

	Course Name	Software Engineering Fundamentals			
1.	Course Type	Department Requirement			
	Course ID.	BSWE 2301	Course Cr. Hrs.	3	
Course Description	This course i Topics include and modeling, quality assuran as a case study	This course introduces the main principles of software engineering. Topics includesoftware process models, software requirement engineering and modeling, software design and implementation, software testing, and quality assurance. These concepts will be practiced through a real project as a case study.			
Course Objectives	 This Course Objectives to enable the students to: Develop an in-depth understanding of software engineering concepts, processes, methods, techniques, and tools. Explain methods of capturing, specifying, visualizing and analyzing software requirements. Learn the concepts and principles of software design and user-centric approach. Learn how practice software engineering concepts through a project 				
Course Outcomes	Upon success Apprec Unders Genera diagran Particip	Ful completion of this course, the iate the need for software engined tand and use various prescriptive te project schedule and can constant of different software projects. pate in all phases of software proj	e student will be ering. software process ruct, design and e ect cycle	e able to: s models. develop	



	Course Name	Digital Logic Design				
2.	Course Type	Department Requirement				
	Course ID.	BSWE2303	Course Cr. 3 Hrs.			
Course Description	This course designs. It c concepts of algebra and digital circui are to be imp	se introduces the fundamental concepts ofdigital logic covers a broad range of fundamental digital circuits. The of digital signals, number systems, logic gates, switching id logic minimization techniques, basic combinatorial and cuits and their application in more complex digital systems in parted to the students.				
	This Course Objectives to enable the students to:					
	• Unders	tand the concept of various comp	ponents.			
Course	 Unders 	tand the concepts of the disciplin	nes digital electronic			
Objectives	logic ci	rcuits.				
	• Learn v	various Number system and Bool	ean algebra.			
	 Design 	and implement the combination	al circuits.			
	Upon success	ul completion of this course, th	e student will be able to:			
	• Unders	tand the concepts of various com	ponents to design stable			
~	logic ci	rcuits.				
Course	Repres	ent numbers and perform arithm	etic operations.			
Outcomes	Minim	ze the Boolean expressions usin	g Boolean algebra and			
	design	it using logic gates.				
	 Analyz 	e and design combinational circu	iit.			
	 Transla 	te real world problems into digit	al logic formulations.			



	Course Name:	Programming I				
3.	Course Type:	Department Requirement				
	Course ID.:	BSWE 2305	Course Cr. Hrs.	4		
Course Description	This course introduces the fundamental concepts of procedural programming. Topics include algorithms and problem solving, data types, control structures, functions, arrays, files, and the mechanics of running, testing, and debugging. The course also offers an introduction to the historical and social context of computing. It is designed for students with no prior programming experience. Students will learn and practice these programming principles using an appropriate programming language such as Java					
Course Objectives	 This Course Objectives to enable the student to: Understand the basic syntax and semantics of the programming language and programming environment. Learn about computer programming logic using Flow charts, Pseudo Code and Algorithms. Know about the concepts applicable to all programming languages, including: Identifiers, Data Types, Control Structures, methods and Arrays. Understand the main concept of Object Oriented Programming. Know how to develop simple and small programs using an 					
Course Outcomes	 appropriate language such as Java. Upon completion of the course, students should be able to: Use programming concepts correctly. Write Boolean expressions to control the flow of a program. Use arrays and distinguish between a reference to an array and a reference to an array element Develop small programs that implement basic algorithmic designs using methods. Analyze real life problems, find and develop algorithmic steps to solve it and then implement these steps in Java programming language. Implement the main concepts of Object Oriented Programming. 					



	Course Name:	Discrete Mathematics				
4.	Course Type:	Department Requirement				
	Course ID.:	BSWE 2308	Course Cr. Hrs.	3		
Course Description	This course gi advanced ma Engineering st methods of m and recurrence	ives the students a foundation for the development of more uthematical concepts which are essential to Software tudents. Topics covered in this course include: Set theory, nathematical proofs, relations, functions, graphs, probability				
Course Objectives	This Course (Express and vice Maniput and press Know Know Underss viewpo Know Counting	Objectives to enable the student to: ess real-life concepts and mathematics using formal logic ice-versa. pulate the problems using formal methods of propositional redicate logic. // basic methods of proofs and use certain basic strategies to ice proofs. // various forms of induction and recursion. rstand algorithms and time complexity from a mathematical point. // a certain amount about: functions, number theory,				
Course Outcomes	 Upon the completion of this course, students should be able to: Explain the concepts of relationships and functions Explain the concepts of recursion and mathematical induction. Identify problems which can be solved by discrete mathematics Apply Boolean algebra and logic to the problems related to computer technology. Apply graph theory based on a concrete problem. Apply elementary set theory. Implement discrete mathematical and statistical calculations and 					



	Course Name:	Data Communications and Net	works			
5.	Course Type:	Department Requirement				
	Course ID.:	BSWE 2302	Course Cr. Hrs.	4		
Course Description	This course is designed to enable students to select, design, deploy, integrate, and administer network and communication infrastructures in an organization. It includes fundamental concepts in the design and implementation of computer networks and their protocols. Also, it includes layered network architectures, applications, transport, congestion, routing, data link protocols, local area networks. An emphasis is on the protocols used in the internet. A top- down approach is emphasized during the course starting from the application layer down to the data link layer					
Course Objectives	 This Course Objectives to enable the student to: Understand the basic taxonomy and terminology of the computer networking and enumerate the layers of OSI model and TCP/IP model. Acquire knowledge of Application layer and Presentation layer paradigms and protocols. Gain core knowledge of Network layer routing protocols and IP addressing. Understand the data link layer concepts, design issues, and protocols 					
Course Outcomes	 Upon completion of the course, students should be able to: Describe the functions of each layer in OSI and TCP/IP model. Explain the functions of Application layer and Presentation layer paradigms and Protocols. Describe the Session layer design issues and Transport layer services. Classify the routing protocols and analyze how to assign the IP addresses for the given network. Describe the functions of data link layer and explain the protocols. Explain the types of transmission media with real time applications. 					



	Course Name: Computer Architecture				
6.	Course Type:	Department Requirement			
	Course ID.	BSWE 2306	Course ID.	4 hr.	
Course Description	This course is fundamentals hierarchy of m transmission v set, processor processor, para	particularly designed to enhance of computer architecture, basic emory, types of memory (cache, vithin computer, addressing and structure and pipelining, para allel processing, and single core ar	students with the components of internal and ext functioning of allelism and sup dimulticore cor	he required computer, ernal), data instruction oper scalar nputers.	
Course Objectives	This Course (Underse Know the Be fame I/O dev Underse function Underse Know the Be fame Underse Computed Underse Computed	 s Course Objectives to enable the student to: Understand fundamentals of computer architecture. Know the hierarchy of memory and types of memory. Be familiar with data transmission between memory, CPU and I/O devices. Understand the instruction set in computer (Addressing and functioning). Understand processor structure and Pipelining. Know the instruction level parallelism and super scalar processor. Be familiar with parallel processing. Understand the mechanism of single core and multicore computers 			
Course Outcomes	 Upon completion of the course, students should be able to: Learn how the computer architecture be, and concentrate on processor, memory and data transmission protocols within system. Know instruction set and parallelism in instruction execution. Compare between single core and multicore computers and their performance and efficiency. Develop skills in solution designs according to computer architecture. Complete the general view of Interaction between the study of hardware structure of computer and software part of it . Take the correct decision in designing big network of computers according to computers architecture. 				



 system, internal layers of computer and processor. Improve oral and engineering capabilities that related to
computer architecture.

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	Course Name:	Programming II				
7.	Course Type:	Department Requirement				
	Course ID.:	BSWE 2310	Course Cr. Hrs.	4		
Course Description	This course introduces the object-oriented programming concepts, principles and techniques. Topics include classes, objects, composition, inheritance, polymorphism and files. Goal of the course is to teach participants how to abstract a problem in an object-oriented style and program a solution in an object-oriented programming language such as Java.					
Course Objectives	This Course C • Unders techniq • Learn a • Gain th inherita • Know D • Use an rather c	 Course Objectives to enable the student to: Understand the object-oriented programming principles and techniques. Learn about classes and the relation between them. Gain the knowledge of reusability via applying composition and inheritance. Know how to usefiles to save the data. Use an object-oriented Programming language to develop 				
Course Outcomes	 rather complex programs Upon completion of the course, students should be able to: Describe the principles of object-oriented programming Have a good understanding of standard Java libraries Apply the concepts of data encapsulation, inheritance, and polymorphism. Acquire the concepts of Graphical User Interfaces Develop object-oriented computer programs andreal life problems. Formulate problems as steps to be solved systematically Develop applications with team-work in mind 					



	Course Name:	Software Requirements				
8.	Course Type:	Department Requirement				
	Course ID.:	BSWE 3311	Course Cr. Hrs.	3		
Course Description	This course development process (analy and through so practical expe Engineering) t	provides the Hands-on practice of the entire software process through role playing in the software development ysts, designers, programmers, testers and project manager), olving hypothetical customer problems. In addition, gaining perience with several CASE (Computer Aided Software tools to perform activities of the life cycle.				
Course Objectives	 This Course (Examine method Carry of to prod Contine ongoin Provide using S Use tess Utilize process 	Objectives to enable the student to: ine the common agile development practices and ods, including Scrum. out all stages of an agile software process in a team, duce working software nually negotiate project requirements during an ng Scrum project de practical knowledge of how to manage a project Scrum framework. est driven development to ensure software quality. e CASE tools during the software development				
Course Outcomes	Course Upon completion of the course, students should be able to: • Understand concept of agile software engineering and its advantages in software development. • Recognize various agile methods such as Extreem Programming and Scrum. • Understand, manage and design the Scrum practices and tools • Write user stories for project requirements. • Use a CASE tool to manage a software process in Scrum					



	Course Name	Data Structure and Algorithms Analysis				
9.	Course Type	Department Requirement	-			
	Course ID.	BSWE 33313	Course Hrs.	Cr.	3	
Course Description	This course co efficient algo algorithm anal abstract data ty solving strateg programming	overs the basics of algorithms, focusing on the themes of orithms. The course emphasizes the following topics: lysis, data structures such as linked lists, stacks and queues, ypes, recursive methods, sorting and searching, and problem- gies. These main concepts are applied using an appropriate language such as Java.				
Course Objectives	 This Course (Unders and ana Unders efficier Know I Learn H lists, st Unders Gain th (inserti various) 	 his Course Objectives to enable the students to: Understand algorithms and data structures and associated design and analysis techniques. Understand the design of the program structure that is correct, efficient in both time and space utilization. Know how to compute the complexity of various algorithms. Learn how to practice various data structures such as arrays, linked lists, stacks, queues and trees. Understand problem solving strategies. Gain the knowledge to perform the basic operations (inserting, deleting, sorting, rearranging, and modifying) on 				
Course Outcomes	 various data structures. Upon completion of the course, students should be able to: Practice the principles of different data structures. Design advance data structure using Non-Linear data structure. Determine and analyze the complexity of given Algorithms. Apply the concepts of data structures in simple projects. Implements the ideas of searching and sorting in different data structures. Implement applications using stacks and queues. Design and develop more complex programs using trees. Develop projects with team-work in mind 					



	Course Name	Database Management				
10.	Course Type	Department Requirement				
	Course ID.	BSWE 3315	Course Cr. Hrs.	4		
Course Description	The course focuses on the fundamentals of knowledgebase and relational database management systems, and the current developments in database theory and their practice. It provides comprehensive coverage of the problems involved in database design, in-depth coverage of data models and database Structural Query Language (SQL). In addition, it provides a survey of implementation techniques applied in modern DBMS's.					
Course Objectives	 This Course Objectives to enable the student to: Understand the characteristics of database systems. Understand data modeling and database design. Be familiar with languages and facilities provided by database systems. Contribute to successful implementation of database 					
Course Outcomes	Upon complet • Define charact • Analyz informa relation • Demon • Transfor schema • Use a d the sch	tion of the course, students should the terminology, features, classifi- eristics embodied in database syst e an information storage problem ation model expressed in the form in diagram. Instrate an understanding of the relation form an information model into a re- lata definition language and/or utilities and the term ema using a DBMS	d be able to: cations, and ems. and derive an of an entity tional data mod elational databa	lel. se ent		



	Course Name:	Advanced Mathematics		
11.	Course Type:	Department Requirement		
	Course ID.:	BSWE 3319	Course Cr. Hrs.	3
Course Description	This Course O useful for softy methods for en expansion, line differential equ	bjectives at introducing important ware engineers. The course covers agineers including: complex variab ear systems resolution and matrix to actions, Laplace and Fourier transf	mathematical te basic mathematical bles and mappin formalism, parti forms.	chniques tical g, Taylor's al
Course Objectives	 This Course Objectives to enable the student to: Understand the concept of complex variables, harmonic functions and mapping in complex plane. Learn the complex mapping, standard mappings, cross ratios and fixed point. Learn the Laplace Transform, Inverse Laplace Transform of various functions and its application. Understand the concept of Fourier series, its complex form and anhenes the problem solving shills. 			
Course Outcomes	 Upon complet Unders harmor Expand comple Unders Laplace to solve 	tion of the course, students should tand complex variable theory, app nic conjugate. If the periodic function by using For ex form of Fourier series. tand the concept of Laplace transf e transform of various functions and e ordinary differential equations.	d be able to: lication of ourier series and form and inverse and its application	e n



	Course Name:	Object Oriented Analysis and I	Design	
12.	Course Type:	Department Requirement		
	Course ID.:	BSWE 3314	Course Cr. Hrs.	3
Course Description	This course provides knowledge and practice in the object-oriented analysis and design activities of software engineering. Topics covered: unified process model, Requirement Engineering using scenarios and use cases, object oriented analysis models (Class diagram, activity diagram, sequence diagram), introduction to object oriented design models, changing the design to code. Practical sessions using CASE (Computer Aided Software Engineering) tools also provided.			
Course Objectives	 This Course Objectives to enable the student to: Teach students an agile software process with multiple iterations. Practice Object Oriented Analysis and Design techniques Teach students object-oriented models using UML standard notation Utilize CASE tools for Object Oriented Analysis and Design 			
Course Outcomes	 Design Upon completion of the course, students should be able to: Recognize the different process models. Describe different models created during object oriented analysis and design Analyze system requirements using Object Oriented methodology Implement CASE tools for Object Oriented analysis and design Write system requirements as Object Oriented. 			



Course Name:Computer Interface Design				
13.	Course Type:	Department Requirement		
	Course ID.:	BSWE 3316	Course Cr. Hrs.	3
Course Description	This course provides students with the concepts of Human Computer Interaction (HCI) methodologies to design user interfaces based on the capabilities of computer technology and the needs of human factors. Students design a user interface for a system and implement a prototype from a list of informal requirements. Students will be involved with a real problem solving/software development project			
Course Objectives	 This Course Objectives to enable the student to: Identify and describe various HCI methodologies, including input and interaction types. Articulate the co-dependency of the user and the technology in an HCI system. Learn the key concepts, theories, processes, and frameworks in interaction design. Apply user-centered design methods to practical design problems Develop basic prototypes with a range of interaction styles and 			
Course Outcomes	 Upon completion of the course, student should be able to: Explain the capabilities of both humans and computers from the viewpoint of human information processing. Describe HCI models and styles. Use HCI design principles, standards and guidelines. Apply an interactive design process and universal design principles to designing HCI systems. Discuss tasks and dialogs of relevant HCI systems based on task analysis and dialog design. Apply knowledge and understanding of the interaction design examples. Analyze and discuss HCI issues in multimedia, virtual reality and web-related environments 			



	Course Name:	Operating Systems		
14.	Course Type:	Department Requirement		
	Course ID.:	BSWE 3418	Course Cr. Hrs.	3
Course Description	This course describes the general structure of Operating Systems . It provides comprehensive knowledge about main Operating System components and Operations such as Process Management, Memory Management, Storage Management, CPU Scheduling, and Process Synchronization. This course discusses several issues of Operating System such as Threads, Deadlocks, and Virtual Memory. It compares different types of Operating Systems even for Servers, Personal computers, or Smartphones such as Windows, Macintosh, Linux, and Android.			
Course Objectives	 This Course Objectives to enable the student to: Understand the structure and organization of the Operating Systems. Understand how the Operating System managing its components and its internal process. Identify the critical differences between Operating Systems. Understand the problems generated by Operating System 			
Course Outcomes	 Upon complet Unders Install a platform Unders algorith Consid software 	ion of the course, students shoul tand what Operating System is and and configure Operating Systems ns. tand the special cases of Operating ms. er the cons and pros of Operating re development and its usage.	Id be able to: d how it works. for different wor g System System for	rk



	Course Name:	Advanced Database			
15.	Course Type:	Department Requirement			
	Course ID.:	BSWE 3320	Course Cr. Hrs.	3	
Course Description	This course equips students with an advanced practical and theoretical knowledge of database management systems enabling them to work productively on projects involving online database applications. The concentration will be on topics like: advanced database modeling, advanced SQL programming, transaction management, recovery and concurrency control, backup and recovery approaches, distributed database, and data warehousing.				
Course Objectives	 This Course Objectives to enable the student to: Examine advanced concepts and issues in database modeling and design. Have the knowledge about the different database management systems (DBMS). Understand methodologies to conceptualize and design database systems. Identify the key issues in developing database systems and applications. Know how to develop applications involving advanced database systems. Identify data integrity and security requirements. 				
Course Outcomes	 Identify data integrity and security requirements. Plan and prepare the Backup and Recovery techniques. Upon completion of the course, students should be able to: Select an appropriate DBMS for an application Design and develop a modern database solutions Evaluate alternative designs and architectures for databases and data warehouses. Discuss and evaluate methods of storing, managing and interrogating complex data. Implement concurrent or distributed processing and select appropriate approaches to mitigate those issues. 				



	Course Name:	Artificial Intelligence		
16.	Course Type:	Department Requirement		
	Course ID.:	BSWE 3322	Course Cr. Hrs.	3
Course Description	This course provides fundamentals of Artificial Intelligence in terms of theories and practices. It presents the applications of Artificial Intelligence such as Data Mining, Artificial Neural Networks, Virtual Reality, Augmented Reality, expert Systems, Bots, and Machine Learning. This course focuses on how to understand and enhance algorithms for solving problems. It covers Python programming for data science purposes			
Course Objectives	 This Course Objectives to enable the student to: Introduce the basic concepts and techniques of Artificial Intelligence. Develop skills for using Artificial Intelligence algorithms for solving practical problems. Understand most scientific applications of Artificial Intelligence. Write Python scripts for Artificial Intelligence techniques and algorithms. 			
Course Outcomes	 Upon completion of the course, students should be able to: Understand what is Artificial Intelligence and its applications. Utilize Artificial Intelligence algorithms for problem-solving. Identify the best Artificial Intelligence application for the optimal solution. Get ready for the data science era with enough knowledge and skills. 			



	Course Distributed software			
	Name:	Systems		
17.	Course Type:	Department Requirement		
	Course ID.:	BSWE 4321	Course Cr. Hrs.	4
Course Description	The course introduces the main principles underlying distributed systems: Introduction to distributed systems; distributed systems architecture; computer networks for distributed systems; distributed objects and remote invocation; distributed naming; distributed file systems; security; synchronization; distributed coordination and agreement; distributed transactions; distributed replication; distributed multimedia systems, distributed shared memory			
Course Objectives	 This Course Objectives to enable the student to: Understand the concept of distributed system, remote method invocation and remote procedure calls Learn communication methodology in distributed systems Acquaint with the distributed file systems Know the concepts of shared memory and security aspects in distributed system 			
Course Outcomes	 Upon complet Learn a and rem Analyz distribu Demon current 	tion of the course, students should and apply the concept of remote me note procedure calls the mechanism of peer to peer system the file systems astrate an understanding of the chat and future distributed systems	ld be able to: ethod invocation ystems and llenges faced by	n ,



	Course Name	Information Security I		
18.	Course Type	Department Requirement		
	Course ID.	BSWE 4325	Course Cr. Hrs.	3
Course Description	This course focuses on the main aspects of computer security. Principles and practices of information security will be present and clarify that including operating system security, network security, software security and web security. Topics include common attacking techniques such as malwares and social engineering. It discusses the formalisms of information security such as access control and information flow theory. It covers cryptography and hashing techniques. Case studies with ethical issues will be utilized			
Course Objectives	 This Course Objectives to enable the student to: Describe the basic concepts of computer security. Utilize information security principles in software development and secure network transmissions. Explain the cybersecurity issues in terms of theories and applications. Protect software hardware data and users by safeguards 			
Course Outcomes	Upon complet Describ Demon on a co techniq Identif	tion of the course, students shou be the basic concepts of computer strate an understanding of the three mputer, or being sent between con- ues to secure that data. y security risks, and suggest appro-	Id be able to: security. eats to data store mputers, and appriate solutions	ed ply



	Course	Web Programming I		
19.	NameCourseType	Department Requirement		
	Course ID.	BSWE 4327	Course Cr. Hrs.	4
Course Description	This course covers web development fundamentals, providing hands-on experience through the building of fully functional web applications. Starting with an overview of client-side technologies such as HTML, CSS, Bootstrap, and jQuery. In addition, students will learn to build web-based applications using the appropriate web programming languages commonly used (PHP or ASP.NET), and database developed include Microsoft SQL Server or MySQL.			
Course Objectives	 This Course Objectives to enable the students to: Learn essential skills for designing a website. Understand how to build layouts that use properly formed HTML ,CSS and bootstrap. Learn bootstrap fundamentals Create dynamic web sites that include client-side and server-side scripting. Connect the website with a database using an appropriate web 			
Course	Upon complet Demon Create 	ion of this course, students will strate understanding of HTML and and compile dynamic web p	be able to: d CSS programmerojects using	ming. client-side
Outcomes	(jQuery technol ● Apply	 JavaScript, bootstrap) and serve ogies. understanding the logical behind a 	er-side (ASP.NE dvanced web ap	ET or PHP)



	Course Name:	Mobile Programming I				
20.	Course Type:	Department Requirement				
	Course ID.:	BSWE 4331	Course Cr. Hrs.	4		
Course Description	This course provides an introduction to mobile software development for those with Java programming experience. Students will learn to build Android mobile applications for smart phones and tablets including use of a standard integrated development environment, debugging, user interface creation, inheritance, polymorphism, sensors, APIs and databases and multithreading and network applications. Moreover, students will be able to code, run, and debug a variety of applications using software emulators as well as tethered hardware devices.					
Course Objectives	 This Course Objectives to enable the student to: Produce applications for android platform devices. Gain a basic understanding of computer architecture and object- oriented programming. Be familiar with Android Studio development tools. Understand the mobile design principles. Identify need and opportunity in app markets. 					
Course Outcomes	Upon complet Install Design Save st Apply develop 	ion of the course, students shou and configure Android application and develop user Interfaces for the ate information across important of Java programming concepts oment.	Id be able to: In development to the Android platfor operating system to Android	ools. orm. 1 events. application		



	Course Name:	Concurrent and Real Time programming			
21.	Course Type:	Department Requirement			
	Course ID.:	BSWE 4324	Course Cr. Hrs.	3	
Course Description	This course provides an introduction to concurrent, real-time and distributed programming with Java object-oriented language. It describes in particular the mechanisms of synchronization (cooperative and competitive) and sharing of data (internal class, static variables) between threads in Java. The course discusses the use of Java for real-time applications and the RTSJ (Real Time Specification for Java) specification				
Course Objectives	 This Course Objectives to enable the students to: Understand threads in Java. Create Threads Synchronization. Develop Real-time systems using Java. Create Distributed Programming in Java 				
Course Outcomes	 Create Distributed Programming in Java. Upon completion of this course, students will be able to: Analyze the requirements for programming concurrent and real-time systems. Evaluate the strengths and weaknesses of the Java concurrency model and how it can be used to facilitate the programming of concurrent systems. Determine the run-time behavior of complex concurrent Java programs. Analyze the Real-Time Specification for Java and how it alleviates the problems with Java for Real-Time Systems. Analyze the restrictions that must be placed on the use of Java to facilitate the timing analysis of concurrent real-time Java programs. 				



	Course Name:	Software Systems Architecture			
22.	Course Type:	Department Requirement			
	Course ID.:	BSWE 4326	Course Cr. Hrs.	3	
Course Description	This course covers the study of design concepts and notations. Architecture, middleware architectures, design patterns, frameworks and components. Designing for qualities such as performance, security, reusability, reliability. Metrics and measurement. Basics of software evolution, reengineering, and reverse engineering. Students participate in a group project on software design.				
Course Objectives	 This Course Objectives to enable the student to: Introduce basic concepts and principles about software design and software architecture Learn practical approaches and methods for creating and analyzing software architecture Acquaint with the interaction between quality attributes and software architecture Experience with examples in design pattern application and case studies in software architecture 				
Course Outcomes	 Upon complet Expression Evalua Select pattern 	tion of the course, students shou s the analysis and design of nal semantics of an application te software architectures and use appropriate architectural s.	ld be able to: an application styles and softw	• Specify vare design	



	Course Name:	Web Programming II			
23.	Course Type:	Specialist Requirement			
	Course ID.:	BMOB 4302	Course Cr. Hrs.	3	
Course Description	This course provides the fundamental knowledge necessary to design and develop dynamic Web pages. The course will also introduce students to client-side JavaScript libraries (e.g., jQuery) and bootstrap, frameworks (e.g., Angular.js), and design patterns (e.g., MVC pattern) and how client-side scripts interact with server-side programs using Ajax. Furthermore, the course will introduce students to back-end concepts and tools for end-to-end (i.e., full-stack) web development, including back-end frameworks (e.g., ASP.NET MVC, PHP Laravel, or Node.js), REST concepts and NoSQL databases. Students will learn how to architect, develop, test, secure, deploy and manage a RESTful Web Service. Comprehensive hands on exercises are integrated throughout the course to reinforce learning and develop real competency.				
Course Objectives	 This Course Objectives to enable the students to: Understand how web technologies interact, from the browser to the backend servers. Gain familiarity with numerous languages and standard protocols. Implement dynamic content web pages using two-and three-tier architectures. Become familiar with the range of browser application clients. Gain practical experience in a selected set of Web technologies. Learn how to keep pace with the rapidly changing landscape of web application development. Implement a web application with database content and a dynamic 				
Course Outcomes	 Upon completion of this course, students will be able to: Explain client-side concepts and compare and contrast client-side versus server-side scripting. Write well-structured, easily maintained JavaScript code following accepted good practice. Effectively debug code, making use of good practice and debugging tools. Use frond and JavaScript librariae (a.g., iOuery), bestatare 				

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frameworks (e.g., Angular.js), and design patterns (e.g., MVC) to create dynamic pages.
• Use Aiax to fetch information from the server and display it on the
• Ose rigax to reten information from the server and display it on the
web page.
• Demonstrate an understanding of server-side (i.e., back-end)
concepts and server-side scripting (e.g., using either PHP or a
ASP.NET framework) for web development.
• Build and configure a back-end server using back-end framework
(e.g., ASP.NET MVC, PHP Laravel, or Node.js).
• Build a RESTful API for the front-end to access back-end services.



	Course Name	Information Security II				
24.	Course Type	Specialist Requirement				
	Course ID.	BMOB 4204	Course Hrs.	Cr.	2	
Course Description	This course for information second covers details apply both que course discuss security such a risk management threats, vulnera	focuses on cybersecurity and its main domains. It presents security risk management frameworks and their practices. It s on how to identify and model information security risks and qualitative and quantitative risk assessment methods. This sses the most standards risk management in information as ISO and NIST 800. It comprises the construction of a full nent plan based on a real risk assessment comprises a list of erabilities, and controls.				
Course Objectives	 This Course Objectives to enable the student to: Understand cybersecurity environment and its real risks. Introduce frameworks of risk management and their standards. Identify critical threats and vulnerabilities based on quantitative and qualitative methods. Provide a wide knowledge and practical skills in incidents and disasters of cybersecurity. 					
Course Outcomes	 Upon complet Unders method Identify Utilize Constru- industri 	tion of the course, students shoul tand information security risk ma lologies. y and modeling information securi Qualitative and quantitative risk a act risk management plans for ies.	d be able t nagement f ty risks. ssessment f local an	t o: Frame meth d in	eworks and ods. iternational	



	Course Name: Mobile Programming II					
25.	Course Type:	Department Requirement				
	Course ID.:	BMOB 4206	Course Cr. Hrs.	2		
Course Description	This course applications for Topics covered architecture, networking and to utilize Swift touch application	provides an introduction to designing and building for mobile devices that use Apple's iOS operating system. ed will include application of Model-View-Controller design database and web services, graphics, multithreading, nd interaction with hardware sensors. Students will also learn ft and the various SDK frameworks to build iPhone & iPod ions under Mac OSX.				
Course Objectives	 This Course Objectives to enable the student to: Produce applications for iOS platform devices. Gain a basic understanding of the iOS environment. Understand the iOS approach to structuring applications. Understand mobile design principles. Be familiar with X-Code development tools. Identify need and opportunity in app markets. 					
Course Outcomes	Upon complet Install a Design Save st Apply develop	ty need and opportunity in app markets. tion of the course, students should be able to: and configure iOS application development tools. and develop user Interfaces for the iOS platform. tate information across important operating system events. Swift programming concepts to iOS application opment.				



	Course Name:	Digital Media Processing Department Requirement					
26.	Course Type:						
	Course ID.:	BSWE 5335	Course Cr. Hrs.	3			
Course Description	This course is basic principle video. It descr when media a audio product Students will animation.	s designed as an introduction to digital multimedia. It covers les of each media type: text, graphics, audio, animation and cribes their digitization and progressing onto issues that arise are combined.The coursecovers graphics design, animation, ction and sound editing, video production, and web design. I be asked to develop a project to produce a video or an					
Course Objectives	This Course (Unders Learn a Unders text ap Learn t Know a Deal w Develo	Se Objectives to enable the student to: lerstand digital media and its applications. rn and understand technical aspect of multimedia systems. lerstand the standards available for different audio, video and applications. rn the types of images and differentiate between them. ow about the basics of audio and its formats. l with video and create simple animations.					
Course Outcomes	 Develop a project on different media types Upon completion of the course, students should be able to: Understand various file formats for audio, video and text media. Developed understanding of technical aspect of multimedia systems. Develop various multimedia systems applicable in real applications. Design interactive multimedia software. Apply production methods to create digital, graphics, audio, animations, and video. Evaluate multimedia application for its optimum performance. 						



	Course Name:	Testing of Software System				
27.	Course Type:	Department Requirement				
	Course ID.:	BSWE 5337	Course Cr. Hrs.	3		
Course Description	The course presents a systematic approach to software testing, in context of the software life cycle and as a branch of software engineering, building on students' prior knowledge of software engineering. Through both the breadth and depth of its coverage, the course provides a very broad introduction to whole discipline of software testing					
Course Objectives	 This Course Objectives to enable the student to: Provide a systematic overview of standards, techniques and tools in software testing Introduce core methodologies for the management and execution of the testing process Introduce practical techniques for testing and apply them to simple examples 					
Course Outcomes	 simple examples Upon completion of the course, students should be able to: Describe key techniques and standards in software testing. Explain and evaluate strategies for software testing for both complete life cycles and individual phases Demonstrate awareness of the range and capabilities of testing tools Produce appropriate documentation for test management, including test plans, test schedules and test progress monitoring Specify and design test cases and execute a test procedure for selected problems 					



	Course Name:	Cloud Computing				
28.	Course Type:	Specialist Requirement				
	Course ID.:	BMOB 5201	Course Cr. Hrs.	2		
Course Description	The course presents the main concepts of cloud computing. Cloud computing has become most needed technology for software engineering industry. The cloud computing has evolved rapidly due to its various features like cost effective and on demand service providing to the clients. Generally, Cloud service provider offers platform, software and infrastructure as a service to the end user. The term cloud computing is simply the use of computing resources delivered over a network.					
Course Objectives	 This Course Objectives to enable the student to: An ability to apply Data Warehouse Introduction about Business Intelligence Advanced database topics such as stored procedures, vies, joins, backup and recovery administration and SOL programming 					
Course Outcomes	 Upon completion of the course, students should be able to: Explore the Cloud Computing various terminology, concepts, principles and applications Have a hands-on comprehensive study of Cloud concepts and capabilities across the various Cloud service models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), and Software as a Service (SaaS) Practice variety of real projects existing in the cloud- based tools market. 					



29.	Course Type:	Specialist Requirement					
	Course ID.:	BMOB 5203	Course Cr. Hrs.	2			
Course Description	This course is develop a com in Graduation students; each system develop In this first pa problem, iden system, analyz design must in as the data mo group must sul	is the first of a two-course sequence in which the students will omplete software system. The second stage will be carried out on Project II. Students will work in groups of up to four ach group will have a supervisor to guide them through the elopment process using a specific methodology. part, each group must identify a problem domain, define the lentify and specify the requirements, document the current lyze it, propose alternative systems, and design a solution. The t include the definitions of all the required system models, such model and the functional model. At the end of the course, each submit a formal report documenting the complete process					
Course Objectives	 This Course C Apply I Design data. Design within social, sustain. Identify Underss Commute Commute Comm	a model and the functional model. At the end of the course, each st submit a formal report documenting the complete process rse Objectives to enable the student to: pply knowledge of mathematics, science, and engineering. esign and conduct experiments, as well as to analyze and interpret tta. esign a system, component, or process to meet desired needs ithin realistic constraints such as economic, environmental, cial, political, ethical, health and safety, manufacturability, and stainability. entify, formulate, and solve engineering problems inderstand of professional and ethical responsibility ommunicate effectively inderstand the impact of engineering solutions in a global, onomic, environmental, and societal context ecognize the need for, and an ability to engage in life-long arning se the techniques, skills, and modern engineering tools necessary r engineering practice					



	 Upon completion of the course, students should be have: An ability to apply knowledge of mathematics, science, and engineering. An ability to design and conduct experiments, as well as to analyze and interpret data.
Course Outcomes	 An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. An ability to identify, formulate, and solve engineering problems An understanding of professional and ethical responsibility An ability to communicate effectively The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context A recognition of the need for, and an ability to engage in life-long learning An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.



	Course Name:	Software Quality Assurance				
30.	Course Type:	Specialist Requirement				
	Course ID.:	BSWE 5228	Course Cr. Hrs.	2		
Course Description	This course provides a general introduction to Software Quality Assurance. It gives an overview of underlying concepts including: Software Quality Assurance, Quality Control, Quality management, Quality components, and software quality metrics. The course also introduces a detailed process and components for achieving software quality which include: Pre-project components, Software project life cycle quality components, Infrastructure components for error prevention and improvements and Managerial SQA components. It also introduces the International Organization for Standardization's (ISO) quality model.					
Course Objectives	 This Course Objectives to enable the student to: Identify benefits of and the needs to enforce software quality. Differentiate between quality control, quality management and quality assurance. Discuss the different components of SQA system. Discuss different software quality factors models. Understand the rational for the SE code of ethics and discuss them. Understand and discuss the benefits, needs and techniques of software reviews, software testing, configuration management and software metrics. Understand and discuss the needs for software process assessment and improvement and discuss the main SPI models. 					
Course Outcomes	 Upon completion of the course, students should be able to: Understand the principles of and motivation behind software quality management Understand the basics of software quality system and how to undertake the system processes Gain the knowledge of software management principles: quality assurance, process improvement, configuration management and 					



software quality management.
• Evaluate the feasibility of a project and selection of alternative
solutions.
• Create models of requirements using a variety of notations and
techniques



	Course Name:	Graduation Project II				
31.	Course Type:	Specialist Requirement				
	Course ID.:	BMOB 5312	Course Cr. Hrs.	3		
Course Description	In this course, started in Grad implement its students must appropriate for report, which problem defini manual for communication successful proj	e, each group will continue developing the software systems aduation Project I. Each group must use a particular tool to s system in a good programming practice. Furthermore, t generate a user manual for their information system in an ormat. At the end of the term, each group must submit a final a documents completely the information system from the nition phase to the implementation phase and contains a user the information system. Team work, leadership, on and writing skills are all important ingredients for a				
Course Objectives	 This Course Objectives to enable the student to: Manage and execute a substantial project in a limited time. Identify and learn whatever new skills are needed to complete the project. Apply design skills in the accomplishment of a single task. 					
Course Outcomes	 Appry design skins in the accomprisionent of a single task. Upon completion of the course, students should be able to: Plan, execute and complete a significant design and, as appropriate, implementation within the time budget available Document the project in final report. Use the project supervisor appropriately as project consultant or customer. Give a demonstration showing practical competence and demonstrating the results of the project. 					



	Course Name:	Introduction to data science				
32.	Course Type:	Department Requirement				
	Course ID.:	BSWE 3313	Course Cr. Hrs.	3		
Course Description	The course pre- study of the ge scientist requir machine learni with a good ur to engineer ef and tools they including data predictive mo evaluation, and	course presents the main concepts of data science. Data Science is the of the generalizable extraction of knowledge from data. Being a data tist requires an integrated skill set spanning mathematics, statistics, nine learning, databases and other branches of computer science along a good understanding of the craft of problem formulation and solving ngineer effective solutions. Students will learn concepts, techniques tools they need to deal with various facets of data science practice, ding data collection and integration, exploratory data analysis, active modeling, descriptive modeling, data product creation, nation, and effective communication				
Course Objectives	 This Course Objectives to enable the student to: Understand the nature of the data collection, the data itself, and the analysis processes relate to the kinds of inferences that can be drawn Understand the limitations of data sets based on their contents and provenance Know the data organization, management, preservation, and reuse Know the statistical analysis techniques to choose, given particular demands of inference and available data Know the general linear models and cluster analysis methods for statistical analysis Know the preparing data for analysis, including cleaning data, manipulating data, and dealing with missing data Analyze data using open source data analysis tools Know the data manipulation, analysis, and visualization 					
Course OutcomesUpon completion of the course, students should be able to:•Describe what Data Science is and the skill sets needed to be a data scientist.•Explain in basic terms what Statistical Inference means. Identify probability distributions commonly used as						

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foundations for statistical modeling. Fit a model to data.
• Use python to carry out basic statistical modeling and
analysis.
• Explain the significance of exploratory data analysis (EDA)
in data science. Apply basic tools (plots, graphs, summary
statistics) to carry out EDA.
• Describe the data science process and how its components
interact.
• Use APIs and other tools to scrap the Web and collect data.
• Apply EDA and the Data Science process in a case study.
• Apply basic machine learning algorithms
• Identify common approaches used for Feature Generation.
• Identify basic Feature Selection algorithms and use in
applications.
• Identify and explain fundamental mathematical and
algorithmic ingredients.
• Create effective visualization of given data (to
communicate or persuade).
• Work effectively in teams on data science projects.



	Course Name:	Engineering Optimization			
33.	Course Type:	Department Requirement			
	Course ID.:	BDTS 4204	Course Cr. Hrs.	2	
Course Description	This course describes the main concepts of optimization using engineering methods. Optimization involves finding the best solution according to specified criteria. In the context of engineering design, the best solution may refer to a minimum cost or weight, maximum quality or efficiency, or some other performance index pertaining to a disciplinary objective. However, determining the optimal design involves more than just the minimization or maximization of an objective function. Typically, the problems of interest in engineering are of a nonlinear nature, in that the objective functions and constraints considered are nonlinear.				
Course Objectives	 This Course Objectives to enable the student to: Understand the fundamental concepts of Optimization Techniques. Know the importance of optimizations in real scenarios. Provide the concepts of various classical and modern methods of for constrained and unconstrained problems in both single and multivariable 				
Course Outcomes	Upon complet Formul Unders various Solve v variable Apply t Solve a	tion of the course, students should ate optimization problems. tand and apply the concept of optimization problems. types of optimization problems. various constrained and unconstrained as well as multivariable. the methods of optimization in realing type of problem using principle	d be able to: mality criteria for ned problems in l life situation. es of optimality	or 1 single	



	Course Name:	Knowledge and Data Engineering			
34.	Course Type:	Department Requirement			
	Course ID.:	BDTS 4206	Course Cr. Hrs.	2	
Course Description	This course delivers techniques and tools for making Knowledge Management happen in an organization. Thoroughly revised to reflect today's latest tools, technologies, and best practices, it takes students through the development of a state-of-the-art enterprise Knowledge Management Platform that can leverage a company's existing investments in Big data and its related technologies. Furthermore, Hadoop open source software will be installed and used to implement the concepts learnt in big data				
Course Objectives	 This Course Objectives to enable the student to: Apply big data analytics Knowledge about big data, knowledge engineering and data analysis Manage big data available frameworks and how to use them 				
Course Outcomes	Upon successf Gain co manage Implem Use big Refine Use HA concep	Ful completion of this course, the oncepts on the implementation of the ement in an organization. The big data and its related topics g data to serve other sectors big data to suit special business no ADOOP open source software to it ts learnt in big data	e student will b knowledge eeds mplement the	e able to:	



	Course Name:	Data Visualization				
35.	Course Type:	Department Requirement				
	Course ID.:	BDTS 5201	Course Cr. Hrs.	2		
Course Description	This course introduces data visualization including both the principles and techniques. Students will learn the value of visualization, specific techniques in information visualization and scientific visualization, and understand how to best leverage visualization methods. In addition, it shows the techniques and algorithms for creating effective visualizations based on principles from graphic design, visual art, perceptual psychology, and cognitive science. Topics include Data abstraction, perception and design, visual exploratory and confirmatory data analysis, visualization topics on tables, spatial data, time-varying data, network and trees, the use of colors and views, and algorithms in data visualization.					
Course Objectives	 This Course Objectives to enable the student to: Know the basics of data visualization Understand the importance of data visualization and the design and use of many visual components Use various visualization structures such as tables, spatial data, time-varying data, tree and network, etc. Know the basics of colors, views, and other popular and important visualization-based issues. Understand basic algorithms in data visualization 					
Course Outcomes	 Upon completion of the course, students should be able to: Present data with visual representations for your target audience, task, and data. Experiment with and compare different visualization tools. Create multiple versions of digital visualizations using various software packages. Identify appropriate data visualization techniques given particular requirements imposed by the data. Apply appropriate design principles in the creation of presentations and visualizations. Analyze, critique, and revise data visualizations 					