Faculty of Computer Systems
& Software Engineering
FACULTY OF COMPUTER SYSTEMS & SOFTWARE ENGINEERING

INTRODUCTION

Faculty of Computer Systems & Software Engineering was established on 16 February 2002 to produce knowledgeable, high skilled and competitive graduates within the sphere of software engineering, system and computer network. At the beginning, the faculty had two fields which are Software Engineering and Networking.

The faculty has also embarked on research and development activities in the area such as information systems, software engineering, computer systems, communication systems, graphic and multimedia technology to produce technologies that are relevant to the needs of industries. Currently, the faculty has four research groups which are Network & Security, Modeling & Simulation, Data Mining & Knowledge Management and Graphic & Image Processing to support university's focus groups (Manufacturing & Automotive and Chemical & Biotechnology).

The faculty emphasizes on the development and growth of its students’ enrolment and graduates. Through high quality teaching (by completing specific quality outcome and generic skills), great laboratories facilities, proper and careful advising and numerous professional activities, our students have opportunity to excel in the classroom and laboratory session. In a personable atmosphere, the students become well prepared in the term of software engineering knowledge and technical skills. Thus, they are ready and confident to begin their professional career or further their studies.

The faculty's current planning is to be an ICT reference centre in Pahang to support the development of East Coast Economic Region (ECER), Malaysia. To realize this, many activities which involve industries and government sectors have been carried out.

VISION

To be a world class competency-based faculty in computer technology.

MISSION

We provide computer technology education, high-quality research and consultation in line with the needs of industries through excellent academic programs by providing a conducive environment to produce creative and innovative human capital.

PROGRAMS OFFERED

Diploma in Computer Science

Bachelor of Computer Science (Software Engineering)
Bachelor of Computer Science (Computer Systems & Networking)
Bachelor of Computer Science (Graphics & Multimedia Technology)
**Master by Coursework**
Master of Science (Software Engineering)
Master of Science (Computer Networking)
Master of Science (Information & Communication Technology)

**Master by Research**
Master in Computer Science
Master in Software Engineering

Doctor of Philosophy (PhD in Computer Science)
Doctor of Philosophy (PhD in Software Engineering)

**LABORATORIES AND FACILITIES**

There are 21 laboratories at the faculty which are located in Block X, Y and M. These laboratories are listed as follows:

- CCNA Lab (2)
- Undergraduate Research Lab (1)
- Innovative Programming (2)
- Distributed Databases (1)
- SQL Databases Lab (1)
- Operating System Lab (1)
- ICT Lab (3)
- CISCO Lab (1)
- LAN Workshop Lab (1)
- Software Engineering Lab (3)
- Postgraduate Research Lab (3)
- Creative Lab (1)
- Modeling Lab (1)
- IBM Center Of Excellence

All these labs are managed by technical unit headed by Head of Technical Unit. Several sub-ordinates comprises of Vocational Training Officer, Information Technology Officer, Assistant of Vocational Training Officer and Technician are located at the laboratories to help in management and administration of all equipments and labs. There are three technical unit rooms provided services to our staffs and students such as printing services, maintenance services, repair and troubleshooting services, and lab management services. These technical unit rooms are placed at each block.

Among equipments (hardware and software) provided to assist teaching and learning in labs are as follows:

- Sun Server
- Server, High-End Desktop and PCs
- Switches and Routers
- Fiber Splicer
- Optical Time-Domain Reflectometer (OTDR)
- Fluke Cable Network Analyzer and Tester
- Wireless Access Point
- Wireless Network Interface Card (NIC)
- Antenna for Wireless Systems (indoor and outdoor)
- Hardware-based firewall
- Network Cabling Tools and Components
- PC Assembly and Disassembly Tools and Components
- Camcorder
- Digital Single-Lens Reflex (DSLR)
- Mobile Studio Lighting
- Radio Frequency Identification (RFID) System
- Fingerprint Reader
- Personal Digital Assistant (PDA) and Mobile Device
- Global System for Mobile Communications (GSM) Modem
- Xbox Set
- MyKad Reader
- Laser Scanner and Printer
- All Microsoft Softwares available through MSDN Academic Alliance Software Center
- Rational Suite
- Adobe Products
- Matrix Laboratory (MATLAB)
- Code Gear C++
- Sun Solaris, Linux and Microsoft Operating System
- S-Plus
- LEGO Robot
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GENERAL OFFICE ASSISTANT

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Sijil Pelajaran Malaysia  
Telephone No.: 09- 5491146  
Email: mahmud@ump.edu.my

CURRICULUM STRUCTURE  
DIPLOMA IN COMPUTER SCIENCE

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COURSES

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TOTAL CREDIT: 91

OVERALL TOTAL CREDIT FOR GRADUATION: 12
## CURRICULUM STRUCTURE

### DIPLOMA IN COMPUTER SCIENCE

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## BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING) WITH HONOURS

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**Core Courses**

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- TOTAL CREDIT FOR GRADUATION: 122
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**OVERALL TOTAL CREDIT FOR GRADUATION**

123
BUM2133
ORDINARY DIFFERENTIAL EQUATIONS
Credit : 3 credit
Pre-requisite : None

Synopsis

This course introduces to the Ordinary differential equations, Laplace transform and Fourier series and their applications in solving engineering problems.

Course outcomes

CO 1 Use the basic principles and methodologies of differential equations, Laplace transform and Fourier series to solve various problems in differential equations, Laplace transform and Fourier Series.

CO 2 Use appropriate tool to solve the computational problems in ordinary differential equation.

CO 3 Apply concepts and methods learned to solve any related problem of differential equations, Laplace Transform and Fourier Series in various fields.

FUNDAMENTAL DISCRETE STRUCTURE
DUM1213

Course Outcomes

By the end of semester, students should be able to:

CO1 Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure.

CO2 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO3 Relate and apply the concepts and methods studied into other courses.

COURSE SYNOPSIS – DIPLOMA IN COMPUTER SCIENCE

FACULTY CORE SUBJECT
BASIC MATHEMATICS
DUM1113

Course Outcomes

By the end of semester, students should be able to:

CO1 Define and use the concepts and properties of basic mathematics.

CO2 Apply concepts and methods learned to solve any related problem of basic mathematics in various fields.

CO3 Relate and apply the concepts and methods studied into other courses.
Synopsis

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic, set theory, elementary number of theory, functions, relations, fundamentals of counting, Boolean algebra and simple proof technique. This course integrates symbolic tools, graphical concepts, and numerical calculations.

COMPUTER ARCHITECTURE & ORGANIZATION
DCN1013

Course Outcomes
By the end of semester, students should be able to:

- CO1 Identify and classify computer structure and its functions
- CO2 Identify the importance of computer system design, in order to achieve high performance
- CO3 Explain the internal components and their functionality of a computer, i.e. control unit, ALU, register, memory and CPU addressing modes
- CO4 Demonstrate team working by solving problems in groups.

Synopsis

This course discusses the structure and function of a computer. It expose student with the architecture and organization of a computer. This subject covers on the numbering system and the representation of data, the internal and external computer communication through system buses and Input and Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra.

PROGRAMMING TECHNIQUES DCS1053

Course Outcomes
By the end of semester, students should be able to:

- CO1 Demonstrate various techniques in solving a problem.
- CO2 Construct and run programs.
- CO3 Present various programming techniques in computer.

Synopsis

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

DATA STRUCTURE & ALGORITHM
DCS2103

Course Outcomes
By the end of semester, students should be able to:

- CO1 Use various types of data structures and algorithms techniques in a related problem.
- CO2 Construct a programme by applying the data structure and algorithms techniques for a related problem.
- CO3 Join online collaboration tool and able to discuss
new idea for learning autonomy.

Synopsis

This course is designed to expose the students to the data structures and algorithm. It provides a theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

DATABASE SYSTEMS
DCI2033

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate the concepts and principles of database systems.

CO2 Manipulate queries using the syntax of Structure Query Language (SQL) and Query By Example.

CO3 Construct innovative solution through the representation of data model, relationship ER and EER Diagrams and database normalization in database application system using appropriate DBMS.

CO4 Organize the group work to complete the given assessments in specified time frame.

Synopsis

The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process. Several query languages such as Structured Query Language (SQL) and Query By Example (QBE) will be discussed but the emphasis is on SQL. Students will be given a real-life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

CALCULUS
DUM1123

Course Outcomes

By the end of semester, students should be able to:

CO1 Apply and solve for elementary function and any related problem using the basic techniques and methodologies of calculus.

CO2 Think critically a wide range of problem and solve it using ideas and methods in calculus.

CO3 Relate and apply the concepts and methods studied into other courses.

Synopsis

This subject discusses single-variable calculus as they apply to computer science and focusing on providing a basic theoretical foundation for further work. Students are exposed to limits and continuity, derivatives, application of the derivatives, integrals, and application of the integrals. This course integrates symbolic tools, graphical concepts and numerical calculations.
DATA COMMUNICATION & NETWORKING
DCN1053

Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate knowledge and understanding of basics computer networking

CO2 Construct a simple LAN topologies by applying basic principles of cabling using network simulation

CO3 Build basic configuration of network design using real network devices such as switches and routers

CO4 Perform standard configuration and troubleshooting network using professional technique

Synopsis
This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

OBJECT ORIENTED PROGRAMMING
DCS2133

Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate the concept of object-oriented programming in given problems

CO2 Manipulate object-oriented programming in given problems

CO3 Propose the solution of given problems using object-oriented programming technique.

Synopsis
This course provides an introduction to the concepts of object orientation and object-oriented programming (OOP) techniques using Java programming language. It will provide students with a through look at the basic constructs of the Java programming language such as its basic data types and operations. It will also emphasize on the use of OOP characteristic that expose students to Unified Modeling Language (UML) design, class and object, inheritance, polymorphism, exception handling and Graphical User Interface (GUI) & event driven programming.

OPERATING SYSTEMS
DCN2063

Course Outcomes
By the end of semester, students should be able to:

CO1 Describe the theory of operating systems, distinguish the relationship between OS and hardware (system calls, I/O, files and symbolic links, directories and file systems, process management, forks, threads, inter-process communication, shells, signal handling, pipes, sockets, CPU scheduling and memory management).
CO2 Follow instructions on Operating Systems installation

CO3 Identify the current issues in operating system the viewpoint of a system designer

**Synopsis**

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Process creation and control, communication synchronization and concurrency, memory management and file systems concept are explored in the context of the WINDOWS/LINUX operating system.

**STATISTICS & PROBABILITY**

**DUM2413**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Describe and data analyze using statistical theory and methodology
- **CO2** Apply statistical concepts and methods learned to solve any related problems in various scientific disciplines
- **CO3** Relate and apply the techniques and methods studied into other courses.

**Synopsis**

In this course, students are exposed to basic statistics and analyze statistically. The topics covered are introduction to statistics, descriptive statistics, probability, discrete probability distributions, continuous probability distributions, sampling distribution and simple linear regression and correlation.

**INDUSTRIAL TRAINING**

**DCC3068**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Adapt working culture in ICT related industry.
- **CO2** Construct solution by applying the theory learned to solve real problem in organization.
- **CO3** Work effectively with others in organization to perform task given.
- **CO4** Practise interpersonal skills and professional ethics in organization.

**Synopsis**

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Student also supervised by industrial and university supervisor to guide and ensure that they can do their work as good as possible and achieved the objective for this course.

**INDUSTRIAL TRAINING REPORT**

**DCC3074**

**Course Outcomes**

By the end of semester, students should be able to:
CO1 Organize the industrial training knowledge, experience and skills in appropriate written report.

CO2 Organize technical writing skill in preparing the project report.

CO3 Report understanding of the leadership hierarchy in the organization.

CO4 Build communication skills on oral presentation.

**Synopsis**

During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, student need to provide an industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Students also need to do final presentation for assessment.

**ICT COMPETENCY WORKSHOP**

**DCC1022**

**Course Outcomes**

By the end of semester, students should be able to:

CO1 Demonstrate the knowledge for installation, maintenance and troubleshooting of Personal Computer and related Peripherall Devices base on Standard procedure.

CO2 Follow the installation, maintenance and troubleshooting Steps for Personal Computer and related Peripherall based on Standard procedure.

CO3 Perform professionalism behavior and good communication skills

**Synopsis**

This course is designated to expose the student an IT Technician and Desktop Support Technician such as be able to troubleshoot and manage all the computer hardware and software. The work is carried out independently and in a team. Student must be able to carry out assigned tasks.

**PROBLEM SOLVING**

**DCS1072**

**Course Outcomes**

By the end of semester, students should be able to:

CO1 Demonstrate the methods and approaches for solving the computing problem.

CO2 Display logical thinking skills in solving problem.

CO3 Demonstrate team working and communication skills through group assignment.

**Synopsis**

This course expose to the students with the appropriate computing methods in solving problem through programming approach, which consists of programming design, algorithm, pseudo code, flow chart and logic structure.
APPLICATION DEVELOPMENT WORKSHOP
DCC1032

Course Outcomes

By the end of semester, students should be able to:

CO1  Discover problems statements from given scenarios and translate them into programming codes

CO2  Construct an executable application by going through all the processes of application development

CO3  Work effectively in team in order to complete the given assessment in specific time

Synopsis

This course enables students to learn how to develop an executable application starting with the design of interface, writing of the codes using programming tool and lastly integrating the application with database.

INTRODUCTION TO IT
DCI1012

Course Outcomes

By the end of semester, students should be able to:

CO1  Demonstrate knowledge and understanding of the benefits of IT, the use of computers, the use of computer’s components and function, current applications and latest knowledge on computer technology.

CO2  Select appropriate approaches to update with current IT.

CO3  React, communicate and work in group work in order to complete the given assessment in specific time frame.

Synopsis

This is an introductory computer course that covers the fundamental of computer and information technology. The internet and World-wide web, application and system software, computer hardware, communication and networks, Information Technology (IT) trends and its challenges, and information systems and its development will also be discussed.

GRAPHICAL USER INTERFACE
DCM2013

Course Outcomes

By the end of semester, students should be able to:

CO1  Classify the Graphical User Interface (GUI) in various types of softwares.

CO2  Construct a GUI prototype according to the user interface guidelines.

CO3  Work and communicate effectively in group to complete the given assessment in specific time given.

Synopsis

This course introduces the standard Graphical User Interface (GUI) using usability-engineering life cycle for any software system and application. Student will expose to the concept of graphical user interface for computer application and how to
design good user interface based on the usability heuristic concept

**WEB PROGRAMMING**
**DCS2143**

**Course Outcomes**
By the end of semester, students should be able to:

- **CO1** Demonstrate understanding in fundamental of dynamic web-based applications.
- **CO2** Design and construct a Web-based application prototype using HTML, web server, database and scripting language.
- **CO3** Show effective communication in written and oral form through group discussion, meeting and presentation.

**Synopsis**
This course introduces the essential topics of Internet programming & development of web-based applications. Students are required to develop a web/Internet application which connected to the database.

**LOCAL AREA NETWORK WORKSHOP**
**DCN2072**

**Course Outcomes**
By the end of semester, students should be able to:

- **CO1** Investigate the Local Area Network Elements such as basic of networking, safety environment, Network hardware and related LAN with Wide Area Network (WAN).
- **CO2** Construct the plan, implement, test and troubleshoot structured cabling for LAN based on rules and standards.
- **CO3** Explain the problem, discuss and make suggestion on the structured cabling network based on the real issue.

**Synopsis**
This course introduces structured cabling for Local Area Network (LAN). Students are exposed to the fundamental of computer network, network topology, network devices and cabling tools, Copper cabling, Fiber Optic cabling, Simple LAN Device Installation, Wide Area Network Connection and network troubleshooting and documentation.

**SYSTEMS ANALYSIS & DESIGN**
**DCS1093**

**Course Outcomes**
By the end of semester, students should be able to:

- **CO1** Classify the stages of Systems Development Life Cycle.
- **CO2** Reproduce the design of a new system from scratch that comply with the stages of systems development life cycle.
- **CO3** Discuss effectively in a team and propose the team decision/solution for a given problem.
- **CO4** Demonstrate leadership’s skills through group assignment.
Synopsis

This course describes the concepts and methods of information system analysis and design, with an emphasis on system analysis methods and tools. The course focuses on the issues and management technique involved in analysis, design and implementation of information system.

FINAL YEAR PROJECT
DCC3016

Course Outcomes

By the end of semester, students should be able to:

- **CO1**: Build solution based on problem statement which comply with the principles of computer science.
- **CO2**: Explain the appropriate tools organization to realize the solution and join online community to search and manage relevance information from various sources.
- **CO3**: Explain the solution through oral and written form in order to defend their proposal.
- **CO4**: Comply commercialization element in project solution.

Synopsis

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.

ELECTIVE SUBJECT

MULTIMEDIA TECHNOLOGY AND APPLICATIONS
DCM2033

Course Outcomes

By the end of semester, students should be able to:

- **CO1**: Categorize characteristics and functions of each multimedia element.
- **CO2**: Manipulate multimedia elements (text, graphic, audio, video & animation) using software tools.
- **CO3**: Identify business opportunity in multimedia technology and application.
- **CO4**: Justify contribution of multimedia technology and application towards economy development, environment and culture preservation.
- **CO5**: Join collaborative learning platform for searching and managing relevance information from various sources.

Synopsis

This course will expose students to the theoretical and fundamental concepts of multimedia, its applications and the techniques involved. Topics to be covered include text and audio, image and video, the art of multimedia, and multimedia over the network.
DATA & NETWORK SECURITY DCN2033

Course Outcomes

By the end of semester, students should be able to:

CO1  Inquire and analyze theory and principles of security, cryptographic tools, user authentication and access control, security in networks, intrusion detection systems, firewalls and intrusion prevention systems and wireless security.

CO2  Construct and organize attack and defense methods into computer and network environments.

CO3  Identify and investigate security issues and keep abreast with current trends. CO4  Demonstrate and explain security issues and propose possible solutions.

Synopsis

The course introduces fundamental of security. Every chapter will explain security concepts, fundamentals, purpose, implementation and discussion in their respective areas related to data and network security. Topics include: Introduction to security, cryptographic tools, user authentication and access control, security in networks, intrusion detection systems, firewalls and intrusion prevention systems and wireless security.

COURSE SYNOPSIS – BACHELOR OF COMPUTER SCIENCE (SOFTWARE ENGINEERING)

PROGRAMMING TECHNIQUES

BCS1023

Course Outcomes

By the end of semester, students should be able to:

CO1  Demonstrate various techniques in solving a problem.

CO2  Construct and run programs

CO3  Differentiate various techniques in solving a problem

Synopsis

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

ICT COMPETENCY WORKSHOP

BCC1012

Course Outcomes

By the end of semester, students should be able to:

CO1  Demonstrate the knowledge for installation, and troubleshooting of Personal Computer and related Peripheral Devices base on Standard procedure.

CO2  Organize the installation, maintenance and troubleshooting Steps for
Personal Computer and related Peripherall based on Standard procedure

CO3 Demonstrate professionalism behavior and good communication skills

Synopsis

This course is designated to expose the student an IT Technician and Desktop Support Technician such as be able to troubleshoot and manage all the computer hardware and software. The work is carried out independently and in a team. Student must be able to carry out assigned tasks.

APPLICATION DEVELOPMENT WORKSHOP BCC1032

Course Outcomes

By the end of semester, students should be able to:

CO1 Analyze problems statements from given scenarios and translate them into programming codes.

CO2 Construct an executable application by going through all the processes of application development.

CO3 Work effectively in team in order to complete the given assessment in specific time.

CO4 Communicate effectively in team in order to complete the given assessment in specific time.

Synopsis

This course enables students to learn how to develop an executable application starting with the design of interface, writing of the codes using programming tool and lastly integrating the application with database.

FUNDAMENTAL DISCRETE STRUCTURE BUM1213

Course Outcomes

By the end of semester, students should be able to:

CO1 Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure.

CO2 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO3 Relate and apply the concepts and methods studied into other courses.

Synopsis

By the end of semester, students should be able to:

CO1 Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure.

CO2 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO3 Relate and apply the concepts and methods studied into other courses.
DATA STRUCTURE & ALGORITHMS  
BCS1093

Course Outcomes

By the end of semester, students should be able to:

CO1 Analyse various types of data structures and algorithms techniques in a related problem.

CO2 Construct a programme by applying the data structure and algorithms techniques for a related problem.

CO3 Join online collaboration tool and able to discuss new idea for learning autonomy.

Synopsis

This course is designed to expose the students to the data structures and algorithm. It provide theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

DATA COMMUNICATION & NETWORKING  
BCN1053

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate knowledge and understanding of basics computer networking

CO2 Construct a simple LAN topologies by applying basic principles of cabling using network simulation

CO3 Build basic configuration of network design using real network devices such as switches and routers

CO4 Perform standard configuration and troubleshooting network using professional technique

Synopsis

This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

COMPUTER ARCHITECTURE & ORGANIZATION  
BCN1043

Course Outcomes

By the end of semester, students should be able to:

CO1 Identify and classify computer structure and its functions

CO2 Identify the importance of computer system design, in order to achieve high performance

CO3 Explain the internal components and their functionality of a computer, i.e. control unit, ALU, register, memory and CPU addressing modes
CO4 Demonstrate team working by solving problems in groups.

Synopsis

This course discusses the structure and function of a computer. It expose student with the architecture and organization of a computer. This subject covers on the numbering system and the representation of data, the internal and external computer communication through system buses and Input and Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra.

SYSTEMS ANALYSIS & DESIGN BCS1133

Course Outcomes

By the end of semester, students should be able to:

CO1 Differentiate the stages of Systems Development Life Cycle.

CO2 reproduce a system from the given case study that comply with the stages of systems development life cycle

CO3 Work effectively in a team and propose the team decision/solution for a given problem.

CO4 Demonstrate team working by solving problems in groups.

CO5 Communicate effectively in a team for a given problem.

Synopsis

This course describes the concepts and methods of information system analysis and design, with an emphasis on system analysis methods and tools. The course focuses on the issues and management technique involved in analysis, design and implementation of information system.

OBJECT ORIENTED PROGRAMMING BCS2143

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate the concept of object-oriented in programming

CO2 Manipulate object-oriented programming in given problems

CO3 Formulate the solution of given problems using object-oriented programming technique

Synopsis

This course provides an introduction to the concepts of object orientation and object-oriented programming (OOP) techniques using Java programming language. It will provide students with a through look at the basic constructs of the Java programming language such as its basic data types and operations. It will also emphasize on the use of OOP characteristic that expose students to Unified Modelling Language (UML) design, class and object, inheritance, polymorphism, exception handling and Graphical User Interface (GUI) and event driven programming.

DATABASE SYSTEMS BCI2023

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate the concepts and principles of database systems.
CO2  Manipulate queries using the syntax of Structure Query Language (SQL), Relational Algebra and Query By Example

CO3  Construct innovative solution through the representation of data model using ER and EER Diagrams and normalize database to be implemented in database application system using appropriate DBMS

CO4  Work in group in order to complete the given assessments in specific time frame

CO5  Communicate effectively in group in order to complete the given assessments in specific time frame

**WEB SCRIPTING**  
**BCS2303**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1**  Demonstrate the understanding of dynamic web-based applications
- **CO2**  Construct a Web-based application prototype using HTML, web server, database and scripting language.
- **CO3**  Demonstrate leadership skill through group project
- **CO4**  Demonstrate teamworking skill through group project
- **CO5**  Show ability to identify business opportunities

**Synopsis**

This course introduces the essential topics of Internet programming & development of web-based applications. Students are required to develop a web/Internet application which connected to the database.

**DISCRETE STRUCTURE AND APPLICATIONS**  
**BUM2223**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1**  Use the basic principles and methodologies of advanced discrete structure to solve various problems in discrete structure.
CO2  Write programs to describe and solve discrete structure problems using any programming language.

CO3  Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO4  Relate and apply the concepts and methods into other courses.

**Synopsis**

This subject discusses an in depth of the discrete structures as they apply to computer science, focusing on providing a basic theoretical foundation for further work. Topics include review on algorithm, integers and matrices, advanced counting technique, graphs, trees, and modeling computation. This course integrates symbolic tools, graphical concepts, and numerical calculations.

**OPERATING SYSTEMS**

**BCN2053**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1**  Distinguish the relationship between OS and hardware (system calls, I/O, files and symbolic links, directories and file systems, process management, forks, threads, inter-process communication, shells, signal handling, pipes, sockets, CPU scheduling and memory management).

- **CO2**  Construct the program for given problem on an operating System (Case Study).

- **CO3**  Organize the related problems using theoretical concepts of operating system.

**APPLIED STATISTICS**

**BUM2413**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1**  Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.

- **CO2**  Perform statistical data analysis by using appropriate software tools.

- **CO3**  Apply statistical concepts and methods learned to solve any related problems in various scientific disciplines.

- **CO4**  Relate and apply the techniques and methods studied into other courses.
Synopsis

Students are exposed to statistics including statistical problem-solving methodology and descriptive statistic, probability distributions commonly used in practice, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit test and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by students to implement some of these ideas in practice.

UNDERGRADUATE PROJECT I BCC3013

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Design the proposed solutions for a specific problem that comply with principles of computer science.
- **CO2** Organize the concept and usage of appropriate tools to be used in the development of the solution.
- **CO3** Organize the solution based on specific problem with minimum supervision and self-independent.
- **CO4** Explain the solution through oral and written form following the provided standard.
- **CO5** Demonstrate understanding the effect of professional practices in the development of the solution.

Synopsis

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.

UNDERGRADUATE PROJECT II BCC3024

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Develop the solution based on the approved proposal (PSM1) which comply with the principles of computer science.
- **CO2** Organize the appropriate tools to realize the solution.
- **CO3** Construct the solution with the best alternative.
- **CO4** Explain the solution through oral and written form following the provided standard.
- **CO5** Show the commercialize potential on a solution project.

Synopsis

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general
solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.

SOFTWARE QUALITY ASSURANCE
BCS3263

Course Outcomes

By the end of semester, students should be able to:

CO1 Inquire a knowledge of main software quality activities, their tasks, work products and their models

CO2 Organize software product quality related activities by applying ISO and IEEE standards

CO3 Work in a team and present the team decision/solution for a given tasks.

Synopsis

This course introduces students to the concept of Software Quality Assurance (SQA) including principles, component, process, models, standards and certification of SQA. Students are required to understand the relationship between software quality assurance and software engineering.

INDUSTRIAL TRAINING
BCC4018

Course Outcomes

By the end of semester, students should be able to:

CO1 Adapt working culture in ICT related industry.

CO2 Construct solution by applying the theory learned to solve real problem in organization.

CO3 Work effectively with others in organization to perform task given.

CO4 Practise interpersonal skills and professional ethics in organization.

CO5 Practice the related theory in the community and prepare for better career opportunity in computing area.

Synopsis

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Student also supervised by industrial and university supervisor to guide and ensure that they can do their work as good as possible and achieved the objective for this course.

INDUSTRIAL TRAINING REPORT
BCC4024

Course Outcomes

By the end of semester, students should be able to:

CO1 Organize the industrial training knowledge, experience and skills in appropriate written report..
CO2  Organize technical writing skill in preparing the project report.

CO3  Report understanding of the leadership hierarchy in the organization.

CO4  Build communication skills on oral presentation.

Synopsis

During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, student need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Students also need to do final presentation for assessment.

CORE SUBJECT

INTRODUCTION TO SOFTWARE ENGINEERING
BCS2283

Course Outcomes

By the end of semester, students should be able to:

CO1  Distinguish the important terminology and activities involves (theoretically and practically) related to foundation concepts of software engineering and software development process.

CO2  Show technical solutions to a range of audience.

CO3  Demonstrate leadership’s skills through group Assignment

Synopsis

This course presents an introduction to software engineering concepts including: software engineering paradigms, requirements specification, functional design, object-oriented design, software verification, and maintenance.

SOFTWARE PLANNING & REQUIREMENT WORKSHOP
BCS2333

Course Outcomes

By the end of semester, students should be able to:

CO1  Classify and choose the software project planning requirement by using appropriate software development process and tools to be used.

CO2  Construct a comprehensive Software Development Plan (SDP) document and Software Requirement Specification (SRS) document by using UML tools.

CO3  Fix problems and construct innovative solutions that comply with principles of software engineering (problem solving skills)

CO4  Work effectively in group and promote leadership’s skills through effective communication ether in written, oral form, presentation and group discussion

Synopsis

This course exposes the student to software project planning and software requirement stages. It will concentrate on analysis of options and risks, configuration management
plan and project planning, discovering and eliciting requirements techniques, languages and models for representing requirements, requirement documentation standard, handling requirement changes and writing Software Development Plan (SDP) document and Software Requirement Specifications (SRS) customize from DOD and IEEE standard.

SOFTWARE DESIGN WORKSHOP
BCS2343

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate the Software Design Description (SDD) document based on IEEE or DOD Software development standard.

CO2 Construct a comprehensive Software Design Description (SDD) and system prototype that comply with the software development document.

CO3 Work effectively in group and promote leadership’s skills through effective communication either in written, oral form, presentation and group discussion.

Synopsis

This course introduces the students how to develop software development documents – Software Design Description (SDD) and their system development process. Continue from previous project/problems (from course BCS2293 Software Planning & Requirement Workshop), students must produce Software Design Description (SDD) document by following standard format which being customized from DOD and IEEE standard.

HUMAN COMPUTER INTERACTION
BCS2173

Course Outcomes

By the end of semester, students should be able to:

CO1 Analyze Human Computer Interface (HCI) principles and related approaches.

CO2 Construct an application based on HCI principles approaches.

CO3 Work and communicate effectively in a team for a project on developing and evaluating the prototype based on HCI rules.

Synopsis

This course provides an introduction to Human-Computer Interaction (HCI). HCI is concerned with understanding, designing, implementing and evaluating user-interfaces so that the students have better support users in carrying out their tasks. On completing this course, the students will have knowledge of the theoretical foundations of designing for interaction between humans and computers. They will also have practical experience in implementing and evaluating graphical user interfaces.

WEB APPLICATION DEVELOPMENT
BCS2203

By the end of semester, students should be able to:

CO1 Analyze the understanding of framework technology

CO2 Manipulate web service components, configuration, securing
and deployment in web application.

CO3 Identify appropriate solution using web technology to the specified problem

**Synopsis**

This course provides students with the knowledge and skills that are needed to develop web application. Students learn data access from database to web application, create and utilize web services, create component and deploy application. The students will implement what they have learned in a mini project.

**ARTIFICIAL INTELLIGENCE TECHNIQUES**

**BCS2313**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Point out the artificial intelligence concept in computer science.
- **CO2** Construct an intelligence system prototype/module
- **CO3** Work effectively in a team to solve a given problem.

**Synopsis**

This course introduces student to the theory and practice of the Artificial Intelligence (AI). Student are expose to the main artificial intelligence concept currently most applied in application such as Artificial Neural Networks(ANN), Fuzzy Logics(FL), Genetic Algorithms(GA) and Expert Systems(ES). Practical examples of how artificial intelligence is applied to commercial, scientific and consumer applications will be covered.

**SOFTWARE CONFIGURATION AND MANAGEMENT**

**BCS3283**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Illustrate all the SCM method and task into the software engineering field
- **CO2** Explain the SCM procedure in the software engineering task
- **CO3** Work effectively in written and oral form through group discussion and presentation session

**Synopsis**

This course comprises factors such as configuration identification, configuration control, status accounting, review, build management, process management, and teamwork . SCM practices taken as a whole define how an organization builds and releases products and identifies and tracks changes. It also concerns with the aspects of SCM that have a direct impact on the day-to-day work of the people writing code and implementing features and changes to that code.

**SOFTWARE TESTING AND MAINTENANCE**

**BCS3323**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Analyze different types and levels of methods which used in software testing and maintenance
- **CO2** Construct test sets using testing techniques and available tools
CO3  Work effectively in a team to find a number of case studies and to identify the basic test cases and documentation

CO4  Demonstrate the leadership skills in the selected case study

Synopsis

This course introduces students to software testing and maintenance, where the student learn and apply basic skills needed to create and automate the test plan for a software development environment. Students also expose to maintenance process including maintenance method and techniques.

ARTIFICIAL INTELLIGENCE TECHNIQUES

BCS2313

Course Outcomes

By the end of semester, students should be able to:

CO1  Point out the artificial intelligence concept in computer science.

CO2  Construct an intelligence system prototype/module

CO3  Work effectively in a team to solve a given problem.

Synopsis

This course introduces students to the theory and practice of the Artificial Intelligence (AI). Student are expose to the main artificial intelligence concept currently most applied in application such as Artificial Neural Networks(ANN), Fuzzy Logics(FL), Genetic Algorithms(GA) and Expert Systems(ES). Practical examples of how artificial intelligence is applied to commercial, scientific and consumer applications will be covered.

ELECTIVE SUBJECT

ARCHITECTURE OF SOFTWARE SYSTEM

BCS3343

Course Outcomes

By the end of semester, students should be able to:

CO1  Demonstrate the understanding of theory and principles of Formal Methods in developing software.

CO2  Construct the software specification using appropriate techniques, skills and tools in Z notation.

CO3  Work and communicate effectively in group to complete the software development based on software specification.

Synopsis

This course is introducing Formal Methods, which can be used in developing software specification. Formal Methods is the software specification language that is used to ensure the software or system to be developed is being validated before it is actually developed. Therefore any bugs can be detected at early stage in order to reduce the cost of the development. Formal Methods language to be introduced is Z notation or any language related to Formal Methods.
CO1  Discover some major architectural structures (styles, patterns, tactics, etc.) and their impact on overall system properties

CO2  Apply the technical, organizational and business role of software architecture

CO3  Reproduce a medium-sized software system that satisfies an architectural specification

CO4  Demonstrate the ability of communication skills and team working elements in group work

Synopsis
This course introduces architectural design concepts critical to designing complex software-intensive systems. It considers commonly used software system structures, techniques for designing and implementing these structures, models and notations for characterizing and reasoning about architectures, tools for generating specific instances of an architecture, and case studies of actual system architectures. The course teaches the skills needed to evaluate the architectures of existing systems and to design new systems using well-founded architectural paradigms.

CURRENT ISSUES IN ICT
BCI3023

Course Outcomes
By the end of semester, students should be able to:

CO1  Analyze the current issue of several areas in ICT.

CO2  Organize a different approaches to gather the information to update with current issues in ICT, especially in Malaysia.

CO3  Demonstrate communication skills in group discussion and presentation

Synopsis
This course addresses several current issues in ICT locally and globally. The issues are raised from several areas in ICT: software or application technology, internet technology, computer hardware and networking, security, current trends in Malaysia ICT environment etc.

MULTIMEDIA TECHNOLOGY AND APPLICATIONS
BCM2043

Course Outcomes
By the end of semester, students should be able to:

CO1  Categorize characteristics and functions of each multimedia element.

CO2  Manipulate multimedia elements (text, graphic, audio, video & animation) using software tools.

CO3  Identify business opportunity in multimedia technology and application.

CO4  Justify contribution of multimedia technology and application towards economy development, environment and culture preservation.

CO5  Join collaborative learning platform for searching and managing relevance information from various sources.
Synopsis

This course will expose students to the theoretical and fundamental concepts of multimedia, its applications and the techniques involved. Topics to be covered include text and audio, image and video, the art of multimedia, and multimedia over the network.

COMPUTER GRAPHICS BCM2053

Course Outcomes

By the end of semester, students should be able to:

CO1 Demonstrate the basic concept of computer graphics and ability to use the computer graphics technology.

CO2 Construct 2D graphics by implementing concepts of computer graphics and computer graphics programming.

CO3 Respond to instruction by listening actively and give feedback using online application. (e.g LMS)

CO4 Work together effectively to achieve the same goal by building a good relationship and interaction among team members.

Synopsis

This course is designed to expose the student to the basic concept of digital graphic technology. This includes understanding and designing aspects by using a computer graphics application. The student will be exposed to the skill of using a computer graphics application. Through this course, the students will expose to explore on the latest graphics design context which will focus on the ‘graphic thinking’ and ‘creative design process’.

IMAGE PROCESSING BCM2063

Course Outcomes

By the end of semester, students should be able to:

CO1 Analyze and investigate different types of image formats and techniques in Image Processing.

CO2 Construct a computerized solution using image processing techniques.

CO3 Identify and organize relevance information by searching from various sources.

Synopsis

This course discusses about the processing of digital images. The techniques covers are reading image, enhance the image quality and manipulate the image. Several image processing methods will be touch in this course. Programming skill and creativity is a required whereby students’ are compulsory to do one related project in order to complete this course.

DATA & NETWORK SECURITY BCN2023

Course Outcomes

By the end of semester, students should be able to:

CO1 Inquire and analyze theory and principles of information security, types of attacks, cryptography, firewalls, wireless and intrusion detection system.

CO2 Construct attack and defence methods into computer and network environments.
CO3 Demonstrate usage of data and network security methods and tools and organize public awareness for newest attack and defence solution.

Synopsis

The course introduces fundamental of security. Every chapter will explain security concepts, fundamentals, purpose, implementation and discussion in their respective areas related to data and network security. Topics include: Introduction to security, cryptographic tools, user authentication and access control, security in networks, intrusion detection systems, firewalls and intrusion prevention systems and wireless security.

z/OS FOUNDATION
BCN3083

Course Outcomes

By the end of semester, students should be able to:

CO1 Distinguish ways in which the mainframe of today challenges the traditional thinking about centralized computing versus distributed computing.

CO2 Explain both theoretical and practical foundation concepts in mainframe environment.

CO3 Construct configuration for a specific mainframe environment.

CO4 Demonstrate team working and communication skills through group assignment

Synopsis

This course provides students of information systems technology with the background knowledge and skills necessary to begin using the basic facilities of a mainframe computer. Explore the reasons why public and private enterprises throughout the world rely on the mainframe as the foundation of large-scale computing and discuss the types of workloads that are commonly associated with the mainframe, such as batch jobs and online or interactive transactions, and the unique manner in which this work is processed by a widely used mainframe operating system—z/OS.

COMPUTER ETHICS AND POLICIES
BCN3133

Course Outcomes

By the end of semester, students should be able to:

CO1 Identify and apply the basic concepts of a ethics and policies and the related area

CO2 Construct the components of a structured plan for solving computing ethical problems

CO3 Study and demonstrate several examples of professional codes of ethics related to computing, discuss their commonalties, differences, and implications.

Synopsis

This course introduces the overview of how computers have affected society and how they could further affect it in the future. Student will learn how to examine various ethical issues surrounding computers. These will include piracy, hacking, viruses, responsibility and liability for the use of
software, cyberporn, computerized invasion of privacy, computers in the workplace, and the use of artificial intelligence and expert systems. This course will also consider many of the moral and professional issues that those who work with computers might expect to face.

SPECIAL TOPIC IN Software Engineering

BCS3063

Course Outcomes

By the end of semester, students should be able to:

- CO1 Demonstrate understanding on best approaches updates for current issues or topics in software Engineering
- CO2 Reproduce a solution to a given problem based on current topics or issues in software engineering
- CO3 Discuss and present in group or individual to elaborate the given task

Synopsis

Advanced topics in specifying, designing, modeling, developing, deploying, testing, and maintaining software. May include such topics as software engineering economics, data security and privacy, ethics of computing, programming languages, visual languages, expert systems, machine vision, web applications and web services. May be repeated with change in topic. May include several topics through-out the semester.

COURSE SYNOPSIS – BACHELOR OF COMPUTER SCIENCE (COMPUTER SYSTEMS & NETWORKING)

FACULTY CORE SUBJECT

PROGRAMMING TECHNIQUES BCS1023

Course Outcomes

By the end of semester, students should be able to:

- CO1 Demonstrate various techniques in solving a problem.
- CO2 Construct and run programs
- CO3 Differentiate various techniques in solving a problem

Synopsis

This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

ICT COMPETENCY WORKSHOP BCC1012

Course Outcomes

By the end of semester, students should be able to:

- CO1 Demonstrate the knowledge for installation, maintenance and troubleshooting of Personal Computer and related Peripheral Devices base on Standard procedure.
- CO2 Organize the installation, maintenance and troubleshooting Steps for
CO3 Demonstrate professionalism behavior and good communication skills

**Synopsis**

This course is designated to expose the student an IT Technician and Desktop Support Technician such as be able to troubleshoot and manage all the computer hardware and software. The work is carried out independently and in a team. Student must be able to carry out assigned tasks

**APPLICATION DEVELOPMENT WORKSHOP**

**BCC1032**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Analyze problems statements from given scenarios and translate them into programming codes.
- **CO2** Construct an executable application by going through all the processes of application development.
- **CO3** Work effectively in team in order to complete the given assessment in specific time.
- **CO4** Communicate effectively in team in order to complete the given assessment in specific time.

**Synopsis**

This course enables students to learn how to develop an executable application starting with the design of interface, writing of the codes using programming tool and lastly integrating the application with database.

**SYLLABUS FOR BCN**

**FUNDAMENTAL DISCRETE STRUCTURE**

**BUM1213**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Use the basic principles and methodologies of structure to solve various problems in discrete structure.
- **CO2** Apply concepts and methods learned to solve any related problem of discrete structure in various fields.
- **CO3** Relate and apply the concepts and methods studied into other courses

**Synopsis**

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic, set theory, elementary number of theory, functions, relations, fundamentals of counting, Boolean algebra and simple proof technique. This course integrates symbolic tools, graphical concepts, and numerical calculations.
DATA STRUCTURE & ALGORITHMS
BCS1093

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Analyse various types of data structures and algorithms techniques in a related problem.
- **CO2** Construct a programme by applying the data structure and algorithms techniques for a related problem.
- **CO3** Join online collaboration tool and able to discuss new idea for learning autonomy.
- **CO4** Build basic configuration of network design using real network devices such as switches and routers.
- **CO5** Perform standard configuration and troubleshooting network using professional technique.

Synopsis

This course is designed to expose the students to the data structures and algorithm. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

DATA COMMUNICATION & NETWORKING
BCN1053

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Demonstrate knowledge and understanding of basics computer networking.
- **CO2** Construct a simple LAN topologies by applying basic principles of cabling using network simulation.
- **CO3** Build basic configuration of network design using real network devices such as switches and routers.
- **CO4** Perform standard configuration and troubleshooting network using professional technique.
- **CO5** Identify the importance of computer system design, in order to achieve high performance.
- **CO6** Explain the internal components and their functionality of a computer, i.e. control unit, ALU, register, etc.

COMPUTER ARCHITECTURE & ORGANIZATION
BCN1043

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Identify and classify computer structure and its functions.
- **CO2** Identify the importance of computer system design, in order to achieve high performance.
- **CO3** Explain the internal components and their functionality of a computer, i.e. control unit, ALU, register, etc.
memory and CPU addressing modes
Demonstrate team working by solving problems in groups.

**Synopsis**
This course discusses the structure and function of a computer. It exposes students to the architecture and organization of a computer. This subject covers the numbering system and the representation of data, the internal and external computer communication through system buses and Input and Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra.

**OBJECT ORIENTED PROGRAMMING**
**BCS2143**

**Course Outcomes**
By the end of semester, students should be able to:

CO1 Demonstrate the concept of object-orientated programming

CO2 Manipulate object-orientated programming in given problems

CO3 Formulate the solution of given problems using object-orientated programming technique

**Synopsis**
This course provides an introduction to the concepts of object orientation and object-orientated programming (OOP) techniques using Java programming language. It will provide students with a through look at the basic constructs of the Java programming language such as its basic data types and operations. It will also emphasize on the use of OOP characteristics that expose students to Unified Modelling Language (UML) design, class and object, inheritance, polymorphism, exception handling and Graphical User Interface (GUI) and event-driven programming.

**DATABASE SYSTEMS**
**BCI2023**

**Course Outcomes**
By the end of semester, students should be able to:

CO1 Demonstrate the concepts and principles of database systems

CO2 Manipulate queries using the syntax of Structure Query Language (SQL), Relational Algebra and Query By Example

CO3 Construct innovative solution through the representation of data model using ER and EER Diagrams and normalize database to be implemented in database application system using appropriate DBMS

CO4 Work in group in order to complete the given assessments in specific time frame

CO5 Communicate effectively in group in order to complete the given assessments in specific time frame

**Synopsis**
The course emphasizes on the importance of data to an organization and how the data
should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process. Several query languages such as relational algebra, Structured Query Language (SQL) and Query by Example (QBE) will be discussed but the emphasis is on SQL. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

DISCRETE STRUCTURE AND APPLICATIONS
BUM2223

Course Outcomes

By the end of semester, students should be able to:

CO1 Use the basic principles and methodologies of advanced discrete structure to solve various problems in discrete structure.

CO2 Write programs to describe and solve discrete structure problems using any programming language.

CO3 Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO4 Relate and apply the concepts and methods studied into other courses.

Synopsis

This subject discusses an in depth of the discrete structures as they apply to computer science, focusing on providing a basic theoretical foundation for further work. Topics include review on algorithm, integers and matrices, advanced counting technique, graphs, trees, and modeling computation. This course integrates symbolic tools, graphical concepts, and numerical calculations.

OPERATING SYSTEMS
BCN2053

Course Outcomes

By the end of semester, students should be able to:

CO1 Distinguish the relationship between OS and hardware (system calls, I/O, files and symbolic links, directories and file systems, process management, forks, threads, inter-process communication, shells, signal handling, pipes, sockets, CPU scheduling and memory management).

CO2 Construct the program for given problem on an operating System (Case Study).

CO3 Organize the related problems using theoretical concepts of operating system.
Synopsis

This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Process creation and control, communication synchronization and concurrency, memory management and file systems concept are explored in the context of the WINDOWS/LINUX operating system.

Applied Statistics

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.
- **CO2** Perform statistical data analysis by using appropriate software tools.
- **CO3** Apply statistical concepts and methods learned to solve any related problems in various scientific disciplines.
- **CO4** Relate and apply the techniques and methods studied into other courses.

Synopsis

Students are exposed to statistics including statistical problem-solving methodology and descriptive statistic, probability distributions commonly used in practice, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit test and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by students to implement some of these ideas in practice.

Industrial Training

Course Outcomes

By the end of semester, students should be able to:

- **CO1** Adapt working culture in ICT related industry.
- **CO2** Construct solution by applying the theory learned to solve real problem in organization.
- **CO3** Work effectively with others in organization to perform task given.
- **CO4** Practise interpersonal skills and professional ethics in organization.
- **CO5** Practice the related theory in the community and prepare for better career opportunity in computing area.

Synopsis

This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Student also supervised by industrial and university supervisor to guide and ensure that they can do their work as good as possible and achieved the objective for this course.
**INDUSTRIAL TRAINING REPORT BCC4024**

**Course Outcomes**

By the end of semester, students should be able to:

CO1: Organize the industrial training knowledge, experience and skills in appropriate written report.

CO2: Organize technical writing skill in preparing the project report.

CO3: Report understanding of the leadership hierarchy in the organization.

CO4: Build communication skills on oral presentation.

**Synopsis**

During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, students need to provide an industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Students also need to do final presentation for assessment.

**SYSTEMS ANALYSIS & DESIGN BCS1133**

**Course Outcomes**

By the end of semester, students should be able to:

CO1: Differentiate the stages of Systems Development Life Cycle.

CO2: Construct a new system from scratch that comply with the stages of systems development life cycle.

CO3: Work effectively in a team and propose the team decision/solution for a given problem.

CO4: Demonstrate team working by solving problems in groups.

CO5: Communicate effectively in a team for a given problem.

**Synopsis**

This course describes the concepts and methods of information system analysis and design, with an emphasis on system analysis methods and tools. The course focuses on the issues and management techniques involved in analysis, design and implementation of information system.

**WEB SCRIPTING BCS2303**

**Course Outcomes**

By the end of semester, students should be able to:

CO1: Demonstrate the understanding of dynamic web-based applications.

CO2: Construct a Web-based application prototype using HTML, web server, database and scripting language.
Synopsis
This course introduces the essential topics of Internet programming & development of web-based applications. Students are required to develop a web/Internet application which is connected to the database.

NETWORK TECHNOLOGIES
BCN2193

Course Outcomes
By the end of semester, students should be able to:

CO1  Demonstrate leadership skill through group project

CO2  Demonstrate teamworking skill through group project

CO3  Show ability to identify business opportunities

CO4  Identify how to solve the common errors that occur in small routed networks

Synopsis
This course describes the principles of routing and routing protocols. Students analyze, configure, verify, and troubleshoot the primary routing protocols RIPv1, RIPv2, EIGRP, and OSPF. By the end of this course, students will be able to recognize and correct common routing issues and problems. Students complete a basic procedural lab, followed by basic configuration, implementation, and troubleshooting labs in each chapter.

LOCAL AREA NETWORK WORKSHOP
BCN1052

Course Outcomes
By the end of semester, students should be able to:

CO1  Investigate the Local Area Network elements such as basic of networking, safety environment, network hardware and related LAN

CO2  Design, implement, configure, test and troubleshoot structured cabling and LAN device based on LAN rules and standard.

CO3  Identify problem, discuss and make suggestion on the structured cabling network.

Synopsis
This course introduces structured cabling for Local Area Network (LAN). Students are
exposed to the fundamental of computer network, network topology, network devices and cabling tools, Copper cabling, Fiber Optic cabling, Simple LAN Device Installation, Wide Area Network Connection and network troubleshooting and documentation

**DATA & NETWORK SECURITY**

**BCN2023**

**Course Outcomes**

By the end of semester, students should be able to:

**CO1**  Inquire and analyze theory and principles of information security, types of attacks, cryptography, firewalls, wireless and intrusion detection system.

**CO2**  Construct attack and defence methods into computer and network environments.

**CO3**  Demonstrate usage of data and network security methods and tools and organize public awareness for newest attack and defence solution.

**Synopsis**

The course introduces fundamental of security. Every chapter will explain security concepts, fundamentals, purpose, implementation and discussion in their respective areas related to data and network security. Topics include: Introduction to security, cryptographic tools, user authentication and access control, security in networks, intrusion detection systems, firewalls and intrusion prevention systems and wireless security.

**NETWORK ANALYSIS & DESIGN**

**BCN2093**

**Course Outcomes**

By the end of semester, students should be able to:

**CO1**  Analyze various computer networks, formulate problems and provide technical solutions to improve quality of service (QoS).

**CO2**  Build a logical and/or physical network following all the steps and documentation phases for a specific requirement.

**CO3**  Demonstrate ability to function effectively as an individual and in a group to produce RFP and finalize a specific project.

**Synopsis**

This course focuses on analysis and design of enterprise networks that are reliable, secure and manageable. It includes top-down network design methodology to design networks that meet customer’s business and technical goals, analysis of business and technical requirements, examine traffic flow and Quality of Service (QoS) requirements, and production of RFP documentation with relevant procedure steps for case study/project to fulfil this subject requirement.

**COMPUTER NETWORKS**

**BCN2083**

**Course Outcomes**

By the end of semester, students should be able to:
CO1  Experiment knowledge and understanding of how a switch communicates with other switches and routers in a small or medium-sized business network to implement VLAN.

CO2  Identify and correct common network problems at layers 1, 2, 3, and 7 using a layered model approach.

CO3  Organize the configuration, verification, and troubleshooting VLANs, trunking on Cisco switches, interVLAN routing, VTP, RSTP and wireless network.

Synopsis
The primary focus of this course is on LAN switching and wireless LANs. This course focuses on Layer 2 switching protocols and concepts used to improve redundancy, propagate VLAN information, and secure the portion of the network where most users access network services. Switching technologies are relatively straightforward to implement; however, as with routing, the underlying protocols and algorithms are often quite complicated. This course will go to great lengths to explain the underlying processes of the common Layer 2 switching technologies. Each switching concept will be introduced within the context of a single topology for each chapter.

UNDERGRADUATE PROJECT I
BCC3013

Course Outcomes
By the end of semester, students should be able to:

CO1  Design the proposed solution for a specific problem that comply with principles of computer science.

CO2  Organize the concept and usage of appropriate to be used in the development of the solution.

CO3  Organize the solution based on specific problem with minimum supervision and self independent.

CO4  Explain the solution through oral and written form following the provided standard.

CO5  Demonstrate understanding the effect of professional practices in the development of the solution.

Synopsis
This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student
will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective

UNDERGRADUATE PROJECT II
BCC3026

Course Outcomes

By the end of semester, students should be able to:

CO1  Develop the solution based on the approved proposal (PSM1) which comply with the principles of computer science

CO2  Organize the appropriate tools to realize the solution

CO3  Construct the solution with the best alternative

CO4  Explain the solution through oral and written form following the provided standard

CO5  Show the commercialize potential on a solution project

Synopsis
This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.

WAN TECHNOLOGY
BCN3203

Course Outcomes

By the end of semester, students should be able to:

CO1  Analyze and classify the components required for network and Internet communications, operation and benefits of DHCP and DNS, purpose and types of access control lists (ACLs), the basic operation of Network Address Translation (NAT) and components of VPN technology.

CO2  Assemble, build, construct and organize WAN serial connection, a Point-to-Point Protocol (PPP) connection between Cisco routers, Frame Relay on Cisco routers, DHCP, DNS, NAT and ACLs operations on a router.

CO3  Formulate common network problems at layers 1, 2, 3 and 7 using a layered model approach, NAT issues and WAN implementation issues.

Synopsis
This course discusses the WAN technologies and network services required by converged applications in enterprise networks. The
course uses the Cisco Network Architecture to introduce integrated network services and explains how to select the appropriate devices and technologies to meet network requirements. Students learn how to implement and configure common data link protocols and how to apply WAN security concepts, principles of traffic, access control and addressing services. Finally, students learn how to detect, troubleshoot and correct common enterprise network implementation issues.

DISTRIBUTED SYSTEM
BCN3123

Course Outcomes
By the end of semester, students should be able to:

- **CO1** Demonstrate the principles and fundamentals of distributed systems, the technical challenges and current issues in distributed systems design and apply the knowledge of Java, Shell programming and Linux environment.

- **CO2** Construct network application with adequate knowledge in distributed systems such as Interprocess communication, distributed transaction and replication.

- **CO3** Explain common and current issues and challenges in distributed computing.

Synopsis
Owing to new technologies like the Internet and cluster computing, distributed systems have become reality and are widely applied in practice. Well known are the Web and distributed component infrastructures like CORBA or J2EE compliant application servers. Moving from a centralized to a distributed environment introduces new complexity: communication, synchronous and asynchronous behaviour of the different components in the system, architectural considerations, failures and more. Distributed systems handle these issues by providing tools and protocols for efficient and powerful coordination among the cooperating components. The objectives of this new subject is to learn the state-of-the-art of practical distributed systems, to understand the typical problems and challenges encountered in distributed environments, and to discuss both sound and practical solutions for them.

INTERNET TECHNOLOGY
BCN3183

Course Outcomes
By the end of semester, students should be able to:

- **CO1** Classify the services supported by the Internet Technology.

- **CO2** Fix the problems to install and configure servers and clients applications individually.

- **CO3** Synthesize and implement all the services and protocols supported by the Internet Technology.

Synopsis
This course is designated to expose the student about Active Directory Technology Specialists how to implement and configure secure network access and implement fault tolerant storage technologies, understand the network technologies most commonly used
and IP-enabled network, and how to secure servers and maintain update compliance.

NETWORK MANAGEMENT
BCN3023

Course Outcomes
By the end of semester, students should be able to:

CO1 Identify and explain the five areas of network management and related tools in a group.

CO2 Organize Network Management Protocols such as Simple Network Management Protocol (SNMP) that is the most widely deployed network management protocols on networking devices.

CO3 Analyze all of the possible pieces of information on a network device including Management Information Bases (MIBs) and also about Remote Network Monitoring Devices (RMON) MIB.

Synopsis
This course introduces the overview of network management to familiarize student with network management systems and the five areas of network management. Student will learn a practical means of designing or evaluating a network management system for particular networking environment. Student also equipped with the example of simple, complex and advanced tools for each category of network management so that they could determine that a particular functionality would be useful and might want to pursue its development.

COMPUTER ETHICS AND POLICIES
BCN3133

Course Outcomes
By the end of semester, students should be able to:

CO1 Identify and apply the basic concepts of a computer ethics and policies and the related area

CO2 Construct the components of a structured plan for solving computing ethical problems

CO3 Study and demonstrate several examples of professional codes of ethics related to computing, discuss their commonalties, differences, and implications.

Synopsis
This course introduces the overview of how computers have affected society and how they could further affect it in the future. Student will learn how to examine various ethical issues surrounding computers. These will include piracy, hacking, viruses, responsibility and liability for the use of software, cyberporn, computerized invasion of privacy, computers in the workplace, and the use of artificial intelligence and expert systems. This course will also consider many of the moral and professional issues that those who work with computers might expect to face.
CURRENT ISSUES IN ICT  
BCI3023

Course Outcomes

By the end of semester, students should be able to:

CO1  Analyze the current issue of several areas in ICT.

CO2  Organize a different approaches to gather the information to update with current issues in ICT, especially in Malaysia.

CO3  Demonstrate communication skills in group discussion and presentation

Synopsis

This course addresses several current issues in ICT locally and globally. The issues are raised from several areas in ICT: software or application technology, internet technology, computer hardware and networking, security, current trends in Malaysia ICT environment etc.

IMAGE PROCESSING  
BCM2063

Course Outcomes

By the end of semester, students should be able to:

CO1  Analyze and investigate different types of image formats and techniques in Image Processing.

CO2  Construct a computerized solution using image processing techniques

CO3  Identify and organize relevance information by searching from various sources

Synopsis

This course discusses about the processing of digital images. The techniques covers are reading image enhance the image quality and manipulate the image. Several image processing methods will be touch in this course. Programming skill and creativity is a required whereby students’ are compulsory to do one related project in order to complete this course.

z/OS FOUNDATION  
BCN3083

Course Outcomes

By the end of semester, students should be able to:

CO1  Distinguish ways in which the mainframe of today challenges the traditional thinking about centralized computing versus distributed computing.

CO2  Explain both theoretical and practical foundation concepts in mainframe environment.

CO3  Construct configuration for a specific mainframe environment.

CO4  Demonstrate team working and communication skills through group assignment
Synopsis
This course provides students of information systems technology with the background knowledge and skills necessary to begin using the basic facilities of a mainframe computer. Explore the reasons why public and private enterprises throughout the world rely on the mainframe as the foundation of large-scale computing and discuss the types of workloads that are commonly associated with the mainframe, such as batch jobs and online or interactive transactions, and the unique manner in which this work is processed by a widely used mainframe operating system—z/OS.

SPECIAL TOPICS IN COMPUTER NETWORKS
BCN2103
Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate knowledge and understanding of how an IP Addressing in computer network is defined to manage all the network communication.

CO2 Organize the ways of actual IP Addressing performed, for instance IPv6 according to a systematic IP addressing network-wide standard.

CO3 Demonstrate on how network can be managed and associated with Network Address Translation (NAT).

Synopsis
This course develops a possible network-wide system for IP Addressing. The fundamental problem of IP Addressing and Network Address Translation is mainly highlighted in this course to be the problem of networking communication. The hypothetical application of the system to an existing network is also discussed.

CREATIVE WRITING
UHE3082
Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate creative writing through a variety of activities

CO2 Write at least one fiction and/or non-fiction piece the elements of creative writing

CO3 Work in group to produce a short video and improve editing skills

Synopsis
This course provides students of information systems technology with the background knowledge and skills necessary to begin using the basic facilities of a mainframe computer. Explore the reasons why public and private enterprises throughout the world rely on the mainframe as the foundation of large-scale computing and discuss the types of workloads that are commonly associated with the mainframe, such as batch jobs and online or interactive transactions, and the unique manner in which this work is processed by a widely used mainframe operating system—z/OS.

SYLLABUS FOR BCG
PROGRAMMING TECHNIQUES
BCS1023
Course Outcomes
By the end of semester, students should be able to:
CO1 Demonstrate various techniques in solving a problem.

CO2 Construct and run programs

CO3 Differentiate various techniques in solving a problem

Synopsis
This course discusses on understanding problems and translating them into computer solution techniques using programming language. This course enables students to apply programming techniques, write programming codes from given problems and execute programming codes successfully.

COMPETENCY WORKSHOP
BCC1012

Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate the knowledge for installation, and troubleshooting of Personal Computer and related Peripheral Devices base on Standard procedure.

CO2 Organize the installation, maintenance and troubleshooting Steps for Personal Computer and related Peripheral based on Standard procedure

CO3 Demonstrate professionalism behavior and good communication skills

APPLICATION DEVELOPMENT WORKSHOP
BCC1032

Course Outcomes
By the end of semester, students should be able to:

CO1 Analyze problems statements from given scenarios and translate them into programming codes.

CO2 Construct an executable application by going through all the processes of application development.

CO3 Work effectively in team in order to complete the given assessment in specific time.

CO4 Communicate effectively in team in order to complete the given assessment in specific time.

Synopsis
This course is designated to expose the student an IT Technician and Desktop Support Technician such as be able to troubleshoot and manage all the computer hardware and software. The work is carried out independently and in a team. Student must be able to carry out assigned tasks.

This course enables students to learn how to develop an executable application starting with the design of interface, writing of the codes using programming tool and lastly integrating the application with database.
### FUNDAMENTAL DISCRETE STRUCTURE
**BUM1213**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Use the basic principles and methodologies of discrete structure to solve various problems in discrete structure.

- **CO2** Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

- **CO3** Relate and apply the concepts and methods studied into other courses.

**Synopsis**

This subject introduces and discusses the fundamental of the discrete as apply to computer science, focusing on providing a basic theoretical foundation for further work. Students are exposed to logic, set theory, elementary number of theory, functions, relations, fundamentals of counting, Boolean algebra and simple proof technique. This course integrates symbolic tools, graphical concepts, and numerical calculations.

### DATA STRUCTURE & ALGORITHMS
**BCS1093**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Analyse various types of data structures and techniques in a related problem.

- **CO2** Construct a programme by applying the data structure and algorithms techniques for a related problem.

- **CO3** Join online collaboration tool and able to discuss new idea for learning autonomy.

**Synopsis**

This course is designed to expose the students to the data structures and algorithms. It provides theoretical basis in data structures and the application of data structures is based on standard algorithms. Students must also be able to transform the data structure and algorithms problems into the computer programs.

### DATA COMMUNICATION & NETWORKING
**BCN1053**

**Course Outcomes**

By the end of semester, students should be able to:

- **CO1** Demonstrate knowledge and understanding of basics computer networking

- **CO2** Construct a simple LAN topologies by applying basic principles of cabling using network simulation

- **CO3** Build basic configuration of network design using real network devices such as switches and routers

- **CO4** Perform standard configuration and
troubleshooting network using professional technique

Synopsis
This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. It uses the OSI and TCP layered models to examine the nature and roles of protocols and services at the application, network, data link, and physical layers. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum.

COMPUTER ARCHITECTURE & ORGANIZATION
BCN1043

Course Outcomes
By the end of semester, students should be able to:

CO1 Identify and classify computer structure and its functions
CO2 Identify the importance of computer system design, in order to achieve high performance
CO3 Explain the internal components and their functionality of a computer, i.e. control unit, ALU, register, memory and CPU addressing modes
CO4 Demonstrate team working by solving problems in groups

Synopsis
This course discusses the structure and function of a computer. It expose student with the architecture and organization of a computer. This subject covers on the numbering system and the representation of data, the internal and external computer communication through system buses and Input and Output, computer storage, internal architecture of Central Processing Unit, Logic Gates and Boolean Algebra.

OBJECT ORIENTED PROGRAMMING
BCS2143

Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate the concept of object-oriented in programming
CO2 Manipulate object-oriented programming in given problems
CO3 Formulate the solution of given problems using object-oriented programming technique

Synopsis
This course provides an introduction to the concepts of object orientation and object-oriented programming (OOP) techniques using Java programming language. It will provide students with a through look at the basic constructs of the Java programming language such as its basic data types and operations. It will also emphasize on the use of OOP characteristic that expose students to Unified Modelling Language (UML) design, class and object, inheritance, polymorphism, exception handling and Graphical User Interface (GUI) and event driven programming.
DATABASE SYSTEMS
BCI2023

Course Outcomes
By the end of semester, students should be able to:

CO1  Demonstrate the concepts and principles of database systems.

CO2  Manipulate queries using the syntax of Structure Query Language (SQL), Relational Algebra and Query By Example

CO3  Construct innovative solution through the representation of data model using ER and EER Diagrams and normalize database to be implemented in database application system using appropriate DBMS

CO4  Work in group in order to complete the given assessments in specific time frame

CO5  Communicate effectively in group in order to complete the given assessments in specific time frame

Synopsis
The course emphasizes on the importance of data to an organization and how the data should be managed. Database management system (DBMS) will be viewed as a solution to the problems of file processing system. Aspects of relational database design will be covered in details. This includes database development life cycle, database architecture, data models, and normalization process.

Several query languages such as relational algebra, Structured Query Language (SQL) and Query by Example (QBE) will be discussed but the emphasis is on SQL. Students will be given a real life problem to design and develop a database application system. In the later part of the course students will be exposed to the latest developments in database architecture.

DISCRETE STRUCTURE AND APPLICATIONS
BUM2223

Course Outcomes
By the end of semester, students should be able to:

CO1  Use the basic principles and methodologies of advanced discrete structure to solve various problems in discrete structure.

CO2  Write programs to describe and solve discrete structure problems using any programming language.

CO3  Apply concepts and methods learned to solve any related problem of discrete structure in various fields.

CO4  Relate and apply the concepts and methods studied into other courses.

Synopsis
This subject discusses an in depth of the discrete structures as they apply to computer science, focusing on providing a basic theoretical foundation for further work. Topics include review on algorithm, integers and matrices, advanced counting technique,
graphs, trees, and modeling computation. This course integrates symbolic tools, graphical concepts, and numerical calculations.

OPERATING SYSTEMS
BCN2053

Course Outcomes
By the end of semester, students should be able to:

- **CO1** Distinguish the relationship between OS and hardware (system calls, I/O, files and symbolic links, directories and file systems, process management, forks, threads, inter-process communication, shells, signal handling, pipes, sockets, CPU scheduling and memory management).

- **CO2** Construct the program for given problem on an operating System (Case Study).

- **CO3** Organize the related problems using theoretical concepts of operating system

Synopsis
This subject introduces the various data and control structures necessary for the design and implementation of modern computer operating systems. Process creation and control, communication synchronization and concurrency, memory management and file systems concept are explored in the context of the WINDOWS/LINUX operating system.

APPLIED STATISTICS
BUM2413

Course Outcomes
By the end of semester, students should be able to:

- **CO1** Analyze data using statistical theory and methodology, and recommend a conclusion or suggestion based on the analyzed data.

- **CO2** Perform statistical data analysis by using appropriate software tools.

- **CO3** Apply statistical concepts and methods learned to solve any related problems in various scientific disciplines.

- **CO4** Relate and apply the techniques and methods studied into other courses

Synopsis
Students are exposed to statistics including statistical problem-solving methodology and descriptive statistic, probability distributions commonly used in practice, sampling distribution and confidence interval, hypothesis testing, analysis of variance (ANOVA), goodness of fit test and contingency tables and regression and correlation including simple and multiple linear regressions. Appropriate software is used by students to implement some of these ideas in practice.
UNDERGRADUATE PROJECT I
BCC3013

Course Outcomes
By the end of semester, students should be able to:

CO1  Design the proposed solutions for a specific problem that comply with principles of computer science.

CO2  Organize the concept and usage of appropriate tools to be used in the development of the solution

CO3  Organize the solution based on specific problem with minimum supervision and self independent

CO4  Explain the solution through oral and written form following the provided standard

CO5  Demonstrate understanding the effect of professional practices in the development of the solution

Synopsis
This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.

UNDERGRADUATE PROJECT II
BCC3024

Course Outcomes
By the end of semester, students should be able to:

CO1  Develop the solution based on the approved proposal (PSM1) which comply with the principles of computer science

CO2  Organize the appropriate tools to realize the solution

CO3  Construct the solution with the best alternative

CO4  Explain the solution through oral and written form following the provided standard

CO5  Show the commercialize potential on a solution project

Synopsis
This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study in the university. Student will learn to identify problem, analyze the problem, give general solution, collect the required data regarding specific solution and do research on the solution. Finally student will be able to produce report proposal and solve the problem identified. During the course, student will be supervised by their supervisor in order to guide and monitor the students’ project progress and to ensure that they can achieve the course objective.
SYSTEMS ANALYSIS & DESIGN
BCS1133

Course Outcomes
By the end of semester, students should be able to:

CO1  Differentiate the stages of Systems Development Life Cycle.

CO2  Construct a new system from scratch that comply with the stages of systems development life cycle

CO3  Work effectively in a team and propose the team decision/solution for a given problem.

CO4  Demonstrate leadership’s skills through group assignment

CO5  Communicate effectively in a team for a given problem.

Synopsis
This course describes the concepts and methods of information system analysis and design, with an emphasis on system analysis methods and tools. The course focuses on the issues and management technique involved in analysis, design and implementation of information system.

INDUSTRIAL TRAINING
BCC4018

Course Outcomes
By the end of semester, students should be able to:

CO1  Adapt working culture in ICT related industry.

CO2  Construct solution by applying the theory learned to solve real problem in organization.

CO3  Work effectively with others in organization to perform task given.

CO4  Practise interpersonal skills and professional ethics in organization.

CO5  Practice the related theory in the community and prepare for better career opportunity in computing area

Synopsis
This course aim to give chances for the student to practice and apply their knowledge and skills that they gain during their study. During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Student also supervised by industrial and university supervisor to guide and ensure that they can do their work as good as possible and achieved the objective for this course.

INDUSTRIAL TRAINING REPORT
BCC4024

Course Outcomes
By the end of semester, students should be able to:

CO1  Organize the industrial training knowledge, experience and skills in appropriate written report.
**CO2** Organize technical writing skill in preparing the project report.

**CO3** Report understanding of the leadership hierarchy in the organization.

**CO4** Build communication skills on oral presentation.

**Synopsis**
During the placement, we expect students to keep a log book, in which they make regular entries describing the work they are undertaking. Then, student need to provide industrial training report to describe their technical and personal development during their placement. The industrial training report need to hand in to the university supervisor. Students also need to do final presentation for assessment.

**IMAGE PROCESSING**
BCM2063

**Course Outcomes**
By the end of semester, students should be able to:

**CO1** Analyze and investigate different types of image formats and techniques in Image Processing.

**CO2** Construct a computerized solution using image processing techniques

**CO3** Identify and organize relevance information by searching from various sources

**Synopsis**
This course discusses about the processing of digital images. The techniques covers are reading image enhance the image quality and manipulate the image. Several image processing methods will be touch in this course. Programming skill and creativity is a required whereby students’ are compulsory to do one related project in order to complete this course.

**MULTIMEDIA TECHNOLOGY AND APPLICATIONS**
BCM2043

**Course Outcomes**
By the end of semester, students should be able to:

**CO1** Categorize characteristics and functions of each multimedia element.

**CO2** Manipulate multimedia elements (text, graphic, audio, video & animation) using software tools.

**CO3** Identify business opportunity in multimedia technology and application.

**CO4** Justify contribution of multimedia technology and application towards economy development, environment and culture preservation.

**CO5** Join collaborative learning platform for searching and managing relevance information from various sources.

**Synopsis**
This course will expose students to the theoretical and fundamental concepts of multimedia, its applications and the
techniques involved. Topics to be covered include text and audio, image and video, the art of multimedia, and multimedia over the network.

HUMAN COMPUTER INTERACTION
BCS2173

Course Outcomes
By the end of semester, students should be able to:

CO1 Analyze Human Computer Interface (HCI) principles and related approaches.

CO2 Construct an application based on HCI principles and approaches.

CO3 Work and communicate effectively in a team for a on developing and evaluating the prototype based on HCI rules.

Synopsis
This course introduces student to the theory and practice of the Artificial Intelligence (AI). Students are expose to the main artificial intelligence concept currently most applied in application such as Artificial Neural Networks(ANN), Fuzzy Logics(FL), Genetic Algorithms(GA) and Expert Systems(ES). Practical examples of how artificial intelligence is applied to commercial, scientific and consumer applications will be covered.

COMPUTER GRAPHICS
BCM2053

Course Outcomes
By the end of semester, students should be able to:

CO1 Demonstrate the basic concept of computer graphics and ability to use the computer graphics technology.

CO2 Construct 2D graphics by implementing concepts of computer graphics and computer graphics programming.

CO3 Respond to instruction by listening actively and give feedback using online application. (e.g LMS)
CO4  Work together effectively to achieve the same goal by building a good relationship and interaction among team members.

Synopsis
This course is designed to expose the student to the basic concept of digital graphic technology. This includes understanding and designing aspects by using a computer graphics application. The student will be exposed to the skill of using a computer graphics application. Through this course, the students will expose to explore on the latest graphics design context which will focus on the ‘graphic thinking’ and ‘creative design process’.

MODELING & SIMULATION
BCM2073

Course Outcomes
By the end of semester, students should be able to:

CO1  Apply certain statistic techniques in analyzing the simulation output and approve the simulation model and also to differentiate between model and proposed model.

CO2  Construct discrete simulation model to assist in decision making based on given problem.

CO3  Propose new idea and capable to model and simulate it.

Synopsis
This module introduces the concepts of virtual reality, using Virtual Reality Modelling Language (VRML) and enables the students to gain hands-on experience by developing their own applications.
CO1 Experiment with the geometrical 2D and 3D shapes.

CO2 Construct 3D models by implementing concepts of 3D modelling.

CO3 Work effectively to achieve the project goals by building a good relationship and interaction among team members.

CO4 Display an idea clearly, effectively and confidently in written and oral form among team members.

Synopsis
The focus of the course is on 3D design and modeling. Students are introduced to 3D design and modeling methods such as modeling with NURBS, polygons, and subdivision surfaces. Texture mapping, lighting, and rendering are also discussed. Production pipeline issues such as geometry deformation and level of detail are emphasized.

DATA VISUALIZATION
BCM3123

Course Outcomes
By the end of semester, students should be able to:

CO1 Analyze the concept of the data visualization in various visualization applications.

CO2 Construct visualization application by implementing the data processing stages which include data acquisition, data filtering.

CO3 Display an idea clearly, effectively and confidently in written and oral form through group discussion, meeting and presentation.

CO4 Propose and lead data visualization group project.

Synopsis
Topics include the introduction to data visualization. It focuses on the visualization techniques and method that have a broad applicability in visualization applications. This course also covers the dataset concept by describing the most frequently used types of datasets in visualization. Students will be exposed to the various data processing stages that form the visualization process: data acquisition, data filtering, data mapping and rendering.

MULTIMEDIA INTERACTIVE DEVELOPMENT
BCM3183

Course Outcomes
By the end of semester, students should be able to:

CO1 Apply basic theories of interactivity to the development of multimedia application.

CO2 Construct multimedia interactive application using various multimedia scripting and tools.

CO3 Report on impact of ethical issues in multimedia interactive application.
This course is designed to expose the student to the multimedia interactive project including basic theories of multimedia learning. This course also teach student to apply various multimedia scripting and tools in order to develop a prototype of multimedia interactive application.

**CREATIVE WRITING**  
**UHE3082**

**Course Outcomes**

By the end of semester, students should be able to:

**CO1** Demonstrate creative writing through a variety of activities

**CO2** Write at least one fiction and/or non fiction piece applying the elements of creative writing

**CO3** Work in group to produce a short video and improve editing skills

**Synopsis**

This Creative Writing course generally aims to foster and bring out the potential and creativity in students by developing descriptive writing using the five senses. This course models a writer’s workshop structure which consists of Mini Lessons, Independent Writing, Conferring and Sharing. This course also generates critical thinking skills in students as well as exposes students to the beauty of the written language by having a reader’s log. Students will be introduced to the elements of creative fiction and non-fiction writing as well as certain elements of grammar, which will be emphasized in the writing process through language software or online resources. Collaborative editing skills will also be introduced before students publish their writing to the public, online or otherwise.

**COMPUTER ANIMATION**  
**BCM3093**

**Course Outcomes**

By the end of semester, students should be able to:

**CO1** Apply computer animation principle and computer animation process.

**CO2** Construct an animation project using animation tools within a group.

**CO3** Work effectively to achieve the project goals by building a good relationship and interaction among team members.

**Synopsis**

This course is designed to provide a platform where comprehensive computer animation skills and technique are introduced. The topic includes an overview of story-boarding, type of animations, animation techniques and animation tools. Through this course, student will explore current research topics in computer animation and work in group to develop a short story using computer animation.

**MULTIMEDIA DATA PROCESSING**  
**BCM3153**

**Course Outcomes**

By the end of semester, students should be able to:

**CO1** Analyze the basic theory of data sampling, algorithm for data storage, and presentation of multimedia data.
CO2  Construct multimedia data processing application using current software/applications development tools.

CO3  Work in a team by identify and respect attitude, behaviour and trust among team members.

Synopsis
This course concentrates on using current existing software/applications for processing the multimedia data as well as theory and techniques used within the software. For this purpose student are exposed with the theory of data sampling, basic algorithm for data storage and data presentation. Students are exposed to data processing by programming. Students are required to produce their own software/application for editing, storage, and presentation of multimedia data by using the library/frame-work. At this stage students are also exposed with the techniques on how to handling multimedia data presentation in network environment.

GEOGRAPHICAL INFORMATION SYSTEM
BCM3173

Course Outcomes
By the end of semester, students should be able to:

CO1  Analyze the concept of the GIS and Information Visualization Concept.

CO2  Manipulate data management module to Construct Geographical Information System application in any related area.

CO3  Share ideas, accept new ideas and take charge of their own learning (autonomy).

Synopsis
Topics include introduction to Geographical Information Systems (GIS) application, principle of information visualization, spatial and attribute data management, analysis and manipulation of the data and information to create useful information. This course also covers the development of the Geographical Information Systems which is generally used in many applications. The development interactive information visualization by using computer graphics and multimedia technology will be discussed. Two type of applications are used ; vector data and raster data.

MOBILE APPLICATION DEVELOPMENT
BCS3283

Course Outcomes
By the end of semester, students should be able to:

CO1  Analyze the limitations and challenges in mobile applications.

CO2  Build a mobile application using selected software development environment.

CO3  Demonstrate ability to recognize and respect group member's attitude, act and belief.

Synopsis
This course is concerned with the development of applications on mobile and wireless computing platforms. It explores mobile