND SEMESTER**			
SSK3100	Computer Programming I	3	1	SSK3101	Computer Programming II	3	1
SSK3003	Discrete Structures	3	0	SSK3207	Computer Organization and Assembly Language	3	0
PRT2008	Agriculture and Man	2	0	SKR3200	Computer Network and Communication	3	0
SKP2101	Malaysian Nationhood	3	0	SKP2203	Asian and Islamic Civilizations	2	0
BBI2422	Reading for Academic Purposes	2	1	SKP2204	Ethnic Relations	2	0
	Co-curriculum	0	1		**Co-curriculum**	0	1
				CEL2102	Effective Listening and Speaking		
				LAX (6 points)			
	TOTAL	**16**			**TOTAL**	**15**	

2ND YEAR

CODE	COURSE	L	L/T	CODE	COURSE	L	L/T
SSK3118	Data Structures and Algorithms	3	0	SKR3201	Internetworking	3	0
SSK3313	Operating System	2	1	SKR3309	Network Protocol	2	1
SSK3408	Database Application Development	3	1	SKR3202	Distributed and Parallel Computing	3	0
SKR3504	Network Analysis and Design	3	0	SSK4602	Intelligent Computing	3	0
SSE3001	Introduction to Software Engineering	3	0	BBI2424	Academic Writing	2	1
BBI2423	Academic Interaction and Presentation	2	1		**Electives**	3	0
	TOTAL	**19**			**TOTAL**	**18**	

3RD YEAR

CODE	COURSE	L	L/T	CODE	COURSE	L	L/T
SKR4401	Distributed Systems	3	0	SKR4301	Network Management	3	0
SKR4200	Network Security	3	0	SKR3308	Parallel and Distributed Programming	2	1
SKR3303	Network Programming	2	1	SIM4207	Ethics in Computing	3	0
SSE3202	Human- Computer Interaction	3	0	SKR4949A	Bachelor Project	0	2
SKR4307	Mobile Application	2	1		**Electives**	6	0
	Electives	3	0	CEL2103	Writing Academic Texts		
LAX (12 points)							
	TOTAL	**18**			**TOTAL**	**17**	

4TH YEAR

CODE	COURSE	L	L/T	CODE	COURSE	L	L/T
SKR4949B	Bachelor Project	0	4	SKR4901	Industrial Training	0	12
	Electives	9	0				
CEL2105/ CEL2106/ CEL2107							
LAX (6 points)							
	TOTAL	**13**			**TOTAL**	**12**	

STUDY SCHEME (BACHELOR OF SOFTWARE ENGINEERING)

Notes : L = Lecture , L/T = Laboratory/Tutorial

1ST YEAR

	1ST SEMESTER				2ND SEMESTER		
CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSK3100	Computer Programming I	3	1	SSK3101	Computer Programming II	3	1
SSK3003	Discrete Structures	3	0	SSK3207	Computer Organization and Assembly Language	3	0
SKP2101	Malaysian Nationhood	3	0	SSE3301	Software Requirements Engineering	3	0
SKP2203	Asian and Islamic Civilizations	2	0	SIM3251	Statistics for Computer Science	3	0
PRT2008	Agriculture and Man	2	0	SKP2204	Ethnic Relations	2	0
BBI2422	Reading for Academic Purposes	2	1		**Co-curriculum**	0	1
	Co-curriculum	0	1	CEL2102	Effective Listening and Speaking		
				LAX (6 points)			
	TOTAL	18			**TOTAL**	16	

2ND YEAR

CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSK3118	Data Structures and Algorithms	3	0	SSK3313	Operating System	2	1
SSK3408	Database Application Development	3	1	SSE3305	Software Testing	3	0
SSE3304	Software Design	3	0	SSE3306	Human-Computer Interface	3	0
SKR3200	Computer Network and Communication	3	0	SSE4350	Software Architecture	3	0
BBI2423	Academic Interaction and Presentation	2	1	BBI2424	Academic Writing	2	1
					Electives	3	0
	TOTAL	16			**TOTAL**	18	

3RD YEAR

CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSE4306	Software Quality	3	0	SIM4208	Electronic Commerce	3	0
SSE4300	Software Project Management	3	0	SSE4356	Secure Software Development	3	0
SSE4351	Software Maintenance And Evolution	3	0	SSE4301	Software Engineering Team Project	2	1
	Electives	9	0	SSE4949A	Bachelor Project	0	2
LAX (12 points)					**Electives**	6	**0**
				CEL2103	Writing Academic Texts		
	TOTAL	18			**TOTAL**	17	

4TH YEAR

CODE	**COURSE**	**L**	**L/T**	**CODE**	**COURSE**	**L**	**L/T**
SSE4949B	Bachelor Project	0	4	SSE4901	Industrial Training	0	12
SIM4207	Ethics in Computing	3	0				
	Electives	6	0				
CEL2105/ CEL2106/ CEL2107							
LAX (6 points)							
	TOTAL	13			**TOTAL**	12	

COURSE SYNOPSIS

Department of Computer Science

SSK3003 **Discrete Structures** 3(3+0)

Prerequisite : None

This course covers the approaches to mathematical concepts of discrete structures that are backbones of computer science and how to use them in practice. The student will be guided to deal with the logic, relation, functions, and algorithms, and their applicability in problem solving.

SSK3100 **Computer Programming I** 4(3+1)

Prerequisite : None

This course covers introduction to programming, emphasizing on the problem solving technique. Students will learn to apply basic programming concepts toward solving problems, develop programs, as well as effectively use basic and abstract data types, control structures, code modularization and arrays using the latest programming language.

SSK3101 **Computer Programming II** 4(3+1)

Prerequisite : SSK3100

This course covers the object oriented programming technique. Students will be introduced to object paradigm including classes, inheritance, and polymorphism applications. Several case studies will be used in the object-oriented programming problem solving. Programming languages such as Java or C# is used in developing program.

SSK3102 **Embedded Systems Programming** 3(2+1)

Prerequisite : SSK3313

The course introduces the fundamental conceptss and requirements of developing an embedded system. It covers the software and hardware of the embedded platform, their environments, and embedded programming approaches. The students will learn to write program and develop applications for embedded system. An embedded platform such as Arduino or Android will be used to implement the system.

SSK3118 **Data Structures and Algorithms** 3(3+0)

Prerequisite : SSK3101

This course covers the concept of storing data in memory and analysing the algorithm that manipulate the data in order to determine its efficiency.

SSK3207 **Computer Organization and Assembly Language** 3(3+0)

Prerequisite : SSK3100

This course covers computer organization and basic development of digital computer. The Assembly language will be applied to illustrate the functions and interactions between the computer main components.

SSK3313 **Operating System** 3(2+1)

Prerequisite: SSK3207

This course covers the fundamentals of operating systems. It aims to equip the student with an understanding of the functions and major components of a modern operating system. Formal principles are illustrated with examples and case studies of one or more contemporary operating systems.

SSK3408 **Database Application Development** 4(3+1)

Prerequisite : SSK3101

This course covers the database design and development of applications using relational database technology. Each step of the development, which consists of database design, queries, and application, will be studied. Current Database Management System software will be used. Practical works will be given as individual and in groups.

SSK4102   Embedded Systems Development   3(3+0)

Prerequisite : SSK3102

This course covers the development of applications for embedded system utilizing the available sensors and peripherals. It includes system development architecture, programming language for embedded environment, operating system supports, peripherals and sensors, and network communication supports. Students will develop embedded applications based on several case studies.

SSK4106   Design and Analysis of Algorithms   3(2+1)

Prerequisite : SSK3118

This course covers the fundamental techniques for designing efficient algorithms and analyzing their This course covers the fundamental techniques for designing efficient algorithms and analyzing their running times. Several design and analysis techniques of algorithms will be discussed. In addition, students will be introduced to graph algorithms, string matching and NP-completeness.

SSK4205   Compiler Design   3(3+0)

Prerequisite : SSK3118

This course introduces the concepts of programming language translation such as formal grammar and compiler design phases. Methods for syntax analysis such as top-down and bottom-up parsing are also discussed. Students will produce a simple compiler using available tool such as LEX and YACC.

SSK4207   Computer Architecture   3(3+0)

Prerequisite : SSK3207

This course covers the design of computer systems and components. Students will also learn advanced techniques for computer design including parallel processing, pipelining, multiprocessors, and multi-computers.

SSK4303   Operating System Design   3(3+0)

Prerequisite : SSK3313

This course covers the internal design of an operating system, specifically the kernel design and algorithms related to internal management of an operating system. A selected existing operating system is also discussed as a case study.

SSK4401   Database Systems   3(3+0)

Prerequisite : SSK3118 and SSK3408

This course covers different data models used to conceptually and logically model databases. The models include entity-relationship, relational, object-oriented, and relational-object. This course also introduces distributed databases as well as new database applications.

SSK4403   Database Administration   3(3+0)

Prerequisite : SSK4401

This course covers the database administration concepts. Students will learn theoretical and practical aspects in database administration to assure the availability dan security of the database, as well as to monitor the database performance.

SSK4407   Business Analytics   3(3+0)

Prerequisite : SSK3408

The course covers the fundamental concepts of business analytics. It covers data handling from the organization, technical and management perspectives. The life-cycle of analytic project includes identifying operational/transactional data sources, data transformation, data warehouse design and modelling, and analytical reporting. This course covers the usage of tools for extracting and analyzing data from various sources

SSK4409   Big Data Analytics   3(3+0)

Prerequisite : SSK3408

This course covers the introduction to big data technology and the importance of big data analytics. It includes big data technology, tools and techniques that are used in various industries. The usage of tools in big data analytics will be discussed

SSK4505   Computer System Security   3(3+0)

Prerequisite : SSK3313

This course covers mathematical principles in data security and how it is used in operating systems, database systems and computer networking. Information theory, number theory and complexity will also be discussed. Basic algorithms for data security such as encryption and cryptography will be emphasized.

SSK4506   Database Security   3(3+0)

Prerequisite : SSK3118

This course covers the concepts and issues on database security, which involve authentication, demystifying authorization and access control, and auditing. Database security techniques used in Database Management Systems (DBMS) such as Oracle are discussed.

SSK4507   Cryptography   3(3+0)

Prerequisite : SSK3118

This course covers the concept of cryptography and its applications. Two categories of cryptography techniques, namely symmetric ciphers and public-key are discussed. Message authentication and functions for message authentication are also discussed. Appropriate cryptography techniques are implemented in the application system development.

SSK4508   Computer Forensics   3(3+0)

Prerequisite : SKR3200 and SSK3313

This course covers several computer forensic techniques, which deal with the preservation, identification, extraction, documentation and interpretation of computer data. Methodology of writing computer forensic reports, as well as legal aspects and policies are also discussed.

SSK4602   Intelligent Computing   3(3+0)

Prerequisite : SSK3118

This course covers concepts and techniques of intelligent computing. The techniques introduced are knowledge representation, heuristic searching, and machine learning. Some advance topics such as expert systems, natural language processing, and software agents are also discussed. An appropriate intelligent computing software is used in the application system development.

SSK4604   Data Mining   3(3+0)

Prerequisite : SSK3118

This course covers concepts and techniques of data mining, which include data pre-processing, as well as data mining functionsand software. The chosen techniques are applied in the data mining application system development.

SSK4610   Knowledge Based System   3(3+0)

Prerequisite : SSK3118

This course covers the knowledge-based systems and other programs which are involved with a special knowledge domain. The key factors that underly knowledge-based systems are knowledge acquisition, knowledge representation, and the application of large bodies of knowledge to the particular problem domain in which the knowledge-based system operates. These will be illustrated with examples drawn from existing systems.

SSK4613   **Machine Learning and Neural Networks**   3(3+0)

Prerequisite : SSK3118

This course covers the concepts of machine learning and neural networks. Students will learn algorithms in machine learning such as version spaces and candidate elimination, decision tree, and genetic algorithms, and then neural network models and applications will be discussed. An appropriate software tools for machine learning and neural networks are used in the application system development.

SSK4617   **Computing Agents**   3(3+0)

Prerequisite : SSK3118

This course covers the concepts of agent as a computer program or communities of programs that are mutually cooperative, and its distinction from traditional programs. It also covers types of agents, agent architectures, multi agent systems, methodologies in agent design, and application agents. The chosen methodology is used in the agent development.

SSK4618   **Robotic System Development**   3(3+0)

Prerequisite : SSK3118

This course covers introduction to robotics system, which includes the mechanical structure of robot systems, mechanics of robot manipulators and control systems. The students will be exposed to the fundamental of automation and robotic programming.

SSK4901   **Industrial Training**   12(0+12)

Prerequisite : SSE3001 and SSK3408 or Organization Approval

In this course, students are exposed to real working environment in industries/organizations. Training includes application of the theoretical and practical aspects that have been studied with current practices in the workplace. Problem solving and communication skills are also emphasized.

SSK4949   **Bachelor Project**   6(0+6)

Prerequisite : Organization Approval

This course covers the aspects of planning and executing project. These include title selection, conducting critical review, designing and performing work strategy, collecting and analysing data, documenting and presenting project output.

Department of Multimedia

SKM3001   Multimedia Technology   3(3+0)

Prerequisite : None

This course covers the basic understanding of multimedia computer hardware and its software. It also provides exposure to the characteristics of various multimedia elements such as text, image, audio, video, and animation. The concept of multimedia applications, data manipulation, file format, media storage, multimedia memory management and configurations, and the techniques of displaying data on the screen of each multimedia elements are also discussed.

SKM3200   Computer Graphics   3(2+1)

Prerequisite : SSK3118

This course covers the basic concept in computer graphics. It covers knowledge related to computer graphics from the hardware and software aspects. It includes concepts and basic techniques for operating with 2D and 3D wireframe objects. This course reviews computer graphics applications, in which the students need to develop a simple computer graphics application using appropriate programming techniques.

SKM3201   Computer Graphics Modeling and Rendering   3(2+1)

Prerequisite : SKM3200

This course covers the use of rendering methods for realistic graphics image generation. It includes techniques such as 3 dimension modelling, computer graphics rendering for realistic display, andthe usage of ray tracing in computer graphics. These techniques are implemented in computer graphics programs

SKM3202   Cognitive Psychology for Computer-based Learning   3(3+0)

Prerequisite : SKM3300

This course covers the basic concept of inter-relationship between cognitive psychology, education and computer science that includes discussion on the different perspectives of learning, human memory, learning processes and knowledge representation. It also covers the approaches used by the computer scientists to develop courseware and Intelligent Tutoring Systems to support human learning based on the insights from cognitive psychology and education fields.

SKM3203   Computer Games Analysis and Design   3(3+0)

Prerequisite: SKM3300

This course covers the preparation and the strengthening of planning skills in game development. It also covers the analyses all the variables in a computer games project which focuses on from customers to techniques, game design, game production phase, computer game project management, marketing and intellectual property.

SKM3300   Multimedia Application Development   3(2+1)

Prerequisite : SSK3100

This course covers the usage of computer hardware and software for multimedia applications development, including the planning stages management and screen display techniques for multimedia elements. This course also covers the phases of multimedia application planning and development as well as issues of multimedia product marketing.

SKM4200   Computer Animation   3(2+1)

Prerequisite : SKM3200

This course covers the basic concepts of computer animation. In the beginning, students will be exposed to cel animation techniques and will later be exposed to the processes involved for adaptation to 2D and 3D computer animation. Emphasis will be given on the twelve principles of animation to ensure a satisfactory outcome. Students will also be introduced to basic animation programming for object and character control.

SKM4201   **Virtual Reality**   3(2+1)

Prerequisite : SKM3200

This course covers the basic concepts of virtual reality and skills involved in developing a virtual reality (VR) environment. It covers the use of software and hardware for virtual reality, and stresses on photorealistic computer graphics aspects, real-time computer graphics, interactivity, and the application of artificial intelligence techniques. At the end of the course, students are required to conduct a case study on the design and construction of an actual virtual reality environment, and build their own prototype.

SKM4203   **Audio Visual Design and Production**   3(2+1)

Prerequisite: SKM3300

This course covers the production of the audio visual elements in developing applications such as interactive multimedia projects and games. It includes visual production techniques such as the graphic design principles, colour theory dan user interface design. Artistic approaches and cinematography basics such as camera viewpoints, volume enhancement, distance effects and lighting effects will also be discussed. This course also integrates audio production techniques which can be utilised to develop audio visual presentations. It includes sound design, sound programming, voice-over, audio team and discusses the audio studio recording requirements

SKM4204   **Artificial Intelligence in Computer Games**   3(3+0)

Prerequisite : SKM3300

This course exposes the usage of artificial intelligence (AI) as one of the features in computer games. AI concepts are applied as an important component in computer games based on recent game examples. This includes specific AI techniques to be used in computer game.

SKM4207   **Data Compression**   3(3+0)

Prerequisite : SSK3118

This course covers the various data compression techniques used on personal and mid-sized computers, explores different data compression methods, explaining the theory, quantization, coding and image compression.

SKM4209   **Natural Language Processing**   3(3+0)

Prerequisite : SSK3118

This course provides an introduction to Natural Language Processing (NLP). It covers both linguistic and statistical approaches to language processing in two major subfields of NLP, which are syntax (language structures) and semantic (language meaning). The techniques discussed are important in the development of a system that can understand and produce language, for applications such as information extraction system, question answering system, information retrieval system, automatic summarization system, and machine translation system.

SKM4210   **Speech Processing**   3(3+0)

Prerequisite: SSK3101

This course covers study of speech processing and state-of-the-art models and algorithms for speech processing. It includes the symbolic approaches representations for language processing, speech recognition and synthesis, information extraction, search engines, machine translation, and the generation of spoken language dialogue agents.

SKM4211   **Sound Processing**   3(3+0)

Prerequisite : SKM4212

This course is to introduce the fundamentals of sound representation and processing as one of the medias in digital media. The mathematical and scientific concepts of digital sound processing towards audio content analysis will be covered. These will include sound transforms, sound feature extraction, compression techniques, and analysis algorithms. Sound processing methods for applications such as intelligent signal-adaptive sound processing systems for various categories of sound data which include speech, music, and sound effects will be discussed.

SKM4212   **Audio Visual Digitisation**   3(2+1)

Prerequisite : SKM3300

This course covers audio visual fundamentals to develop audio visual applications and audio visual data content analysis. It also includes recording and manipulation techniques based on the audio quality, use of various sound categories such as music, speech and digital sound effects. Students will learn video design concepts, film/video digitisation techniques for all types of multimedia production, editing digital video for creating good quality pictures and films. Exposure to various audio visual compression techniques and formats will also be given. Practical works will be given

SKM4213   **Digital Image Processing**   3(2+1)

Prerequisite : SSK3101

This course covers the manipulation of image data for viewing by people and blends the techniques of image processing. It also uses a unique approach to the practice of digital image processing, which contains all the basic concepts, definitions, models, and algorithms necessary to understand computer imaging. It covers the elements of a digital image processing system, the digital image fundamentals, the image transforms, enhancement, restoration, encoding, segmentation, and description. Practical works will be given

SKM4214   **Pattern Recognition**   3(2+1)

Prerequisite: SSK3118

This course covers pattern recognition techniques to solve practical problems through intuitive understanding of the application using suitable algorithms. Emphasis will be given to the use and extraction of features until the process of supervised or unsupervised classification for various patterns. Among the real world applications that will be looked into are Computer Science, Biological Engineering, Medicine, and Psychology.

SKM4215   **Creative Design Elements**   3(2+1)

Prerequisite : SKM3300

This course covers the technique required to design multimedia elements creatively for the development of a portfolio. It covers the basic concepts, usability design, and creative interface. This course requires the student to consider creative design from a conceptual point of view, composition, and design principles for the integration of elements.

SKM4301   **Multimedia Information Retrieval**   3(3+0)

Prerequisite : SSK3118

This course covers the basic theory and practical aspects of multimedia information retrieval (MMIR) which involves the techniques of structuring, storing and retrieving multimedia information automatically, the integration of various techniques that are important for the development of MMIR systems such as information retrieval (IR) based on text, image, audio, and video. Some case studies of existing retrieval systems are studied.

SKM4310   **Computer Game Development**   3(2+1)

Prerequisite: SKM3203

This course covers the preparation and the strengthening of skills in computer games development. It covers studies on programming languages and scripting, usage of authoring tools, the fundamentals of game programming, game architecture and entities, developing game resources, and game testing.

SKM4311   **Animation for Multimedia Production**   3(2+1)

Prerequisite : SKM3300

This course covers the basic design principles, design issues, concept of developing animation, and practices in the development of 2D and 3D animation by using computer application. It includes the practical approach and requires the students to plan, design and develop 2D and 3D animation according to the related project requirement.

SKM4312   Educational Multimedia Software Development   3(2+1)

Prerequisite : SKM3300

This course covers the usage of the instructional design concepts in developing educational multimedia software and the computer-based instructional methodologies. This course also exposes the use of authoring tools and studies the effects of the authoring tools towards the design of educational multimedia software.

SKM4313   Augmented Reality Application   3(1+2)

Prerequisite: SKM3200

This course covers the basic concept in augmented reality. It covers basic knowledge related to augmented reality from the hardware and software aspects. It includes augmented reality interactivity display, techniques for processing and displaying continuous picture in augmented reality together with 2D and 3D image transformations in augmented reality environment. The development of augmented reality application is practically developed using interactive programming and command language.

SKM4400   Multimedia Project Management   3(3+0)

Prerequisite : SKM3300

This course covers the strategy and planning for a multimedia business, the variables within projects from clients to techniques and choosing the multimedia team members to implement the project management process. Legal issues which involve the innovative use of communication, advertising, searching and storage mechanisms that online media offers are also be studied.

SKM4901   Industrial Training   12(0+12)

Prerequisite : SKM3300 or Organization Approval

In this course, students are exposed to real working environment in industries/organizations. Training includes application of the theoretical and practical aspects that have been studied with current practices in the workplace. Problem solving and communication skills are also emphasized.

SKM4949   Bachelor Project   6(0+6)

Prerequisite : Organization Approval

This course covers the aspects of planning and executing project. These include title selection, conducting critical review, designing and performing work strategy, collecting and analysing data, documenting and presenting project output.

Department of Communication Technology and Network

SKR3200   **Computer Network and Communication**   3(3+0)

Prerequisite : None

This course covers the basic concepts of computer communications and the standard networking model. These include the characteristics of physical transmission, network architecture, types of network, the latest technologies on computer networks, the major components of data communication systems, local area networks (LAN) and wide area networks (WAN).

SKR3201   **Internetworking**   3(3+0)

Prerequisite : SKR3504

This course covers the addressing, binding, routing, Internet and application protocols, principles, and the architecture of the global Internet. It is particularly focus on TCP/IP.

SKR3202   **Distributed and Parallel Computing**   3(3+0)

Prerequisite : SKR3200

This course covers the concept of parallel and distributed computing that to be used in distributed systems. It emphasizes on the main aspect of parallel such as memory and communication models, also strategy in designing algorithm in order to analyse and evaluate the effectiveness of parallel and distributed computing.

SKR3303   **Network Programming**   3(2+1)

Prerequisite: SKR3200

This course comprises of programming concepts in network systems, technology and strategies for network-application development. It includes methods to write a program for Application Programming Interface (API).

SKR3305   **Python Programming**   3(2+1)

Prerequisite : SSK3100

This course covers Python programming concepts and its applications in managing informations in distributed environment such as cloud. It emphasises on the skills to extract, parse and analyse data in real world problems more efficiently using Python. Interactions with unstructured databases in distributed environment is discussed.

SKR3306   **C++ Programming**   3(2+1)

Prerequisite : SSK3100

This course covers the basic programming in the C++ language and presents the fundamental concepts and techniques used in object-oriented programming. The concepts and techniques are used to create structured, modular and reuse-able code in designing a computer program.

SKR3307   **Shell Programming**   3(2+1)

Prerequisite : SSK3100

This course covers shell programming and its respective concepts, syntax and usage in the Unix environment. It emphasizes skills of writing shell for the purpose of controlling programs, connecting to other programs and to enhance the language ability to include new functionalities. Multiple language programming projects are introduced.

SKR3308   **Parallel and Distributed Programming**   3(2+1)

Prerequisite : SKR3202 and SKR3303

This course covers concepts of parallel and distributed programming for multiprocessor computer system which are either based on the shared or distributed memory. It also covers synchronization, data distribution, load balancing, scheduling, data partitioning, interconnection networks and data communication. Several parallel and distributed programs are designed, implemented and performance-evaluated using appropriate software tools.

SKR3309   Network Protocols   3(2+1)

Prerequisite : SKR3504

This course covers the network protocols together with the installation and configuration of network devices. These include the characteristics of protocols for all standard TCP/IP layers and network configuration of switches and routers.

SKR3504   Network Analysis and Design   3(3+0)

Prerequisite : SKR3200

This course covers the analysis and design of computer networks. Students are exposed to the technical aspects and constraints in the implementation of a computer network system.

SKR4200   Network Security   3(3+0)

Prerequisite : SKR3504

Kursus ini merangkumi konsep dan prinsip kepada keselamatan rangkaian bermula dengan teori asas matematik, algorithma kriptografi, protokol dan aplikasi keselamatan.
This course covers the concepts and principles of network security begins with relevant mathematical foundations, cryptographic algorithms, security protocols and applications.

SKR4201   High Speed Networks   3(3+0)

Prerequisite : SKR3504

This course covers the design of High Speed Network. The course emphasizes on network modeling, network optimisation, routing, design of high speed switching fabrics, congestion control and traffic characterization.

SKR4202   High Performance Computing   3(3+0)

Prerequisite: SKR3504

This course covers the design of modern computer architectures, programming and software, parallel processors and shared-memory for high performance computing.

SKR4205   Wireless and Mobile Network   3(3+0)

Prerequisite : SKR3504

This course comprises the concept the concepts of mobility and its impact on systems and network applications. It also includes the mobile devices, end users, Internet protocol layers and industry standards. Mobile applications for each node and network infrastructure that can be accessed through wireless network technology are also discussed.

SKR4301   Network Management   3(3+0)

Prerequisite : SKR3504

This course covers the concepts of network management. The operational aspect, and the current standard of network management systems are also discussed.

SKR4305   Distributed Operating System   3(3+0)

Prerequisite : SSK3313 and SKR3200

This course comprises of the concepts and structures of operating system for distributed environments. This includes the classification of operating systems for local area networks, wide area networks and distributed systems. Design methods for distributed operating system will be discussed and case studies will be analyzed.

SKR4307   Mobile Application   3(2+1)

Prerequisite : SKR3200

This course comprises the concept of mobile application development utilizing suitable tools such as Symbian EPOC, Window mobile, BREW, OPERA, Web 2 and AJAX. The programming languages such as Java bean, JSP, ASP and XML are used.

SKR4401   **Distributed Systems**   3(3+0)

Prerequisite : SKR3504

This course covers the area of computer networks which includes client-server systems, distributed databases, distributed transaction processing, distributed operating systems, distributed application systems and open systems standards.

SKR4403   **Grid Computing**   3(3+0)

Prerequisite : SKR3202

This course covers the basic technology and architecture concepts of grid computing. Current research issues in grid architecture, infrastructure and skills in utilising current grid tools and technologies are emphasized.

SKR4404   **Cloud Computing**   3(3+0)

Prerequisite : SKR3200

This course covers the concepts of cloud computing and its deployment. It emphasizes the architecture and model used, cloud services and elements of virtualization in the cloud system. Approaches for deployment of cloud services are also discussed.

SKR4901   **Industrial Training**   12(0+12)

Prerequisite : SKR3504 or Organization Approval

In this course, students are exposed to real working environment in industries/organizations. Training includes application of the theoretical and practical aspects that have been studied with current practices in the workplace. Problem solving and communication skills are also emphasized.

SKR4949   **Bachelor Project**   6(0+6)

Prerequisite : Organization Approval

This course covers the aspects of planning and executing project. These include title selection, conducting critical review, designing and performing work strategy, collecting and analysing data, documenting and presenting project output.

Department of Software Engineering and Information System

SIM3251   **Statistics for Computer Science**   3(3+0)

Prerequisite : None

This course covers the fundamental concepts of statistics and statistical methods to analyze data and make inferences. The teaching focuses on how to use appropriate methods, make decisions, and make interpretation using statistical terms. Solving problems in computer science will be emphasized.

SIM4200   **Information Systems**   3(3+0)

Prerequisite : SSK3101

This course provides students with knowledge about the importance of information management in an organization. The teaching focuses on the basic concepts of information systems, the tools and the basic techniques in modeling information system are also introduced to strengthen the understanding and application of information systems. Students are also required to develop an information system and know the use of information systems in organizations, at the same time identifying business opportunities.

SIM4207   **Ethics in Computing**   3(3+0)

Prerequisite : SSK3100

This course provides students with ethics in computerization and its relation to information technology. This includes issues such as copyright, piracy, intellectual properties, unauthorized access to information technology and others. Emphasis will also be given to its importance to all levels of computer users such as professional, businessmen and end users.

SIM4208   **Electronic Commerce**   3(3 +0)

Prerequisite : SSE3150

This course covers the concepts and philosophy of electronic commerce and related issues, challenges and advantages of information technology used in the digital economy which includes electronic payment system, electronic banking, and digital publishing. Emphasis will be given to application development and technology utilization for the real borderless business world.

SSE3001   **Introduction to Software Engineering**   3(3+0)

Prerequisite : SSK3101

This course covers the foundation knowledge and skills in software engineering. Software engineering principles and methods including current and emerging software engineering practices and supports tools are discussed. Requirement analysis, design, implementation and testing techniques are emphasised.

SSE3150   **Web Application Development**   3(2+1)

Prerequisite: SSK3101

This course covers the fundamental concepts of web technology and practical in developing web applications. Students will learn the interaction between client side and server side through technology. Students will design and develop web applications that consider the quality factors for web through practical.

SSE3202   **Human-Computer Interaction**   3(3+0)

Prerequisite : SSK3101

This course covers the introduction to human-computer interaction. Three main components are to understand user/human, to understand the computer and to understand interaction. Human components include few psychological aspects. On the other hand, interaction understanding includes techniques used to enable an effective and efficient interaction between computer and users. Evaluation is also an important component to ensure the system developed is using user-centered approach.

SSE3301   **Software Requirements Engineering**   3(3+0)

Prerequisite : SSK3100

This course explores software requirements considerations, how to gather the right software requirements, and document the software requirements effectively. In this course, students need to produce and present software requirements specification.

SSE3304   **Software Design**   3(3+0)

Prerequisite: SSE3301 or SSE3001

This course covers the design concepts and software design techniques. The course also emphasizes the object-oriented design modeling approach. System design and detailed design including design pattern usage are emphasized.

SSE3305   **Software Testing**   3(3+0)

Prerequisite : SSE3304

This course covers fundamental concepts of software testing. The goal of the course is to provide students with the skill to select and apply a testing strategy and testing techniques that are appropriate to a particular software to be tested. In addition the student will able to assess the effectiveness of implemented testing activity by providing evidence to justify the evaluation made. The course will be supported by a practical work involving the assessment of software quality.

SSE3306   **Human-Computer Interface**

Prerequisite : SSE3304

This course consists of the introduction to the meaning and understanding the usability of the system in theory. This understanding about the importance of usability is implemented through the development of graphical user interface (GUI). In the development of graphical user interface (GUI), few programming concepts are introduced such as event-driven programming. The development of user interface will cover few important aspects which includes interfaces and interaction types, the usage of design principles and guidelines in the graphical user interface (GUI) development, cognitive aspects and graphical user interface (GUI) components.

SSE4300   **Software Project Management**   3(3+0)

Prerequisite : SSE3301 or SSE3001

This course covers the functions and responsibilities of software management and how to manage software development project. The emphasis is on the production of quality product in time and within budget. It covers project scheduling and planning, cost estimation, risk management, human management, document production and quality management, and configuration management.

SSE4301   **Software Engineering Team Project**   3(2+1)

Prerequisite : SSE4300

This course covers practical techniques used in Software Engineering (SE) today. The focus is in object-oriented SE. Students will learn object-oriented SE technique by acting as a team member on a realistic project.

SSE4303   **Formal Methods in Software Development**   3(3+0)

Prerequisite : SSE3301 or SSE3001

This course covers formal methods which can be used in developing software. The usage includes specifying and verifying software. Formal methods languages which includes Event-B, Z or VDM will be introduced.

SSE4306   **Software Quality**   3(3+0)

Prerequisite : SSE3305

This course covers basic principle of software quality and quality assurance techniques. The teaching focuses on the importance of preventing problems from happening in producing quality software. Students will also given the opportunity to engage in activities of inspecting software documents based on selected software quality standards.

SSE4350   Software Architecture   3(3+0)

Prerequisite : SSE3304

This course covers the concepts, principles, and state-of-the-art methods in software architectures. It stresses on the non-functional requirements where the main focus is to develop a quality system through complete and effective architectural design. Some architectural styles will be introduced and the students will be exposed to a few approaches in analysing the architecture.

SSE4351   Software Maintenance and Evolution   3(3+0)

Prerequisite : SSE3301

This course comprises concept, process and techniques, which can support the ability of a software system to change, evolve and sustain. It covers plans, processes, techniques, tools and changed-control software. Issues related to software maintenance, which include object-oriented software maintenance and the future of software maintenance are also discussed. A software maintenance project in groups is implemented.

SSE4353   Component Based Software Development   3(3+0)

Prerequisite : SSE3304

This course covers concept of reusability and component-based software engineering. The course also introduces component technologies which includes API, Java and web services. Issues on component based software engineering is also discussed.

SSE4354   Enterprise Systems Development   3(2+1)

Prerequisite: SSE3150

This course extends the basic language skills taught in the Java programming course to cover more advanced Java based technologies. Students will gain further experience in object-oriented program design through the development of enterprise system that exploits many leading-edge technologies and techniques. Case studies will be used to demonstrate the use of these technologies and techniques while developing practical design and programming skills that will provide a solid foundation for the future. This course will provide students with the skills to design and develop professional solutions to real enterprise application.

SSE4355   Real-Time Software Engineering   3(3+0)

Prerequisite: SSE3304

This course covers foundation knowledge and skills in real-time software engineering. Real-time software engineering principles and methods including current and emerging software engineering practices in real-time software development are presented. Requirement analysis, design, verification and validation techniques are emphasised.

SSE4356   Secure Software Development   3(3+0)

Prerequisite: SSK3313

This course covers secure software development methodologies and examines strategies to integrate security principles into the software development lifecycle. It includes security in requirements engineering, secure designs, risk analysis, and developing secure code. Approaches in secure programming based on suitable programming language and software packages will be discussed.

SSE4901   Industrial Training   12(0+12)

Prerequisite : SSE4300 and Organization Approval

In this course, students are exposed to real working environment in industries/organizations. Training includes application of the theoretical and practical aspects that have been studied with current practices in the workplace. Problem solving and communication skills are also emphasized.

SSE4949   **Bachelor Project**   6(0+6)

Prerequisite: Organization Approval

This course covers the aspects of planning and executing project. These include title selection, conducting critical review, designing and performing work strategy, collecting and analysing data, documenting and presenting project output