

Curriculum / Scheme of Studies
of
Associate Degree in Computer Science
(ADP Computer Science)
(2023)



University of Education, Lahore

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1. Introduction to AD Computer Science (ADCS) Program

Computer science encompasses the study of the principles, experimentation, and engineering involved in the creation and utilization of computers. It embraces both the scientific and practical aspects of computation and its applications, as well as the systematic examination of the feasibility, structure, expression, and mechanization of the systematic procedures (or algorithms) that underlie the acquisition, representation, processing, storage, communication, and access to information.

Furthermore, computer science involves the systematic, disciplined, and measurable application of approaches in the design, development, operation, and maintenance of software systems. It entails the practice of designing and implementing large, reliable, efficient, and cost-effective software by employing engineering principles and practices. The program aims to equip students with comprehensive skills encompassing the entire software lifecycle, from specification and analysis to design, testing, maintenance, and evaluation of software products.

Computer science encompasses a broad spectrum, ranging from its theoretical and algorithmic foundations to cutting-edge advancements in robotics, computer vision, intelligent systems, bioinformatics, and other exciting domains. The overall scope of computer science can be categorized as follows:

1. Developing effective solutions for computing problems: Computer science endeavors to devise optimal approaches for storing information in databases, transmitting data over networks, and displaying complex images. Its theoretical underpinnings enable the determination of optimal performance, and the study of algorithms allows for the development of innovative problem-solving methods that deliver superior performance.
2. Creating intelligent and efficient computer utilization: Progress in networking, database management to revolutionize the world through the advent of the World Wide Web. Ongoing research focuses on developing practical, intelligent robots, databases that generate new knowledge, and novel applications of computers.
3. Designing and implementing software systems: Computer science equips individuals with the knowledge and skills necessary for successfully implementing software systems to tackle complex programming tasks. It spans various areas, from theoretical models to design and programming, providing a comprehensive foundation that empowers graduates to adapt to emerging technologies and novel concepts.

2. Program Vision Statement

The goal of the ADCS program is to foster innovation, expand horizons, disseminate, and share advanced knowledge in the field of computer science. It aims to empower students to actively engage and make valuable contributions in their discipline at local, national, and global levels, whether through academia, research endeavors, or practical applications.

3. Program Mission Statement

The program's mission is to provide a contemporary, high-quality, and well-rounded education in both theoretical and practical aspects of various domains within Computer Science. It aims to cultivate a strong sense of professionalism in students by enhancing their communication, problem-solving, and technical skills, preparing them to tackle present and future challenges.

Through a comprehensive degree program, the curriculum is designed to equip students with a wide range of professional knowledge and skills. This enables them to effectively navigate the evolving landscape of computer science and make valuable contributions to the industry as software developers, technology experts, and academics in the field of computer science. Provide quality learning experiences through effective classroom practices/smart rooms, active learning styles of teaching, and opportunities for meaningful interactions between students and faculty.

4. Program Objectives

The program aims to accomplish the following objectives, thereby rapidly equipping students with the necessary skills to meet market demands and produce highly skilled professionals in the field of computer sciences and related areas. These professionals will possess technological expertise, research capabilities, effective communication and problem-solving skills, managerial acumen, and leadership qualities. They will contribute to their profession as managers, academics, innovators, and planners. Additionally, the program seeks to foster an environment that promotes innovation, facilitates the application of theoretical knowledge, and empowers students to acquire new competencies for the future. It also aims to provide students with a strong foundation aligned with state-of-the-art research and technologies to prepare them for global challenges and meet national needs. Key objectives of the program include:

- Offering comprehensive education and training in various domains of computer science, as well as supporting areas such as science, mathematics, and management, to provide students with a broad and in-depth understanding of the latest concepts, theories, and techniques.
- Developing students' problem-solving and analytical thinking capabilities to propose and develop practical solutions that find applications in both industry and research.
- Encouraging innovation among students and providing them with the necessary communication skills and an environment conducive to presenting their proposed solutions through well-organized reports, presentations, and projects utilizing the latest tools and technologies.
- Cultivating awareness of state-of-the-art research and the rapidly evolving technological landscape in the industry.
- Providing formal foundations for higher learning and education while simultaneously equipping students with the necessary skills and knowledge for successful entry into the industry.

5. Curricula Consideration

During the revision of the Computing Curricula, two major guidelines have been considered (ACM and Seoul Accord). However, in some cases, the main focus of these guidelines is mostly traditional Computer Science programs.

5.1. Association of Computing Machinery (ACM) - Guidelines

Association of Computing Machinery (ACM), USA is the largest body in the world for computer scientists. Its membership is spread over the entire globe. It has a pool of highly reputed professionals which meet after a few years to assess the directions being taken by the computing discipline. In view of its assessment, it identifies knowledge areas and also their relative importance in the years to come. Thus, ACM shows the path to follow to the computing academia and professionals all over the world. Computing curricula are designed keeping in view following identified knowledge areas of ACM [ref # ACM 2013 curriculum report]. It has been tried to reasonably cover all knowledge areas without compromising the flexibility needed for a national model curriculum. The mapping of these key knowledge areas with the courses are given in table below.

- AL -Algorithms and Complexity
- AR -Architecture and Organization
- CN -Computational Science
- DS -Discrete Structures
- GV -Graphics and Visual Computing
- HCI -Human-Computer Interaction
- IAS -Information Assurance and Security
- IM -Information Management
- IS -Intelligent Systems
- NC -Networking and Communications
- OS -Operating Systems
- PBD - Platform-based Development
- PD -Parallel and Distributed Computing
- PL -Programming Languages
- SDF -Software Development Fundamentals
- SE -Software Engineering
- SF -Systems Fundamentals
- SP -Social Issues and Professional Issue

The following knowledge areas have been addressed with the major computing courses.

5.2. Knowledge Areas in ACM CS 2013 Curriculum

#	Knowledge Area	CS 2013		ACM 2013 Subjects Taught in Various Universities	NCEAC Revised 2023 Subjects in Core
		Tier-1	Tier-2		
1	AL-Algorithms and Complexity	19	9	Algorithms; Algorithms and Data Structures; Algorithm Design and Analysis	Data structures, Analysis of Algorithms, Theory of Automata
2	AR-Architecture and Organization	0	16	Intro to Computer Architecture; DLD; Computer Engineering	DLD, Computer Org & Assembly Language, Computer Architecture

3	CN-Computational Science	1	0	eScience; Modeling and Simulation; Computer Graphics	HCI & Computer Graphics; (Elective: Numerical Analysis)
4	DS-Discrete Structures	37	4	Discrete Mathematics; Mathematical Foundations of CS; Probability for CS; Discrete Structures 1; Discrete Str 2	Discrete Structures, Introduction to Statistics
5	GV-Graphics and Visualization	2	1	Computer Graphics; Computer Graphics	HCI & Computer Graphics; (Elective: Computer Graphics)
6	HCI-Human-Computer Interaction	4	4	Human Computer Interaction	HCI & Computer Graphics
7	IAS-Information Assurance and Security	3	6	Computer Systems Security	Information Security; (Elective: Cyber Security)
8	IM-Information Management	1	9	Database Systems	Database Systems; Adv Database Management Sys
9	IS-Intelligent Systems	0	10	Artificial Intelligence Programming; Artificial Intelligence	Artificial Intelligence
10	NC-Networking and Communication	3	7	Introduction to Computer Networking; Computer Networks	Computer Networks

11	OS-Operating Systems	4	11	Operating Systems	Operating Systems
12	PBD-Platform-based Development	0	0		(Electives: Web Technology {ASP, Javascript}, Visual Prog {C#}, Mobile App Dev {React/Flutter/Kotlin/Swift})
13	PD-Parallel and Distributed Computing	5	10	Parallel Programming Principle and Practice;	Parallel & Distributed Computing
14	PL-Programming Languages	8	20	Introduction to Compilers; Compilers; Introduction to Programming; Programming Languages	Programming Fundamentals, OOP, Compiler Construction
15	SDF-Software Development Fundamentals	43	0	Java Programming I; Introduction to Program Design; Introduction to Programming; OOP	Programming Fundamental, Object Oriented Programming, Data Structures
16	SE-Software Engineering	6	22	Software Engineering	Software Engineering
17	SF-Systems Fundamentals	18	9	Computer Systems and Networks; Great Ideas in Computer Architecture; System Programming	DLD, Computer Networks, Computer Architecture
18	SP-Social Issues and Professional Practice	11	5	Ethics in Technology; Technology Consulting in the Community	Professional Practices
	Total Core Hours	165	143		
			308		

5.3. Associate Degree in Computer Science

Associate Degree Computer Science (ADCS) program is a two years' degree which covers important aspect of the computing discipline. The duration of the Associate Degree is two years with an option to upgrade it to a full-fledged bachelor's degree program. Important features of the AD programs are as follows:

1. Associate Degree Computer Science comprises of 04 semesters / 02 years' duration. AD Computer Science may only be offered under semester system.
2. Semester duration is 18 weeks, including two weeks for examinations and results
3. The minimum credits for award of Associate Degree Computer Sciences 72 Credit Hours.
4. 1 (one) Theory CrHr is equivalent to 1 (one) contact hour per week in a normal semester of 15/16 weeks teaching so a 3 CrHr course means at least 45 contact hours for the whole semester.
5. 1 Lab CrHr is equivalent to 3 contact hours per week for 15/16 weeks
6. Semester rules will be adopted from the approved university policy.

5.4. Admission Requirement/Eligibility Criteria for AD Computer Science

- Minimum 50% marks in Intermediate/12 years schooling/A- Level (HSSC) or Equivalent with Mathematics are required for admission in Associate Degree Computer Science. **Equivalency certificate by IBCC will be required in case of education from some other country or system.*
- The students who have not studied Mathematics at intermediate level have to pass deficiency courses of Mathematics (06 credits) in first two semesters. Mathematics courses include Pre-Calculus-I and Pre-Calculus-II. Additionally, courses will be considered as non-credited courses.
- A minimum 2.0 CGPA (Cumulative Grade Point Average) on a scale of 4.0 is required for award of AD Computer Science degree.
- The candidates with AD Computer Science Degrees are eligible for admission in 5th Semester of BS Computer Science Programs. Such students shall complete the deficiency courses of General Education (if any) during 5th to 8th Semester.
- The candidates who acquired ADP Computer Science Degrees prior to the admission criteria (as stated above) are also eligible for admission in 5th Semester of BS Computer Science Programs. Such students shall complete the deficiency courses of General Education (if any) during 5th to 8th Semester.

Degree Equivalency

The Associate Degree is equivalent to 14 years of schooling – level 05 qualification as per National Qualifications Framework of Pakistan.

Title of Degree

The Nomenclature of the Associate Degree 'Title' will be written on degree as "Associate Degree in Computer Science".

Grading System

The grading of the AD Computer Science program shall follow the same criteria as the four-year bachelor degree programs or adhere to the approved university policy.

Curriculum Model for AD in Computer Science

Students will be required to complete the following courses to obtain Associate Degree CS.

6. Generic Structure for Computer Science Disciplines:

Areas	Credit Hours	Courses
Computing Core	28	8
Allied Courses	14	5
General Education Requirement	30	12
Totals	72	25

7. Mapping of ADCS Program on the Generic Structure:

#	Pre-Reqs	Course Title	Dom	Cr Hr
Computing Core				
1		Programming Fundamentals	Core	4 (3+1)
2	PF	Object Oriented Programming	Core	4 (3+1)
3		Database Systems	Core	4 (3+1)
4	OOP	Data Structures	Core	4 (3+1)
5		Information Security	Core	3 (2+1)
6		Artificial Intelligence	Core	3 (2+1)
7		Computer Networks	Core	3 (2+1)
8		Software Engineering	Core	3 (3+0)
Allied Courses				
9		Advanced Database Lab	Allied	2 (0+2)
10		Web Technologies Lab	Allied	3 (1+2)
11		Mobile Application Development Lab	Allied	3 (1+2)
12		Advanced Programming Lab	Allied	3 (1+2)
13		Cyber Security Lab	Allied	3 (1+2)
14	CAG	Elementary Linear Algebra	Allied	3 (3+0)
General Education Requirement Courses				
15		Applications of Information and Communication Technologies	GER	3 (2+1)
16		Functional English	GER	3 (3+0)
17		Expository Writing	GER	3 (3+0)

18	Pre-Calculus I and Pre- Calculus II.	QR-1 (Calculus and Analytic Geometry)	GER	3 (3+0)
19	Pre-Calculus I and Pre- Calculus II.	QR-2 (Discrete Mathematics)	GER	3 (3+0)
20		Islamic Studies/Ethics	GER	2 (2+0)
21		Ideology and Constitution of Pakistan	GER	2 (2+0)
22		Social Sciences (Foundations of Management)	GER	2 (2+0)
23		Natural Sciences (Applied Physics)	GER	3 (2+1)
24		Arts & Humanities (Professional Practices)	GER	2 (2+0)
25		Civics and Community Engagement	GER	2 (2+0)
26		Introduction to Entrepreneurship	GER	2 (2+0)

8. Semester/Study Plan for ADCS

#	Code	Pre-Reqs	Course Title	Domain	Cr Hr (Cont hr)
Semester 1					
1	COMP1112		Programming Fundamentals	Core	4 (3+1)
2	COMP1116		Applications of Information and Communication Technologies	GER	3 (2+1)
3	MATH1129	Pre-Calculus I and Pre-Calculus II.	QR 1 (Calculus and Analytic Geometry)	GER	3 (3+0)
4	ENGL1114		Functional English	GER	3 (3+0)
5	PHYS1124		Applied Physics	GER	3 (2+1)
6	ISLA1111 / HUMN1111		Islamic Studies / Ethics	GER	2 (2+0)
				Total Cr Hrs	18 (15+3)
Semester 2					
7	COMP2111	PF	Object Oriented Programming	Core	4 (3+1)
8	COMP2114		Database Systems	Core	4 (3+1)
9	MATH2113	Pre-Calculus I and Pre-Calculus II.	QR 2 (Discrete Mathematics)	GER	3 (3+0)
10	ENGL1120		Expository Writing	GER	3 (3+0)
11	ITEC4112		Professional Practices	GER	2 (2+0)
12	BUSA2118		Foundations of Management	GER	2 (2+0)
				Total Cr Hrs	18 (16+2)
Semester 3					
13	COMP2117		Data Structures	Core	4 (3+1)
14	COMP2120		Information Security	Core	3 (2+1)
15	COMP2121		Artificial Intelligence	Core	3 (2+1)
16	COMP2119		Computer Networks	Core	3 (2+1)
17	COMP2112		Software Engineering	Core	3 (3+0)
18	POLS2111		Civics and Community Engagement	GER	2 (2+0)
				Total Cr Hrs	18 (14+4)
Semester 4					
18	COMP2122		Allied 1 (Advanced Database Lab)	Allied	2 (0+2)
19	COMP2123		Allied 2 (Web Technologies Lab)	Allied	3 (1+2)
20	COMP2124		Allied 3 (Mobile Application Development Lab)	Allied	3 (1+2)

21	COMP2125		Allied 4 (Advanced Programming Lab)	Allied	3 (1+2)
22	COMP2126		Allied 5 (Cyber Security Lab)	Allied	3 (1+2)
23	PAKS1119		Ideology and Constitution of Pakistan	GER	2 (2+0)
24	BUSA1114		Introduction to Entrepreneurship	GER	2 (2+0)
				Total Cr Hrs	18 (8+10)

Note: One credit of lab means 3 contact hours, which means students will spend three hours in the lab for each credit earned.

Note: The prerequisites, Pre-Calculus-I and Pre-Calculus-II, for mathematics courses are applicable only to individuals who have not previously studied mathematics in their prior degree.

9. Course Outlines

Course Name:	<i>Programming Fundamentals</i>
Course Code:	COMP1112
Credit Hours:	4 (3+1)
Contact Hours:	3+1
Pre-requisites:	None

Course Introduction:

This course provides fundamental concepts of programming to freshmen. The course is pre-requisite to many other courses, therefore, students are strongly advised to cover all contents and try to achieve CLOs to the maximum possible level. The course may be taught as language independent. Further, it is up to the university to choose any language for the practical/Lab purpose but that must be latest and market oriented.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Understand basic problem-solving steps and logic constructs	C2 (Understand)
CLO-2	Apply basic programming concepts	C3 (Apply)
CLO-3	Design and implement algorithms to solve real world problems	C3 (Solve)

Course Outline:

Introduction to problem solving, Introduction to programming, role of compiler and linker, introduction to algorithms, basic data types and variables, arithmetic, comparison and logical operators, conditional statements and execution flow for conditional statements, repetitive statements and execution flow for repetitive statements, , introduction to modular programming, function definition and calling, stack rolling and unrolling, string and string operations, pointers/references, static and dynamic memory allocation, File I/O operations.

Weekly Plan

1. Introduction to problem solving [TB2]
2. Introduction to programming [TB2: CH2]
3. Role of compiler and linker [TB1: CH.01]
4. Introduction to algorithms [TB1: CH.01,02]
5. Basic data types and variables [TB1: CH.01,02]
6. Arithmetic, Comparison and logical Operators [TB1: CH.01,02,04]
7. conditional statements and execution flow for conditional statements [TB1: CH.01,02,04]
8. Repetitive statements and execution flow for repetitive statements [TB1: CH.04,05]

9. Introduction to modular programming [TB1: CH,06]
10. Function definition and calling [TB1: CH.03]
11. Stack rolling and unrolling [TB1: CH.07]
12. String and string operations [TB1: CH.09]
13. pointers [TB1: CH.13 and 14]
14. Static and dynamic memory allocation [TB1: CH.13 and 14]
15. File I/O operations [TB1: CH 11]

Text Book(s)

1. Starting out with Programming Logic & Degin, 4th Edition, Tony Gaddis,
2. The C Programming Language, 2nd Edition by Brian W. Kernighan, Dennis M. Ritchie
3. Object Oriented Programming in C++ by Robert Lafore
4. C How to Program, 7th Edition by Paul Deitel & Harvey Deitel
5. Problem Solving and Program Design in C++, 7th Edition by Jeri R. Hanly & Elliot B. Koffman

Course Name:	<i>Object Oriented Programming</i>
Course Code:	COMP2111
Credit Hours:	4 (3+1)
Contact Hours:	3+1
Pre-requisites:	Programming Fundamentals

Course Introduction:

The course aims to focus on object-oriented concepts, analysis and software development. The basic concept of OOP is covered in this course.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Understand principles of object-oriented paradigm.	C2 (Understand)
CLO-2	Identify the objects & their relationships to build object oriented solution	C3 (Identify)
CLO-3	Model a solution for a given problem using object oriented principles	C3 (Apply)
CLO-4	Examine an object-oriented solution	C4 (Examine)

Course Outline:

Introduction to object oriented design, history and advantages of object oriented design, introduction to object oriented programming concepts, classes, objects, data encapsulation, constructors, destructors, functions, function overloading, operator overloading, identification of classes and their relationships, inheritance, multiple inheritance, polymorphism, abstract classes and interfaces, generic programming concepts, function & class templates, standard template library, object streams, data and object serialization using object streams, exception handling.

Weekly Plan

1. Introduction to object-oriented design, history and advantages of object-oriented design [TB1: CH.13, Ch.14]
2. Introduction to object-oriented programming concepts [TB1: CH.13, Ch.14]
3. Classes [TB1: CH.13, Ch.14]
4. Objects [TB1: CH.13, Ch.14]
5. Data encapsulation, constructors, destructors [TB1: CH.13]
6. Functions, function overloading [TB1: Ch.06, CH.13, Ch.14]
7. Operator overloading, identification of classes and their relationships [TB1: Ch.06, CH.13, Ch.14]
8. Inheritance, multiple inheritance [TB1: CH.15]
9. Polymorphism [TB1: CH.15]
10. Abstract classes and interfaces, generic programming concepts [TB1: CH.16, Ch.17]
11. Function & class templates, standard template library [TB1: CH.16, Ch.17]

12. Function & class templates, standard template library [TB1: CH.16, Ch.17]
13. Standard template library [TB1: CH.16, Ch.17]
14. Object streams, data and object serialization using object streams, exception handling [TB1: CH.16, Ch.17]
15. Data and object serialization using object streams, exception handling [TB1: CH.16, Ch.17]
16. Exception handling [TB1: CH.16, Ch.17]

Text Books:

1. Java: How to Program, 9th Edition by Paul Deitel
2. Beginning Java 2, 7th Edition by Ivor Horton
3. An Introduction to Object Oriented Programming with Java, 5th Edition by C. Thomas Wu
4. Starting Out with C++ from Control Structures to Objects, 9th Edition, Tony Gaddis
5. C++ How to Program, 10th Edition, Deitel & Deitel.
6. Object Oriented Programming in C++, 3rd Edition by Robert Lafore

Course Name:	<i>Database Systems</i>
Course Code:	COMP2114
Credit Hours:	4 (3+1)
Contact Hours:	3+1
Pre-requisites:	None

Course Introduction:

The course aims to introduce basic database concepts, different data models, data storage and retrieval techniques and database design techniques. The course primarily focuses on relational data model and DBMS concepts

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Explain fundamental database concepts.	C2 (Explain)
CLO-2	Design conceptual, logical and physical database schemas using different data models.	C5 (Design)
CLO-3	Identify functional dependencies and resolve database anomalies by normalizing database tables.	C2 (Identify)
CLO-4	Use Structured Query Language (SQL) for database definition and manipulation in any DBMS	C4 (Use)

Course Outline:

Basic database concepts, Database approach vs. file based system, database architecture, three level schema architecture, data independence, relational data model, attributes, schemas, tuples, domains, relation instances, keys of relations, integrity constraints, relational algebra, selection, projection, Cartesian product, types of joins, normalization, functional dependencies, normal forms, entity relationship model, entity sets, attributes, relationship, entity-relationship diagrams, Structured Query Language (SQL), Joins and sub-queries in SQL, Grouping and aggregation in SQL, concurrency control, database backup and recovery, indexes

Weekly Plan

1. Basic database concepts, Database approach vs. file-based system [TB1: CH:01]
2. Database architecture, three level schema architecture [TB1: CH:02]
3. Data independence, relational data model [TB1: CH:02,10]
4. Attributes, schemas, tuples, domains [TB1: CH:12, 02, 05]
5. Relation instances, keys of relations, integrity constraints [TB1: CH:02, 04]
6. Relational algebra, selection, projection [TB1: CH:02, 10, 23]
7. Cartesian product [TB1: CH:04]
8. Types of joins [TB1: CH:25, 14, 15]
9. Normalization [TB1: CH:25, 14, 15]
10. Functional dependencies [TB1: CH:14]
11. Normal forms, entity relationship model [TB1: CH:14, 04]
12. Attributes, relationship, entity-relationship diagrams [TB1: CH:04]

13. Structured Query Language (SQL)
14. Joins and sub-queries in SQL, Grouping and aggregation in SQL [TB1: CH:06]
15. Concurrency control [TB1: CH:22]
16. Database backup and recovery, indexes [TB1: CH:20]

Text Books:

1. Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition by Thomas Connolly and Carolyn Begg

Reference Materials: (or use any other standard and latest books)

2. Database Systems: The Complete Book, 2nd Edition by Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom
3. Database System Concepts, 6th Edition by Avi Silberschatz, Henry F. Korth and S. Sudarshan.
4. Database Management Systems, 3rd Edition by Raghu Ramakrishnan, Johannes Gehrke

Course Name: *Digital Logic and Design*
Course Code: PHYS4129
Credit Hours: 3 (2+1)
Pre-requisites: None

Objectives:

The students will be able to understand:

- Digital circuits using Boolean algebra and to implement digital circuits with different logic gates and capable of designing both sequential and combinational circuits for microprocessor based systems.
- Design considerations for the telecommunication systems using analog integrated circuits.

Course Outline:

Review of Number Systems: Binary, octal and hexadecimal number system their inter conversion, basic logic gates, different codes (BCD, ASCII, Gray etc.), Parity in codes.

Boolean Algebra: Demorgan theorems, simplification of Boolean expression by Boolean postulates and theorem, SOP and POS conversions, K maps and their uses, don't care condition.

Combinational Logic Circuit: Logic circuits based on AND-OR, OR-AND, NAND, NOR Logic gates design, addition, subtraction, 2's compliments, half adder, full adder, half subtractor, full subtractor in coder, decoder, multiplexer and demultiplexer.

Sequential Logic Circuit: Latches, Flip- flop, S-R, J-K, T and D flip flops, Master-slave flips- flops.

IC Logic Families: Basic characteristics of a logic family. (Propagation delay time, dissipation, noise margins etc. Different logic based IC families (DTL, RTL, TTL, CMOS).

List of Experiments:

1. Design and study of a half and full with different Boolean expression
2. Construct and study RS, JK, T, D Flip Flops by using IC's

3. To construct and understand an operation of arithmetic logic unit and study different operation of it.
4. Design and study the application of operational amplifier (current to voltage converter, voltage clamp, integrator and differentiator)

Recommended Books:

- Nashelsky, L. (1972). *Introduction to digital computer technology*.
 - Debenham, M. J. (2013). *Microprocessors: principles and applications*. Elsevier.
 - Mano, M. M. (1988). *Computer engineering hardware design*. Prentice-Hall, Inc.

 - Tokheim, R. (2007). *Digital Electronics*. 7th Ed McGraw Hill.
- Instructor of respective course may add two books.

Course Name:	<i>Data Structures</i>
Course Code:	COMP2117
Credit Hours:	4 (3+1)
Contact Hours:	3+1
Pre-requisites:	Programming Fundamentals

Course Introduction:

The course is designed to teach students structures and schemes, which allow them to write programmer to efficiently manipulate, store, and retrieve data. Students are exposed to the concepts of time and space complexity of computer programs.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Implement various data structures and their algorithms and apply them in implementing simple applications	C3 (Apply)
CLO-2	Analyze simple algorithms and determine their complexities.	C5 (Analyze)
CLO-3	Apply the knowledge of data structure to other application domains.	C3 (Apply)
CLO-4	Design new data structures and algorithms to solve problems.	C6 (Design)

Course Outline:

Abstract data types, complexity analysis, Big Oh notation, Stacks (linked lists and array implementations), Recursion and analyzing recursive algorithms, divide and conquer algorithms, Sorting algorithms (selection, insertion, merge, quick, bubble, heap, shell, radix, bucket), queue, dequeuer, priority queues (linked and array implementations of queues), linked list & its various types, sorted linked list, searching an unsorted array, binary search for sorted arrays, hashing and indexing, open addressing and chaining, trees and tree traversals, binary search trees, heaps, M-way trees, balanced trees, graphs, breadth-first and depth-first traversal, topological order, shortest path, adjacency matrix and adjacency list implementations, memory management and garbage collection.

Weekly Plan:

- 1- Abstract data types, complexity analysis, Big Oh notation [TB1: CH.02]
- 2- Stacks (linked lists and array implementations) [TB1: CH.03]
- 3- Recursion and analyzing recursive algorithms, divide and conquer algorithms [TB1: CH.01,10]
- 4- Sorting algorithms (selection, insertion and merge sort) [TB1: CH.07]
- 5- Sorting algorithms (Quick, Bubble, Heap) [TB1: CH.07]
- 6- Sorting algorithms (Shell, Radix, Bucket) [TB1: CH.07]
- 7- Queue, dequeuer, priority queues (linked and array implementations of queues) [TB1: CH.03,06]
- 8- Linked list & its various types, sorted linked list [TB1: CH.03,05]
- 9- Searching an unsorted array, binary search for sorted arrays [TB1: CH.04,07]
- 10- Hashing and indexing, open addressing and chaining [TB1: CH.05]

- 11- Trees and tree traversals, binary search trees, heaps [TB1: CH.04]
- 12- M-way trees, balanced trees [TB1: CH.04]
- 13- Graphs, breadth-first and depth-first traversal [TB1: CH.09]
- 14- Topological order, shortest path [TB1: CH.09]
- 15- Adjacency matrix and adjacency list implementations [TB1: CH.09]
- 16- Memory management and garbage collection [TB1: CH.01]

Text Book(s)

- 1- Data Structures and Algorithms in Java" by Robert Lafore

Reference Materials: (or use any other standard and latest books)

- 1. Data Structures and Algorithm Analysis in Java by Mark A. Weiss
- 2. Data Structures and Abstractions with Java by Frank M. Carrano & Timothy M. Henry
- 3. Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein

Course Name:	<i>Information Security</i>
Course Code:	COMP2120
Credit Hours:	3 (2+1)
Contact Hours:	2+1
Pre-requisites:	None

Course Introduction:

This course provides a broad overview of the threats to the security of information systems, the responsibilities and basic tools for information security, and the levels of training and expertise needed in organizations to reach and maintain a state of acceptable security. It covers concepts and applications of system and data security. Areas of particular focus include secure network design, implementation and transition issues, and techniques for responding to security breaches.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Explain key concepts of information security such as design principles, cryptography, risk management, and ethics	C2 (Explain)
CLO-2	Discuss legal, ethical, and professional issues in information security	A2 (Discuss)
CLO-3	Apply various security and risk management tools for achieving information security and privacy	C3 (Apply)
CLO-4	Identify appropriate techniques to tackle and solve problems in the discipline of information security	C4 (Identify)

Course Outline:

Information security foundations, security design principles; security mechanisms, symmetric and asymmetric cryptography, encryption, hash functions, digital signatures, key management, authentication and access control; software security, vulnerabilities and protections, malware, database security; network security, firewalls, intrusion detection; security policies, policy formation and enforcement, risk assessment, cybercrime, law and ethics in information security, privacy and anonymity of data, Cryptography, Image Encryption.

Weekly Plan:

- 1- Information security foundations [TB1: CH.01]
- 2- Security design principles [TB1: CH.01]
- 3- Security mechanisms [TB1: CH.01, 02]
- 4- Symmetric and asymmetric cryptography [TB1: CH.02]
- 5- Encryption, hash functions [TB1: CH.02]
- 6- Digital signatures, Key management, [TB1: CH.02, 03]
- 7- Authentication and access control [TB1: CH. 03,04]
- 8- Malware, vulnerabilities and protections [TB1: CH.06]

- 9- Software security [TB1: CH.11]
- 10- Database security [TB1: CH.05]
- 11- Network security [TB1: CH.22, 23,24]
- 12- Firewalls, intrusion detection [TB1: CH.09]
- 13- Security policies, policy formation and enforcement, risk assessment [TB1: (Part 03) CH.14, 15, 16, 17]
- 14- Cybercrime [TB1: CH.19]
- 15- Law and ethics in information security [TB1: CH.19]
- 16- Privacy and anonymity of data [TB1: CH.019]

Text Book(s)

- 1- Computer Security: Principles and Practice, 3rd edition by William Stallings

Reference Materials: (or use any other standard and latest books)

1. Computer Security: Principles and Practice, 3rd edition by William Stallings
2. Principles of Information Security, 6th edition by M. Whitman and H. Mattord
3. Computer Security, 3rd edition by Dieter Gollmann
4. Computer Security Fundamentals, 3rd edition by William Easttom
5. Official (ISC)2 Guide to the CISSP CBK, 3rd edition

Course Name:	<i>Artificial Intelligence</i>
Course Code:	COMP2121
Credit Hours:	3 (2+1)
Contact Hours:	2+1
Pre-requisites:	Object Oriented Programming

Course Introduction:

Artificial Intelligence has emerged as one of the most significant and promising areas of computing. This course focuses on the foundations of AI and its basic techniques like Symbolic manipulations, Pattern Matching, Knowledge Representation, Decision Making and Appreciating the differences between Knowledge, Data and Code. AI programming language Python has been proposed for the practical work of this course.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Understand the fundamental constructs of Python programming language.	C2 (Understand)
CLO-2	Understand key concepts in the field of artificial intelligence	C2 (Understand)
CLO-3	Implement artificial intelligence techniques and case studies	C3 (Apply)

Course Outline:

An Introduction to Artificial Intelligence and its applications towards Knowledge Based Systems; Introduction to Reasoning and Knowledge Representation, Problem Solving by Searching (Informed searching, Uninformed searching, Heuristics, Local searching, Min-max algorithm, Alpha beta pruning, Game-playing); Case Studies: General Problem Solver, Eliza, Student, Macsyma; Learning from examples; ANN and Natural Language Processing; Recent trends in AI and applications of AI algorithms. Python programming language will be used to explore and illustrate various issues and techniques in Artificial Intelligence.

Weekly Plan:

- 1- An Introduction to Artificial Intelligence and its applications towards Knowledge Based Systems [TB1: CH.01] (TB2: CH 01)
- 2- Introduction to Reasoning and Knowledge Representation [TB1: CH.02, 11] [TB2: CH.07]
- 3- Problem Solving by Searching (Informed searching) [TB1: CH.02, 03] [TB2: CH.03]
- 4- Uninformed searching [TB1: CH.04] [TB2: CH.03]
- 5- Heuristics [TB1: CH.07] [TB2: CH.03]
- 6- Local searching [TB1: CH.07] [TB2: CH.04]
- 7- Min-max algorithm [TB1: CH.09] [TB2: CH.05]
- 8- Alpha beta pruning [TB1: CH.09] [TB2: CH.05]
- 9- Game-playing [TB1: CH.09] [TB2: CH.05]
- 10- Case Studies: General Problem Solver [TB1: CH.01]

- 11- Eliza, Student [Internet Resources]
 - 12- Macsyma [Internet Resources]
 - 13- ANN [TB1: CH.14] [TB2: CH.18]
 - 14- Natural Language Processing [TB1: CH.10, 11, 12] [TB2: CH.22]
 - 15- Recent trends in AI and applications of AI algorithms [TB1: CH.01, 15, 16] [TB2: CH.27]
- *Note:** Python programming language will be used to explore and illustrate various issues and techniques in Artificial Intelligence.

Text Book(s)

- 1. Joshi, P., 2017. “Artificial intelligence with python.” Packt Publishing Ltd. (For Lab)
- 2. Russell, S. and Norvig, P. “Artificial Intelligence. A Modern Approach”, 3rd ed, Prentice Hall, Inc., 2015.

Reference Materials: (or use any other standard and latest books)

- 1. Norvig, P., “Paradigms of Artificial Intelligence Programming: Case studies in Common Lisp”, Morgan Kaufman Publishers, Inc., 1992.
- 2. Luger, G.F. and Stubblefield, W.A., “AI algorithms, data structures, and idioms in Prolog, Lisp, and Java”, Pearson Addison-Wesley. 2009.
- 3. Severance, C.R.,2016. “Python for everybody: Exploring data using Python 3.” CreateSpace Independent Publ Platform.
- 4. Miller, B.N., Ranum, D.L. and Anderson, J., 2019. “Python programming in context.” Jones & Bartlett Pub.
- 5. Joshi, P., 2017. “Artificial intelligence with python.” Packt Publishing Ltd.

Course Name:	<i>Computer Networks</i>
Course Code:	COMP2119
Credit Hours:	3 (2+1)
Contact Hours:	2+1
Pre-requisites:	None

Course Introduction:

This course introduces the basic concept of computer network to the students. Network layers, Network models (OSI, TCP/IP) and protocol standards are part of the course.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Describe the key terminologies and technologies of computer networks	C2 (Describe)
CLO-2	Explain the services and functions provided by each layer in the Internet protocol stack.	C2 (Explain)
CLO-3	Identify various internetworking devices and protocols and their functions in a networking	C4 (Identify)
CLO-4	Analyze working and performance of key technologies, algorithms and protocols	C4 (Analyze)
CLO-5	Build Computer Network on various Topologies	P3 (Build)

Course Outline:

Introduction and protocols architecture, basic concepts of networking, network topologies, layered architecture, physical layer functionality, data link layer functionality, multiple access techniques, circuit switching and packet switching, LAN technologies, wireless networks, MAC addressing, networking devices, network layer protocols, IPv4 and IPv6, IP addressing, sub netting, CIDR, routing protocols, transport layer protocols, ports and sockets, connection establishment, flow and congestion control, application layer protocols, latest trends in computer networks.

Weekly Plan:

- 1- Introduction and protocols architecture, basic concepts of networking [TB1: CH.01]
- 2- Network topologies [TB1: CH.01]
- 3- Layered architecture, physical layer functionality [TB1: CH.02, 03]
- 4- Data link layer functionality [TB1: CH.09, 10, 11]
- 5- Multiple access techniques [TB1: CH.12]
- 6- Circuit switching and packet switching [TB1: CH.08]
- 7- LAN technologies, wireless networks [TB1: CH.13,14,15,16,17]
- 8- MAC addressing [TB1: CH.13]
- 9- Networking devices [TB1: CH.17]
- 10- Network layer protocols, Ipv4 and ipv6, IP addressing [TB1: CH. 18, 19, 22]
- 11- Sub netting, CIDR [TB1: CH.18]
- 12- Routing protocols, transport layer protocols [TB1: CH.20, 21, 23, 24]
- 13- Ports and sockets, connection establishment [TB1: CH.25, 26]

- 14- Flow and congestion control [TB1: CH.18, 24]
- 15- Application layer protocols [TB1: CH.26]
- 16- Latest trends in computer networks [TB1: CH.29, 31]

Text Book(s)

- 1- Data Communication and Computer Networks, 5th Edition by Behrouz A. Forouzan

Reference Materials: (or use any other standard and latest books)

- 1. Computer Networking: A Top-Down Approach Featuring the Internet, 6th edition by James F. Kurose and Keith W. Ross
- 2. Computer Networks, 5th Edition by Andrew S. Tanenbaum
- 3. Data and Computer Communications, 10th Edition by William Stallings
- 4. Data Communication and Computer Networks, 5th Edition by Behrouz A. Forouzan

Course Name:	<i>Computer Organization and Assembly Language</i>
Course Code:	COMP2118
Credit Hours:	3 (2+1)
Contact Hours:	2+1
Pre-requisites:	Digital Logic and Design

Course Introduction:

The main objective of this course is to introduce the organization of computer systems and usage of assembly language for optimization and control. Emphasis should be given to expose the low-level logic employed for problem solving while using assembly language as a tool. At the end of the course the students should be capable of writing moderately complex assembly language subroutines and interfacing them to any high-level language.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Acquire the basic knowledge of computer organization computer architecture and assembly language	C2 (Understand)
CLO-2	Understand the concepts of basic computer organization, architecture, and assembly language techniques	C2 (Understand)
CLO-3	Solve the problems related to computer organization and assembly language	C3 (Apply)

Course Outline:

Introduction to computer systems: Information is bits + context, programs are translated by other programs into different forms, it pays to understand how compilation systems work, processors read and interpret instructions stored in memory, caches matter, storage devices form a hierarchy, the operating system manages the hardware, systems communicate with other systems using networks; Representing and manipulating information: information storage, integer representations, integer arithmetic, floating point; Machine-level representation of programs: a historical perspective, program encodings, data formats, accessing information, arithmetic and logical operations, control, procedures, array allocation and access, heterogeneous data structures, putting it together: understanding pointers, life in the real world: using the gdb debugger, out of-bounds memory references and buffer overflow, x86-64: extending ia32 to 64 bits, machine-level representations of floating-point programs; Processor architecture: the Y86 instruction set architecture, logic design and the Hardware Control Language (HCL), sequential Y86 implementations, general principles of pipelining, pipelined Y86 implementations

Weekly Plan:

- 1- Computer Systems: Introduction to computer systems: Information is bits + context, programs are translated by other programs into different forms, it pays to understand how compilation systems work, processors read and interpret instructions stored in memory. (TB 01: CH 1)
- 2- Computer Systems: caches matter, storage devices form a hierarchy, the operating system manages the hardware, systems communicate with other systems using networks. (TB 01: CH 1)

- 3- Representing and manipulating information: information storage, integer representations, integer arithmetic (TB01: CH2)
- 4- Representing and manipulating information: Floating point, Fractional Binary Numbers, IEEE Floating-Point Representation, Example Numbers, Rounding, Floating-Point Operations, Floating Point in C (TB01: CH2)
- 5- Machine-level representation of programs: a historical perspective, program encodings, data formats, accessing information, arithmetic and logical operations (TB01: CH 3)
- 6- Machine-level representation of programs: Control, Condition Codes, Accessing the Condition Codes, Jump Instructions and Their Encodings, Translating Conditional Branches, Loops, Conditional Move Instructions, Switch Statements (TB01: CH 3)
- 7- Machine-level representation of programs: Array allocation and access, heterogeneous data structures. (TB01: CH 3)
- 8- Machine-level representation of programs: Understanding pointers, life in the real world: using the gdb debugger, out of-bounds memory references and buffer overflow. (TB01: CH 3)
- 9- Machine-level representation of programs: x86-64: Extending ia32 to 64 bits. (TB01: CH 3)
- 10- Machine-level representation of programs: machine-level representations of floating-point programs (TB01: CH 3)
- 11- Processor architecture: The Y86 instruction set architecture, Y86 Instructions, Y86 Exceptions (TB01: CH 4)
- 12- Processor architecture: The Y86 instruction set architecture. Y86 Programs. (TB01: CH 4)
- 13- Processor architecture: Logic design and the Hardware Control Language (HCL). (TB01: CH 4)
- 14- Processor architecture: Sequential Y86 implementations. (TB01: CH 4)
- 15- Processor architecture: General principles of pipelining. (TB01: CH 4)
- 16- Processor architecture: Pipelined Y86 implementations. (TB01: CH 4)

Text Book(s)

1. Computer Systems: A Programmer's Perspective, 3/E (CS:APP3e), Randal E. Bryant and David R.O' Hallaron, Carnegie Mellon University
2. Assembly Language Programming for Intel- Computer, Latest Edition (Can be used for Lab)

Reference Materials:

1. Computer System Architecture, M. Morris Mano, Latest Edition.
2. Robert Britton, MIPS Assembly Language Programming, Latest Edition

Course Name:	<i>Software Engineering</i>
Course Code:	Comp2112
Credit Hours:	3 (3+0)
Contact Hours:	3+0
Pre-requisites:	None

Course Introduction:

This course provides a general introduction to software engineering. It introduces concepts such as software processes and agile methods, and essential software development activities, from initial specification through to system maintenance. Formalisms and tools to assist in software development are also presented, including common design patterns and UML notation. There is a focus on software testing, from unit testing to the testing of software releases. Project management, software security, professional software engineering practice will also be covered.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Describe various software engineering processes and activates	C1 (Describe)
CLO-2	Apply the system modeling techniques to model a medium size software systems	C3 (Apply)
CLO-3	Apply software quality assurance and testing principles to medium size software systems	C4 (Apply)
CLO-4	Discuss key principles and common methods for software project management such as scheduling, size estimation, cost estimation and risk analysis	C2 (Discuss)

Course Outline:

Nature of Software, Overview of Software Engineering, Professional software development, Software engineering practice, Software process structure, Software process models, Agile software Development, Agile process models, Agile development techniques, Requirements engineering process, Functional and non-functional requirements, Context models, Interaction models, Structural models, behavioral models, model driven engineering, Architectural design, Design and implementation, UML diagrams, Design patterns, Software testing and quality assurance, Software evolution, Project management and project planning, configuration management, Software Process improvement.

Weekly Plan:

- 1- Nature of Software, Overview of Software Engineering [TB1: CH.01]
- 2- Professional software development, Software engineering practice [TB1: CH.01]
- 3- Software process structure, Software process models [TB1: CH.04]
- 4- Agile software Development, Agile process models, Agile development techniques [TB1: CH.03]

- 5- Requirements engineering process, Functional and non-functional requirements [TB1: CH.06, 07]
- 6- Context models, Interaction models [TB1: CH.04, 07]
- 7- Structural models, behavioral models [TB1: CH.06]
- 8- Model driven engineering, Software evolution [TB1: CH.31]
- 9- Architectural design and implementation [TB1: CH.09]
- 10- UML diagrams [TB1: CH. Appendix 01]
- 11- Design patterns [TB1: CH.12]
- 12- Software testing [TB1: CH.17, 18, 19, 20]
- 13- Quality assurance [TB1: CH.14, 15, 16]
- 14- Project management and project planning [TB1: CH.24, 26]
- 15- Configuration management [TB1: CH.22]
- 16- Software Process improvement [TB1: CH.30]

Text Book(s)

1. Software Engineering, A Practitioner's Approach, Pressman R. S.& Maxim B. R., 8th Edition, McGraw-Hill, 2015.

Reference Materials: (or use any other standard and latest books)

2. Software Engineering, Sommerville I., 10th Edition, Pearson Inc., 2014
3. Software Engineering, A Practitioner's Approach, Pressman R. S.& Maxim B. R., 8th Edition, McGraw-Hill, 2015.

Course Name: *Advanced Database Lab*
Course Code: COMP2122
Credit Hours: 2 (0+2)
Contact Hours: 0+2
Pre-requisites: Database Systems

Course Introduction:

Advanced Database is an extension to “Database Systems” course. The aim of the course is to enhance the previous knowledge of database systems by deepening the understanding of the theoretical and practical aspects of the database technologies, and showing the need for distributed database technology to tackle deficiencies of the centralized database systems. Moreover, it focuses to introduce the basic principles and implementation techniques of distributed database systems, and expose emerging research issues in database systems and application development.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Understanding advance data models, technologies and approaches for building distributed database systems.	C2 (Understand)
CLO-2	Applying the models and approaches in order to become enabled to select and apply appropriate methods for a particular case	C3 (Apply)
CLO-3	To develop a database solution for a given scenario/ challenging problem in the domain of distributed database systems.	C3 (Apply)

Course Outline:

Introduction to advance data models such as object relational, object oriented. File organizations concepts, Transactional processing and Concurrency control techniques, Recovery techniques, Query processing and optimization, Database Programming (PL/SQL, T-SQL or similar technology), Integrity and security, Database Administration (Role management, managing database access, views), Physical database design and tuning, Distributed database systems, Emerging research trends in database systems, MONGO DB, NO SQL (or similar technologies)

Weekly Plan:

- 1- Introduction to advance data models such as object relational, object oriented. File organizations concepts (TB1:CH 9)
- 2- Database Programming Advanced SQL (TB1: CH 7)
- 3- Database Programming Advanced SQL (TB1: CH 8)
- 4- PL/SQL (TB1: CH 8)
- 5- Physical database design (TB 1: CH 18)
- 6- Tuning (schema optimization, monitoring and tuning operational systems)(TB 1: CH 19)
- 7- Integrity and security (TB1: Chapter 20)
- 8- Database Administration (Role management, managing database access, views) (TB 1: CH 20)

- 9- Transaction Management: Transactional processing and Concurrency control techniques (TB1: CH22)
- 10- Transaction Management: Recovery techniques (TB1: CH22)
- 11- Query processing and optimization (TB1: Chapter 23)
- 12- Distributed database systems (TB 1: CH 25)
- 13- NO SQL: Introduction, types (TB 2: Ch 1, 2)
- 14- NO SQL: MongoDB, HBase (TB 2: Ch 3)
- 15- Project

Text Book:

1. Database Systems: A Practical Approach to Design, Implementation, and Management, 6th Edition by Thomas Connolly and Carolyn Begg
2. Professional NoSQL, by Shashank Tiwari, John Wiley & Sons, Inc.

Reference Materials:

1. Database Management Systems, 3rd Edition by Raghu Ramakrishnan, Johannes Gehrke
2. Database System Concepts, 6th Edition by Avi Silberschatz, Henry F. Korth and S. Sudarshan.
3. Database Systems: The Complete Book, 2nd Edition by Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom

Course Name:	<i>Web Technologies Lab</i>
Course Code:	COMP2123
Credit Hours:	3 (1+2)
Contact Hours:	1+2
Pre-requisites:	None

Course Introduction:

In this course, we investigate the origins of hypermedia and the World Wide Web and discuss current and future developments on the Web. The architecture of the Internet and various protocols such as the Hypertext Transfer Protocol (HTTP, client and server-side issues in web architectures, Web 2.0 and Rich Internet Applications (RIAs), latest HTML5, XML technologies and applications are presented. JavaScript is introduced and CSS3, the Semantic Web, web search, security and privacy.

CLO No. Course Learning Outcomes**Bloom Taxonomy**

CLO-1	Sound understanding of basic web technology architectures	C2(Understand)
CLO-2	Application of syntax and semantics of several Markup languages for use in information communication.	C3(Apply)

Course Outline:

Introduction to Web Applications, TCP/IP Application Services. Web Servers: Basic Operation, Virtual hosting, Chunked transfers, Caching support, Extensibility. SGML, HTML5, CSS3. XML Languages and Applications: Core XML, XHTML, XHTML MP. Web Service: SOAP, REST, WML, XSL. Web Services: Operations, Processing HTTP Requests, Processing HTTP Responses, Cookie Coordination, Privacy and P3P, Complex HTTP Interactions, Dynamic Content Delivery. Server Configuration. Server Security. Web Browsers Architecture and Processes. Active Browser Pages: JavaScript, DHTML, AJAX. JSON, Approaches to Web Application Development. Programming in any Scripting language. Search Technologies. Search Engine Optimization. XML Query Language, Semantic Web, Future Web Application Framework.

Weekly Plan:

- 1- Introduction to Web Applications, TCP/IP Application Services. (TB2:CH1, TB2:CH2)
- 2- Web Servers: Basic Operation, Virtual hosting, Chunked transfers, Caching support, Extensibility. (TB2:CH3)
- 3- SGML, HTML5, CSS3. (TB2:CH4, TB3:CH19, TB3:CH20)
- 4- XML Languages and Applications: Core XML, XHTML, XHTML MP. Web Service: SOAP, REST, WML, XSL. (TB2:CH5)
- 5- Web Services: Operations, Processing HTTP Requests, Processing HTTP Responses, Cookie Coordination, Privacy and P3P, Complex HTTP Interactions, Dynamic Content Delivery. Server Configuration. Server Security. (TB2:CH6)
- 6- Web Browsers Architecture and Processes. (TB2:CH7)
- 7- Active Browser Pages: JavaScript, DHTML, AJAX. JSON (TB2:CH8)
- 8- Approaches to Web Application Development. (TB2:CH9)
- 9- Programming in Scripting language; Setting environment, PHP (TB3: CH 2, CH1)

- 10- Programming in Scripting language; PHP Functions and Objects, PHP Arrays, Date and Time Functions (TB3: CH 2, CH1)
- 11- Programming in Scripting language; Accessing MySQL Using PHP (TB3:CH11)
- 12- Programming in Scripting language; Form Handling (TB3:CH12)
- 13- Programming in Scripting language; PHP Cookies, Sessions, and Authentication (TB3: CH 13)
- 14- Programming in Scripting language; JavaScript (TB3:CH14, CH15)
- 15- Programming in Scripting language; JavaScript (TB3:CH16, CH17)
- 16- Search Technologies. Search Engine Optimization. XML Query Language, Semantic Web, Future Web Application Framework. (TB1: CH 12, TB1: CH13)

Text Book:

- 1 Web Technologies: A Computer Science Perspective by Jeffrey C. Jackson, Prentice Hall; 1st Edition (August 27, 2006). ISBN-10: 0131856030
- 2 Web Application Architecture: Principles, protocols and practices by Leon Shklar and Richard Rosen, Wiley; 2nd Edition (May 5, 2009). ISBN-10: 047051860X
- 3 Learning PHP, MySQL, JavaScript, and CSS, A Step-by-Step Guide to Creating Dynamic Websites By Robin Nixon, O'Reilly Media; Latest Edition

Reference Materials:

1. Web Technologies by Uttam Kumar Roy, Oxford University Press, USA (June 13, 2011). ISBN-10: 0198066228

Course Name:	<i>Mobile Application Development Lab</i>
Course Code:	COMP2124
Credit Hours:	3 (1+2)
Contact Hours:	1+2
Pre-requisites:	Object Oriented Programming

Course Introduction:

This course discusses the principles and issues associated with mobile application development using Android as the development platform. The course covers all the basic functionality to get started, as well as experienced knowledge of unique features of Android to enhance existing products or create innovative new ones. Topics covered will include Android application components, UI design, data storage and latest SDK features. Students will develop their own apps in Java using Android Studio in their semester-long projects. Prior knowledge of object-oriented programming is required

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Discuss different architectures & framework for Mobile Application development	C1(Discuss)
CLO-2	Develop mobile applications using current software development environments.	C3(Develop)
CLO-3	Compare the different performance tradeoffs in mobile application development.	C3(Compare)

Course Outline:

Mobiles Application Development Platform; HTML5 for Mobiles; Android OS: Architecture, Framework and Application Development; iOS: Architecture, Framework; Application Development with Windows Mobile; Eclipse; Fragments; Calling Built-in Applications using Intents; Displaying Notifications; Components of a Screen; Adapting to Display Orientation; Managing Changes to Screen Orientation; Utilizing the Action Bar; Creating the User Interface; Listening for UI Notifications; Views; User Preferences; Persisting Data; Sharing Data; Sending SMS Messages; Getting Feedback; Sending E- mail; Displaying Maps; Consuming Web Services Using HTTP; Web Services: Accessing and Creating; Threading; Publishing, Android Applications; Deployment on App Stores; Mobile Programming Languages; Challenges with Mobility and Wireless Communication; Location-aware Applications; Performance/Power Tradeoffs; Mobile Platform Constraints; Emerging Technologies.

Weekly Plan:

1. Mobiles Application Development Platforms; HTML5 for Mobiles; Android OS: Architecture, Framework and Application Development; iOS: Architecture, Framework; (Android Developer Guide) (Online resource) (TB3: CH03) (Ref:05)
2. Creating the User Interface; Listening for UI Notifications; Views. (TB1:CH02, CH11)
3. App Components (Android Developer's guide Application fundamentals), Activity (TB1: CH 03)

4. Adapting to Display Orientation; Managing Changes to Screen Orientation; (Android Developer Guide), Intents (TB1: CH07)
5. Implicit Intents (TB1:CH16)
6. Dynamic List View and RecyclerView (TB1: CH10)
7. Displaying Notifications, Action bar (Android Developer Guide)
8. Fragments. (TB1:CH09)
9. User Preferences; Persisting Data; Sharing Data; Database (TB2:CH 17) (Android Developer Guide)
10. Sending SMS Messages; Getting Feedback; Sending E- mail; (Android Developer Guide)
11. Displaying Maps; Location-aware Applications; (Android Developer Guide, codelab Receive location updates in Android with Kotlin)
12. Consuming Web Services Using HTTP (Android Developer Guide codelab: Get data from the internet)
13. Threading (TB3: CH 04, CH 05)
14. Publishing, Android Applications; Deployment on App Stores (TB2: CH 28)
15. Mobile Programming Languages (swift, react native, flutter), Mobile Platform constraints (Screen size, sensors and interactions, Storage and cache sizes, Latencies, Network issues, Data user requirements), Emerging Technologies (IOT Enables Apps, ML integrated, wearable app integration) (online resources)
16. Performance/Power Tradeoff: Android Profiler, Network Profiler, CPU Profiler, Energy Profiler, Memory Profiler, Detecting Memory Leaks (TB 3: CH 11)

Text Book:

1. Android Programming: The Big Nerd Ranch Guide, 5th Edition, by Bryan Sills, Brian Gardner, Kristin Marsicano, Chris Stewart, 2022.
2. Android Programming with Kotlin for Beginners John Horton, Packt Publishing, 2019
3. Programming Android with Kotlin by Pierre-Olivier Laurence, Amanda Hinchman-Dominguez, Mike Dunn, G. Blake Meike, Released December 2021, Publisher(s): O'Reilly Media, Inc.

Reference Materials:

1. Professional Android application development, Reto Meier, Wrox Programmer to Programmer, 2015.
2. iOS Programming: The Big Nerd Ranch Guide, Conway, J., Hillegass, A., & Keur, C., 5th Edition, 2014.
3. Android Programming: The Big Nerd Ranch Guides, Phillips, B. & Hardy, B., 2nd Edition, 2014.
4. Head First Android Development by Dawn Griffiths and David Griffiths, 2015
5. Chapter 8: Mobile Web, Chapter 9: Mobile Platform, A fresh Graduate's Guide to software Development tools and technologies, by Damith C Rajapakse, 2nd Edition

Course Name:	<i>Advanced Programming Lab</i>
Course Code:	COMP2125
Credit Hours:	3 (1+2)
Contact Hours:	1+2
Pre-requisites:	Object Oriented Programming

Course Introduction:

The course covers the techniques of Java network Programming, advanced graphical user interfaces, event handling techniques and security of applications.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	Use the different elements of a programming language as building blocks to develop correct, coherent programs.	C1(Discuss)
CLO-2	Program using the fundamental software development process, including design, coding, documentation, testing, and debugging	C3(Develop)
CLO-3	Analyze problems, develop conceptual designs that solve those problems, and transform those designs to Visual Programs.	C4(Analyze)

Course Outline:

Java API: Abstract classes, Interfaces, Packages, Exception handling, Advance issues of GUI and event handling, Applets and swing, Network Programming Concepts: JDBC, Multithreading, Building Client/ Server, implementation of protocols in Client and Server Programs, Applets and Network Programming: Java secure socket extension, Secure sockets layer (SSL); SSL socket and SSL server socket classes

Weekly Plan:

- 1- The Java Language: The bytecode, servlets, applets. An Overview of Java, Object Oriented Programming, Data Types, Variables, and Arrays, Operators, (TB1: CH 1, CH2, CH3, CH 4)
- 2- The Java Language: Control Statements, Introducing Classes. (TB1: CH 5, CH6, CH7)
- 3- The Java Language: Inheritance, Abstract Classes, Packages and Interfaces (TB1: CH 8, CH 9)
- 4- The Java Language: Exception Handling (TB1: Ch 10)
- 5- The Java Language: Multithreaded Programming (TB1:CH 11)
- 6- The Java Language: Generics, Lambda Expressions (TB1:CH 14,CH 15)
- 7- The Java Library: String Handling, java.util: The Collections Framework, Input/Output: Exploring java.io,
- 8- The Java Library: Networking (TB1:CH 23)
- 9- Event Handling (TB1:CH 24)
- 10- Introducing GUI Programming with Swing, Introducing Swing (TB1:CH 31)
- 11- Exploring Swing, Introducing Swing Menus (TB1:CH 32, TB1: CH 33)

- 12- JDBC (TB2: CH 24)
- 13- Servlets, Introduction, reading a file from Web Server, establishing a Simple Server Using Stream Sockets (TB2: CH 28)
- 14- Servlets: Establishing a Simple Client Using Stream Sockets, Client/Server Interaction with Stream Socket Connections, Datagrams: Connectionless Client/Server Interaction, Client/Server using Multithreaded server (TB2:CH 28)
- 15- Java secure socket extension, Secure sockets layer (SSL); SSL socket and SSL server socket classes (TB3:CH 10)

Text Book:

- 1- Derek Hamner, Conrad Hughes , Java The Complete Reference, 11th ed. Herbert Schildt
- 2- Java How to Program Early Objects, Paul Deital, Harvey Deital, Pearson Tenth Edition.
- 3- Merlin Hughes, Michael Shoffner, Derek Hamner, Conrad Hughes Java Network Programming: A Complete Guide to Networking, Streams, and Distributed Computing (Latest Edition)

Reference Materials:

- 1. Floyd Marinescu (2002), EJB Design Patterns: Advanced Patterns, Processes, and Idioms, John Wiley & Sons, ISBN: 0471208310.

Course Name:	<i>Cyber Security Lab</i>
Course Code:	COMP2126
Credit Hours:	3 (1+2)
Contact Hours:	1+2
Pre-requisites:	Information Security

Course Introduction:

This course provides students an introduction to common cyber security threats, vulnerabilities, and risks related to web applications, networks, software and mobile applications. The course provides basic concepts and terminology used in the information and cyber security fields. Moreover, it will also enable students to differentiate between the various forms of malware and how they affect computers and networks.

CLO No.	Course Learning Outcomes	Bloom Taxonomy
CLO-1	To be able to identify computer system threats	C2 (Understand)
CLO-2	To be able to identify Malware attacks, and understand the stages of attack and payloads.	C2 (Understand)
CLO-3	Implement various cryptographic techniques and simulate attack scenarios	C3 (Apply)

Course Outline:

Introduction to Cyber security; Networks and the Internet; cyber threat landscape; understanding security; information security Principles (Confidentiality, Integrity, Availability); Information Security Terminology; Who are the attackers; Advanced Persistent Threat (APT); Malware, types of malware; Attacks using malware; Malware Attack Lifecycle: Stages of Attack; Social engineering attacks; types of payload; Industrial Espionage in Cyberspace; Basic cryptography; Web application attacks; Database security; Cyber kill chain; Privacy and anonymity; Network security; Software security; Mobile device security; Mobile app security; Cyber Terrorism and Information Warfare; Introduction to Digital Forensics; Digital Forensics Categories.

Weekly Plan:

- 1- Introduction to Cyber security [TB1: CH.01]
- 2- Networks and the Internet [TB1: CH.02]
- 3- Cyber threat landscape [TB1: CH.03]
- 4- Understanding security, information security Principles (Confidentiality, Integrity, Availability) [TB1: CH.01]
- 5- Information Security Terminology, who are the attackers, Advanced Persistent Threat (APT)[TB1: CH.05, 06]
- 6- Malware, types of malwares, Attacks using malware, Malware Attack Lifecycle: Stages of Attack [TB1: CH.05]
- 7- Social engineering attacks [TB1: CH.01, 05, 06]
- 8- Types of payloads [TB1: CH.04, 05, 06]
- 9- Industrial Espionage in Cyberspace [TB1: CH.07]

- 10- Basic cryptography [TB1: CH.08]
- 11- Web application attacks [TB1: CH.01]
- 12- Database security, Cyber kill chain [TB1: CH.09, 14]
- 13- Privacy and anonymity, Network security [TB1: CH.11]
- 14- Software security, Mobile device security, Mobile app security [TB1: CH.14]
- 15- Cyber Terrorism and Information Warfare [TB1: CH.12]
- 16- Introduction to Digital Forensics, Digital Forensics Categories [TB1: CH.14]

Text Book(s)

1. Computer Security Fundamentals by Chuck Easttom, 4th edition or latest.

Reference Materials:

1. Computer Security Fundamentals by Chuck Easttom, 4th edition or latest
2. Security+ Guide to Network Security Fundamentals, by Mark Ciampa, 5th Edition
3. Security in Computing by C.P. Pfleeger, Prentice-Hall, 4th Edition or Latest

Course Name:	<i>Linear Algebra</i>
Course Code:	MATH3114
Credit Hours:	3 (3+0)
Pre-requisites:	Calculus and Analytic Geometry

Course Description: Linear algebra is the study of vector spaces and linear transformations. The main objective of this course is to help students learn in rigorous manner, the tools and methods essential for studying the solution spaces of problems in Mathematics, engineering, the natural sciences, and social sciences and develop mathematical skills needed to apply these to the problems arising within their field of study; and to various real-world problems.

Course Content:

Vectors: Vectors In R_n and C_n , Linear Combination of Vectors, Dot (Inner) Product, Angle between Vectors, Projections, Cauchy-Schwarz Inequality, Minkowski's Inequality, Hyperplanes, Lines, Vectors in (Spatial Vectors), Cross Product, Lagrange's Identity.

Matrix Operations: Matrices, Trace, Powers of Matrices, Polynomials in Matrices, Invertible Matrices, Orthogonal Matrices, Normal Matrices, Hermitian Matrices, Unitary Matrices, Block Matrices.

Systems of Linear Equations: Homogeneous and Non- Homogeneous System of Linear Equations and its Solutions, Equivalent Systems, Elementary Operations, Gaussian Elimination, Echelon and Reduced Echelon Forms, Row Equivalence, Elementary Matrices, Lu Decomposition.

Determinants: Determinants, Properties of Determinants, Minors and Cofactors, Classical Adjoint, Cramer's Rule, Principal Minors, Block Matrices and Determinants, Evaluation of Determinants and Inverses Using Row Operations

Vector Spaces: Introduction to Vector Spaces, Linear Combinations, Spanning Sets, Subspaces, Linear Dependence and Independence, Basis and Dimension, Rank of Matrices, Direct Sums, Coordinate Vectors.

Eigenvalues and Eigenvectors: Characteristic Polynomial, Cayley-Hamilton Theorem, Eigenvalues and Eigenvectors, Diagonalizable Matrices, Diagonalization, Symmetric Matrices, Minimal Polynomial.

Linear Transformations: Introduction to Linear Transformations, Kernel, and Image of a Linear Transformations, Rank and Nullity Theorem, Singular and Nonsingular Linear Mappings, Isomorphisms, Matrix Representations of a Linear Transformation, Change of Basis, Similar Matrices

Inner Product Spaces: Definition, Orthonormal Bases, The Concept of Length, Angle, and Distance. Some Inequalities Related to Inner Product Spaces, Gram Schmidt's Process of Normalization.

Recommended Books

1. Lipschutz, S. and Lipson, M. (2009). *Linear Algebra*. New York, McGraw-Hill
2. Kolman, B. (2007). *Elementary Linear Algebra with Applications*. Toronto, Pearson.
3. Anton, H. (2005). *Elementary Linear Algebra*. John Wiley & Sons
4. Lay D.C. (2012) *Linear Algebra and its Applications*, 4th Edition

Course Name: Applications of Information and Communication Technologies
Course Code: COMP1116
Credit Hours: 3 (2+1)
Pre-requisites: None

Description:

This course is designed to provide students with an exploration of the practical applications of Information and Communication Technologies (ICT) and software tools in various domains. Students will gain hands-on experience with a range of applications, learning how to leverage ICT to solve daily life problems, enhance productivity, and innovate in different fields. Through individual and interactive exercises and discussions, students will develop proficiency in utilizing software for communication, creativity, and more.

Course Learning Outcomes:

By the end of this course, students will be able to:

1. Explain the fundamental concepts, components, and scope of Information and Communication Technologies (ICT)
2. Identify uses of various ICT platforms and tools for different purposes.
3. Apply ICT platforms and tools for different purposes to address basic needs in different domains of daily, academics, and professional life.
4. Understand the ethical and legal considerations to use of ICT platforms and tools.

Syllabus

1. Introduction to Information and Communication Technologies
 - Components of Information and Communication Technologies (basis of hardware, software, ICT platforms, networks, local, and cloud data storage etc.)
 - Scope of Information and Communication Technologies (use of ICT in education, business, governance, health care, digital media and entertainment, etc.)
 - Emerging technologies and future trends.
2. Basic ICT Productivity Tools:
 - Effective use of popular search engines (e.g., Google, Bing, etc.) to explore World Wide Web.
 - Formal Communication Tools and etiquettes (Gmail, Microsoft Outlook, etc.).
 - Microsoft Office Suites (word, Excel, PowerPoint).
 - Google Workspace (Google Docs, Sheets, Slides).
 - Dropbox (Cloud Storage and file sharing), Google Drive (Cloud storage with Google Docs integration) and Microsoft OneDrive (Cloud storage with Microsoft Office Integration).
 - Evernote (Note-taking and organization applications) and OneNote (Microsoft's digital notebook for capturing and organizing ideas).
 - Video conferencing (Google Meet, Microsoft Teams, Zoom, etc.).
 - Social media applications (LinkedIn, Facebook, Instagram, etc.).
3. ICT in Education :
 - Working with learning management systems (Moodle, Canvas, Google Classrooms, etc.).
 - Sources of online education courses (Coursera, edX, Udemy, Khan Academy, etc.).
 - Interactive multimedia and virtual classrooms.

4. ICT in Health and Well-being:

- Health and fitness tracking devices and applications (Google Fit, Samsung Health, Apple , Health Xiaomi, Mi Band, Runkeeper, etc.).
- Telemedicine and online health consultations (OLADOC, Sehat Kahani, Marham, etc.)

5. ICT in Personal Finance and Shopping:

- Online banking and financial management tools (.lazzCash, Easypaisa, Zong PayMax, ILINK and MNET, keenu Wallet, etc.).
- E-commerce platforms (Darazpk, Telemart, Shophive, etc.).

6. Digital Citizenship and Online Etiquette:

- Digital identity and online reputation.
- Netiquette and respectful online communication.
- Cyberbullying and online harassment.

7. Ethical Considerations in Use of ICT Platforms and Tools:

- Intellectual property and copyright issues.
- Ensuring originality in content creation by avoiding plagiarism and unauthorized use of information sources.
- Content accuracy and integrity (ensuring that the content shared through ICT platforms is free from misinformation, fake news, and manipulation).

Practical Requirements

As part of the overall learning requirements, the course will include:

1. Guided tutorials and exercises to ensure that students are proficient in commonly used software applications such as word processing software (e.g., Microsoft Word), presentation software (e.g., Microsoft PowerPoint), and spreadsheet software (eg, Microsoft Excel) among such other tools. Students may be assigned practical tasks that require them to create documents, presentations, and spreadsheets etc.
2. Assigning of tasks that involve creating, managing, and organizing files and folders on both local and cloud storage systems. Students will practice file naming conventions, creating directories, and using cloud storage solutions (e.g., Google Drive, OneDrive).
3. The use of online learning management systems (LMS) where students can access course materials, submit assignments, participate in discussion forums, and take quizzes or tests. This will provide students with the practical experience with online platforms commonly used in education and the workplace.

Suggested Instructional Reading Materials

- "Discovering Computers" by Vermaat, Shaffer, and Freund.
- "GO! with Microsoft Office" Series by Gaskin, Vargas, and McLellan.
- "Exploring Microsoft Office" Series by Grauer and Poatsy.
- "Computing Essentials" by Morley and Parker.
- "Technology in Action" by Evans, Martin. and Poatsy

Course Name:	<i>Functional English</i>
Course Code:	ENGL1114
Credit Hours:	3 (3+0)
Contact Hours:	3+0
Pre-requisites:	None

Course Description:

This course is designed to equip students with essential language skills for effective communication in diverse real-world scenarios. It focuses on developing proficiency in English language usage: word choices, grammar and sentence structure. In addition, the course will enable students to grasp nuanced messages and tailor their communication effectively through application of comprehension and analytical skills in listening and reading. Moreover, the course encompasses a range of practical communication aspects including professional writing, public speaking, and everyday conversation, ensuring that students are equipped for both academic and professional spheres. An integral part of the course is fostering a deeper understanding of the impact of language on diverse audiences. Students will learn to communicate inclusively and display a strong commitment to cultural awareness in their language use. Additionally, the course will enable them to navigate the globalized world with ease and efficacy, making a positive impact in their functional interactions.

Learning outcomes:

By the end of this course, students will be able to:

1. Apply enhanced English communication skills through effective use of word choices, grammar and sentence structure.
2. Comprehend a variety of literary/non-literary written and spoken texts in English.
3. Effectively express information, ideas and opinions in written and spoken English.

Syllabus:

1. Foundations of Functional English:
 - Vocabulary building (contextual usage, synonyms, antonyms and idiomatic expressions)
 - Communicative grammar (subject-verb-agreement, verb tenses, fragments, run-ons, modifiers, articles, word classes, etc.)
 - Word formation (affixation, compounding, clipping, back formation, etc.)
 - Sentence structure (simple, compound, complex and compound-complex)
 - Sound production and pronunciation
2. Comprehension and Analysis:
 - Understanding purpose, audience and context
 - Contextual interpretation (tones, biases, stereotypes, assumptions, inferences, etc.)
 - Reading strategies (skimming, scanning, SQ4R, critical reading, etc.)
 - Active listening (overcoming listening barriers, focused listening, etc.)
3. Effective Communication:
 - Principles of communication (clarity, coherence, conciseness, courteousness, correctness, etc.)
 - Structuring documents (introduction, body, conclusion and formatting)

- Inclusivity in communication (gender-neutral language, stereotypes, cross-cultural communication, etc.)
- Public speaking (overcoming stage fright, voice modulation and body language)
- Presentation skills (organization content, visual aids and engaging the audience)
- Informal communication (small talk, networking and conversational skills)
- Professional writing (business e-mails, memos, reports, formal letters, etc.)

PRACTICAL REQUIREMENT

As part of the overall learning requirements, students will also be exposed to relevant simulations, role-plays and real-life scenarios and will be required to apply skills acquired throughout the course in the form of a final project.

SUGGESTED INSTRUCTIONAL/READING MATERIALS

1. "Understanding and Using English Grammar" by Betty Schramper Azar.
2. "English Grammar in Use" by Raymond Murphy.
3. "The Blue Book of Grammar and Punctuation" by Jane Straus.
4. "English for Specific Purposes: A Learning-Centered Approach" by Tom Hutchinson and Alan Waters.
5. "Cambridge English for Job-hunting" by Colm Downes.
6. "Practical English Usage" by Michael Swan.
7. "Reading Literature and Writing Argument" by Missy James and Alan P. Merickel.
8. "Improving Reading: Strategies, Resources, and Common Core Connections" by Jerry Johns and Susan Lenski.
9. "Comprehension: A Paradigm for Cognition" by Walter Kintsch.
10. "Communication Skills for Business Professionals" by J.P. Verma and Meenakshi Raman.

Course Name: *Discrete Mathematics*
Course Code: COMP2113
Credit Hours: 3 (3+0)
Pre-requisites: Pre-Calculus I and Pre-Calculus II

Course Objectives:

This course will help the students translate verbal statements into symbolic ones by using the elements of mathematical logics. Further, this course will also help develop better reasoning power, problem-solving skills and logical thinking.

Course Content:

Mathematical Reasoning: Sets, Subsets, Algebra of Sets, Propositions and Compound Statements, Basic Logical Operations, Propositional Logic and its Applications with Statement Problems (Including Propositions and Truth Tables, Tautologies and Contradictions, Conditional and Bi-conditional Statements, Arguments, Propositional Functions, Quantifiers, Negation of Quantified Statements Etc.), Relations, Equivalence Relations, Partial Ordering Relations, Functions, Recursively Defined Functions,

Combinatorics: Basics of Counting Methods, Combinations, Permutations, Pigeonhole Principle, Graphs and its Types, Graphs Isomorphism, Trees, Connectivity, Eulerian and Hamiltonian Paths, Spanning Trees and Shortest Path Problem, Revisiting the Graphs of Power Function, Floor Function, Increasing Function and Decreasing Function, Big O, Little O and Omega Notations, Orders of the Polynomial Functions

Recommended Books:

- *Rosen, K.H., 1999. Discrete Mathematics & Applications. McGraw-Hill.*
- *Susanna, S.E., 2018. Discrete Mathematics with Applications.*
- *Lipschutz, S., 2016. Schaum's Outlines of Theory and Problems of Discrete Mathematics*

Course Name:	<i>Calculus and Analytic Geometry</i>
Course Code:	MATH1129
Credit Hours:	3 (3+0)
Contact Hours:	3+0
Pre-requisites:	Pre-Calculus I and Pre-Calculus II.

Course Introduction:

To provide foundation and basic ground for calculus and analytical geometry background.

Course Outline:

Limits and Continuity; Introduction to functions, Introduction to limits, Techniques of finding limits, Indeterminate forms of limits, Continuous and discontinuous functions and their applications, Differential calculus; Concept and idea of differentiation, Geometrical and Physical meaning of derivatives, Rules of differentiation, Techniques of differentiation, Rates of change, Tangents and Normals lines, Chain rule, implicit differentiation, linear approximation, Applications of differentiation; Extreme value functions, Mean value theorems, Maxima and Minima of a function for single-variable, Concavity, Integral calculus; Concept and idea of Integration, Indefinite Integrals, Techniques of integration, Riemann sums and Definite Integrals, Applications of definite integrals, Improper integral, Applications of Integration; Area under the curve, Analytical Geometry; Straight lines in R^3 , Equations for planes.

Weekly Plan

1. Limits and Continuity; Introduction to functions, Introduction to limits [TB1: CH.01, CH.12]
2. Techniques of finding limits, Indeterminate forms of limits [TB1: CH.01, CH.12]
3. Continuous and discontinuous functions and their applications [TB1: Ch,05, CH.01]
4. Differential calculus; Concept and idea of differentiation [TB1: Ch,04, Ch.14]
5. Geometrical and Physical meaning of derivatives, Rates of change, Tangents and Normals line [TB1: Ch,02]
6. Rules of differentiation, Techniques of differentiation [TB1: Ch,02]
7. Rates of change, Tangents and Normals lines [TB1: Ch,02]
8. Chain rule, implicit differentiation, linear approximation [TB1: Ch,02]
9. Applications of differentiation; Extreme value functions, Mean value theorems, Maxima and Minima of a function for single-variable [TB1: Ch,03]
10. Concavity [TB1: Ch,03]
11. Concavity, Integral calculus; Concept and idea of Integration [TB1: Ch,04]
12. Indefinite Integrals, Techniques of integration [TB31: Ch,04]
13. Riemann sums and Definite Integrals, [TB1: Ch,04]
14. Applications of definite integrals, Improper integral [TB1: Ch,04]
15. Applications of Integration; Area under the curve [TB1: Ch,04, Ch.07]
16. Analytical Geometry; Straight lines in R^3 , Equations for planes. [TB1: Ch,04, Ch.07]

Text Books:

1. Calculus by Earl William Swokowski; Michael Olinick; Dennis Pence; Jeffery A. Cole

Reference Materials: (or use any other standard and latest books)

2. Calculus and Analytic Geometry by Kenneth W. Thomas.
3. Calculus by Stewart, James.

Course Name:	<i>Islamic Studies</i>
Course Code:	ISLA1111
Credit Hours:	2 (2+0)
Contact Hours:	2+0
Pre-requisites:	None

Introduction/Compulsory Foundation Course

This course is designed to provide students with a comprehensive overview of the fundamental aspects of Islam, its beliefs, practices, history and influence on society. It will further familiarize the students with a solid foundation in understanding Islam from an academic and cultural perspective. Through this course, students will have an enhanced understanding of Islam's multifaceted dimensions which will enable them to navigate complex discussions about Islam's historical and contemporary role, fostering empathy, respect, and informed dialogue.

Course Learning Outcomes

By the end of this course, students will be able to:

1. Demonstrate enhanced knowledge of Islamic foundational beliefs, practices, historical development, spiritual values and ethical principles.
2. Describe basic sources of Islamic law and their application in daily life.
3. Identify and discuss contemporary issues being faced by the Muslim world including social challenges, gender roles and interfaith interactions.

Syllabus

- Introduction to Islam:
 - Definition of Islam and its core beliefs.
 - The Holy Quran (introduction, revelation and compilation).
 - Hadith and Sunnah (compilation, classification, and significance).
 - Key theological concepts and themes (Tawhid, Prophethood, Akhirah etc.).
- Sirah of the Holy Prophet (Peace Be Upon Him) as Uswa-i-Hasana:
 - Life and legacy of the Holy Prophet PBUH.
 - Diverse roles of the Holy Prophet PBUH (as an individual, educator, peace maker, leader etc.).
- Islamic History and Civilization:
 - World before Islam.

- The Rashidun Caliphate and expansion of Islamic rule.
- Contribution of Muslim scientists and philosophers in shaping world civilization.
- Islamic Jurisprudence (Fiqh):
 - Fundamental sources of Islamic jurisprudence.
 - Pillars of Islam and their significance.
 - Major schools of Islamic jurisprudence.
 - Significance and principles of Ijtihad.
- Family and Society in Islam:
 - Status and rights of women in Islamic teachings.
 - Marriage, family, and gender roles in Muslim society.
 - Family structure and values in Muslim society.
- Islam and the Modern World:
 - Relevance of Islam in the modern world (globalization, challenges and prospects).
 - Islamophobia, interfaith dialogue, and multiculturalism.
 - Islamic viewpoint towards socio-cultural and technological changes.

Suggested Instructional/Reading Materials

- *"The Five Pillars of Islam: A Journey Through the Divine Acts of Worship"* by Muhammad
- *Mustafa Al-Azami.*
- *"The Five Pillars of Islam: A Framework for Islamic Values and Character Building"* by Musharraf Hussain.
- *"Towards Understanding Islam"* by Abul A' la Mawdudi.
- *"Islami Nazria e Hayat"* by Khurshid Ahmad.
- *"An Introduction to Islamic Theology"* by John Renard.
- *"Islamic Civilization Foundations Belief & Principles"* by Abul A' la Mawdudi.
- *"Women and Social Justice: An Islamic Paradigm"* by Dr. Anis Ahmad.
- *"Islam: Its Meaning and Message"* by Khurshid Ahmad.

Note: This course is compulsory for Muslim and optional for non-Muslim undergraduate students. Non-Muslim students can opt for any course of at least the same or more credits in subjects such as religious studies, ethics, theology, comparative religion, Christian ethics, etc

Course Name:	<i>Introduction to Entrepreneurship</i>
Course Code:	BUSA1114
Credit Hours:	2 (2+0)
Pre-requisites:	None

Description

This course is designed to promote entrepreneurial spirit and outlook among students. Encouraging them to think critically, identify opportunities, and transform their ideas into successful ventures. It aims at imparting them with the requisite knowledge: skills and abilities, enabling them to seize the identified opportunities for initiating ventures and successfully navigating the challenges that come with starting a business and managing it. The course covers topics relevant to entrepreneurship including setting up and initiation of business (including requirements for registration and incorporation with regulators such as SECP and others), market research, opportunity identification. business planning. Financial literacy for managing finances and securing funding, marketing and I sales, team building and innovation. Overall, the course is geared towards personal growth and professional development for pursuing innovative ideas, availing opportunities and initiating start- ups.

Course Learning Outcomes

By the end of this course, students shall have:

1. Knowledge of fundamental entrepreneurial concepts, skills and process;
2. Understanding of different personal, social and financial aspects associated with entrepreneurial activities;
3. Basic understanding of regulatory requirements to set up an enterprise in Pakistan, with special emphasis on exports;
4. Ability to apply knowledge, skills and abilities acquired in the course to develop a feasible

Course Content:

- 1) Introduction to Entrepreneurship:
 - a) Definition and concept of entrepreneurship;
 - b) Why to become an entrepreneur?
 - c) Entrepreneurial process;
 - d) Role of entrepreneurship in economic development.
- 2) Entrepreneurial Skills:
 - a) Characteristics and qualities of successful entrepreneurs (including stories of successes and failures).
 - b) Areas of essential entrepreneurial skills and abilities such as creative and critical thinking innovation and risk taking.
- 3) Opportunity Recognition and Idea Generation:
 - a) Opportunity identification, evaluation and exploitation;
 - b) Innovative ideas generation techniques for entrepreneurial ventures.
- 4) Marketing and Sales
 - a) Target market identification and segmentation;

- b) Four P's of Marketing;
 - c) Developing a marketing strategy;
 - d) Branding.
- 5) Financial Literacy:
- a) Basic concepts of income, savings and investments;
 - b) Basic concepts of assets, liabilities and equity;
 - c) Basic concepts of revenue and expenses;
 - d) Overview of cash-flows;
 - e) Overview of banking products including Islamic modes of financing;
 - f) Sources of funding for startups (angel financing, debt financing, equity financing etc.)
- 6) Team Building for Startups:
- a) Characteristics and features of effective teams
 - b) Team building and effective leadership for startups.
- 7) Regulatory Requirements to Establish Enterprises in Pakistan:
- a) Types of enterprises (e.g., sole proprietorship; partnership; private limited companies etc.):
 - b) Intellectual property rights and protection;
 - c) Regulatory requirements to register an enterprise in Pakistan, with special emphasis on export firms:
 - d) Taxation and financial reporting obligation.

Practical Requirements:

As part of the overall learning requirements, students shall be tasked with creating and presenting a comprehensive business plan at the end of the course for a hypothetical or real business idea. This practical exercise shall allow them to apply the knowledge, skills and abilities acquired in the course to develop a feasible business plan and where possible explore the possibility of implementing the plan with support and assistance from established businesspersons and entrepreneurs.

Suggested Instructional/Reading Material:

- *"Entrepreneurship: Successfully Launching New Ventures"* by Bruce R. Barringer and R. Duane Ireland.
- *"Entrepreneurship: Theory, Process, and Practice"* by Donald F. Kuratko.
- *"New Venture Creation: Entrepreneurship for the 21st Century"* by Jeffrey A. Timmons, Stephen Spinelli Jr., and Rob Adams.
- *"Entrepreneurship: A Real-World Approach"* by Rhonda Abrams.
- *"The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses"* by Eric Ries.
- *"Effectual Entrepreneurship"* by Stuart Read, Saras Sarasvathy, Nick Dew, Robert Wiltbank, and Anne-Valérie Ohlsson

Course Name:	<i>Applied Physics</i>
Course Code:	PHYS1124
Credit Hours:	3 (2+1)
Pre-requisites:	None

Objectives:

The main objectives of this course is to provide knowledge of wide variety of electric and magnetic phenomena, their relevant mathematics, atomic level phenomena and their applications.

Course Outlines:

Electrostatics and Magnetism: Coulombs Law, Electrostatic potential energy of discrete charges, Continuous charge distribution, Gauss's Law, Electric field around conductors, Dielectric Magnetic fields, Magnetic force on current, Hall effect, Biot- Savart Law, Ampere's Law, Fields of rings and coils, Magnetic dipole, Diamagnetism, Para magnetism and Ferromagnetism.

Waves and Oscillations: Reflection and Refraction of light waves, Total internal reflection, Double slit interference, Interference from thin films, Diffraction, Polarization of electromagnetic waves.

Semi-Conductors: Semi-Conductors Energy levels in a semi-conductor, Hole concept, Intrinsic and Extrinsic regions, PNP, NPN junction Transistor, LEDs Modern Physics, Inadequacy of classical physics, Plank's explanations of black body radiation.

Modern physics: Photo electric effect, Compton effect, Bohr's theory of Hydrogen atom. Nuclear stability and radioactivity.

Nuclear Physics: Alpha decay, Beta decay, Gamma decay attenuation, Fission, Energy release, Nuclear Fusion

List of Experiments: (At least 3 experiments should be performed), Measuring moments of inertia of different bodies; disc, hollow and solid cylinders. The Harmonic Oscillation of Helical springs-parallel and series connection of spring Value of g using a compound pendulum or simple pendulum. Verification of Ohm's law. Determine the speed of sound using Sonometer/Air column. Determine the refractive index with help of prism/glass plate

Recommended books:

- Fundamentals of Physics (Extended), 10th edition, Resnick and Walker
- Narciso Garcia, Arthur Damask, Steven Schwarz, —Physics for Computer Science students, Springer Verlag, 199
- Instructor of respective course may add two books.

Course Name:	<i>Professional Practices</i>
Course Code:	ITEC4112
Credit Hours:	2 (2+0)
Pre-requisites:	None

Course Introduction:

A Computing graduate as professional has some responsibilities with respect to the society. This course develops student understanding about historical, social, economic, ethical, and professional issues related to the discipline of Computing. It identifies key sources for information and opinion about professionalism and ethics. Students analyze, evaluate, and assess ethical and professional computing case studies.

Course Outline:

Historical, social, and economic context of Computing (software engineering, Computer Science, Information Technology); Definitions of Computing (software engineering, Computer Science, Information Technology) subject areas and professional activities; professional societies; professional ethics; professional competency and life-long learning; uses, misuses, and risks of software; information security and privacy; business practices and the economics of software; intellectual property and software law (cyber law); social responsibilities, software related contracts, Software house organization. Intellectual Property Rights, The Framework of Employee Relations Law and Changing Management Practices, Human Resource Management and IT, Health and Safety at Work, Software Liability, Liability and Practice, Computer Misuse and the Criminal Law, Regulation and Control of Personal Information. Overview of the British Computer Society Code of Conduct, IEEE Code of Ethics, ACM Code of Ethics and Professional Conduct, ACM/IEEE Software Engineering Code of Ethics and Professional Practice. Accountability and Auditing, Social Application of Ethics.

Reference Materials: (or use any other standard and latest books)

1. Professional Issues in Software Engineering by Frank Bott, Allison Coleman, Jack Eaton and Diane Rowland, CRC Press; 3rd Edition (2000). ISBN-10: 0748409513
2. Computer Ethics by Deborah G. Johnson, Pearson; 4th Edition (January 3, 2009). ISBN-10: 0131112414
3. A Gift of Fire: Social, Legal, and Ethical Issues for Computing and the Internet (3rd Edition) by Sara Baase, Prentice Hall; 3rd Edition (2008). ISBN-10: 0136008488
4. Applied Professional Ethics by Gregory R. Beabout, University Press of America (1993). ISBN-10: 0819193747.

Course Name:	Foundations of Management
Course Code:	BUSA2118
Credit Hours:	2(2+0)
Prerequisite(s):	None

Specific Objectives of course:

This 2-credit hour course is designed to provide non-business students with a comprehensive introduction to management principles, with a focus on understanding organizations and businesses. The course will cover various aspects of management, including the roles and functions of managers, the historical development of management theories, the concept of the environment in which organizations operate, decision-making processes, and the core functions of planning, organizing, leading, and controlling. Additionally, students will be introduced to different types of businesses and their key characteristics.

Learning Outcomes:

By the end of this course, students will be able to:

1. Define the concept of management and explain the significance of managers in organizations.
2. Describe the managerial functions of planning, organizing, leading, and controlling and their role in achieving organizational objectives.
3. Understand the different roles and skills required of managers and how they contribute to effective leadership.
4. Trace the historical development of management theories and identify their impact on modern management practices.
5. Analyze the influence of the external environment on managerial decision-making and organizational performance.

Detailed outline

Introduction to Management

- Definition and significance of management
- Overview of key management functions and roles

Short History of Management

- Classical management approaches (scientific management and administrative management)
- Contemporary management theories (systems theory, contingency theory)

Managerial Functions - Planning

- Importance of planning in management
- Types of plans: strategic, tactical, and operational
- Decision making: rational vs intuitive
- Goal-setting and decision-making in the planning process

Managerial Functions - Organizing

- Principles of organizational structure
- Delegation of authority and responsibility
- Departmentalization and coordination within organizations

Organizational Structure and Design

- Types of organizational structures
- Factors influencing organizational design
- Mechanistic vs. organic structures

Managerial Functions – Leading

- Theories of leadership and leadership styles
- Motivation and employee engagement
- Communication and effective leadership

Managerial Functions – Controlling

- The control process and its significance
- Types of control measures and their application
- Addressing deviations and corrective actions

Introduction to Organizations and Types of Businesses

- Overview of organizations and their characteristics
- Types of businesses: Sole proprietorship, partnership, corporation, and more
- Advantages and disadvantages of different business types

Understanding the Organizational Environment

- Internal and external environmental factors
- Environmental analysis and adaptation
- Strategic planning in a dynamic environment

Recommended Books:

1. Management by Courtland L. Bovee
2. Management by Stephen P. Robbins and Mary Coulter

Note: In addition to the above, any other text or book referred by Instructor can also be included.

Course Name:	<i>Expository Writing</i>
Course Code:	ENGL1120
Credit Hours:	3 (3+0)
Pre-requisites:	None

Course Description:

Expository Writing is a sequential undergraduate course aimed at refining writing skills in various contexts. Building upon the foundation of the pre-requisite course, Functional English, this course will enhance students' abilities of producing clear, concise and coherent written texts in English. The course will also enable students to dissect intricate ideas, to amalgamate information and to express their views and opinions through well-organized essays. The students will further be able to refine their analytical skills to substantiate their viewpoints using credible sources while adhering to established ethical writing norms. Additionally, the course will highlight the significance of critical thinking enabling students to produce original and engaging written texts.

Learning outcomes:

By the end of this course, students will be able to:

1. Understand the essentials of the writing process integrating pre-writing, drafting, editing and proof reading to produce well-structured essays.
2. Demonstrate mastery of diverse expository types to address different purposes and audiences.
3. Uphold ethical practices to maintain originality in expository writing.

Syllabus:

1. Introduction to Expository Writing:
 - Understanding expository writing (definition, types, purpose and applications)
 - Characteristics of effective expository writing (clarity, coherence and organization)
 - Introduction to paragraph writing
2. The Writing Process:
 - Pre-writing techniques (brainstorming, free-writing, mind-mapping, listing, questioning and outlining etc.)
 - Drafting (three stage process of drafting techniques)
 - Revising and editing (ensuring correct grammar, clarity, coherence, conciseness etc.) Proof reading (fine-tuning of the draft)
 - Peer review and feedback (providing and receiving critique)
3. Essay Organization and Structure:
 - Introduction and hook (engaging readers and introducing the topic)
 - Thesis statement (crafting a clear and focused central idea)
 - Body Paragraphs (topic sentences, supporting evidence and transitional devices)
 - Conclusion (types of concluding paragraphs and leaving an impact)
 - Ensuring cohesion and coherence (creating seamless connections between paragraphs)
4. Essay Organization and Structure:
 - Description
 - Illustration
 - Classification
 - Cause and effect (exploring causal relationships and outcomes)
 - Process analysis (explaining step-by-step procedures)
 - Comparative analysis (analyzing similarities and differences)
5. Writing for Specific Purposes and Audiences:

- Different types of purposes (to inform, to analyze, to persuade, to entertain etc.)
 - Writing for academic audiences (formality, objectivity, and academic conventions)
 - Writing for public audiences (engaging, informative and persuasive language)
 - Different tones and styles for specific purposes and audiences
6. Ethical Considerations:
- Ensuring original writing (finding credible sources, evaluating information etc.)
 - Proper citation and referencing (APA, MLA, or other citation styles)
 - Integrating quotes and evidences (quoting, paraphrasing, and summarizing)
 - Avoiding plagiarism (ethical considerations and best practices)

PRACTICAL APPLICATIONS AND CAPSTONE PROJECT

As part of the overall learning requirements, students will be required to build a writing portfolio having a variety of expository texts and present the same at the end of the course showcasing proficiency in expository writing.

SUGGESTED INSTRUCTIONAL/READING MATERIALS

1. “The St. Martin Guide to Writing” by Rise B. Axelrod and Charles R. Cooper.
2. “They Say / I Say: The Moves That Matter in Academic Writing” by Gerald Graff and Cathy Birkenstein.
3. “Writing Analytically” by David Rosenwasser and Jill Stephen.
4. “Style: Lessons in Clarity and Grace” by Joseph M. Williams and Joseph Bizup.
5. “The Elements of Style” by William Strunk Jr. and E.B. White.
6. “Good Reasons with Contemporary Arguments” by Lester Faigley and Jack Selzer.
7. “Writing to Learn: How to Write - and Think - Clearly About Any Subject at All” by William Zinsser.
8. “The Norton Field Guide to Writing” by Richard Bullock, Maureen Daly Goggin, and Francine Weinberg.
9. “The Art of Styling Sentences” by Ann Longknife and K.D. Sullivan.
10. “Writing Today” by Richard Johnson-Sheehan and Charles Paine.

Course Name:	Ideology and Constitution of Pakistan
Course Code:	PAKS1119
Credit Hours:	2 (2+0)
Pre-requisites:	None

Specific Objectives of course: This course is designed to provide students with a fundamental exploration of the ideology and the constitution of Pakistan. The course focuses on the underlying principles, beliefs, and aspirations that have been instrumental in shaping the creation and development of Pakistan as a sovereign state. Moreover, the course will enable students to understand the core provisions of the Constitution of the Islamic Republic of Pakistan concerning the fundamental rights and responsibilities of Pakistani citizens to enable them function in a socially responsible manner.

Course Outline:

Introduction to the Ideology of Pakistan:

- Definition and significance of ideology.
- Historical context of the creation of Pakistan (with emphasis on socio-political, religious, and cultural dynamics of British India between 1857 till 1947).
- Contributions of founding fathers of Pakistan in the freedom movement including but not limited to Allama Muhammad Iqbal, Muhammad Ali Jinnah., etc.
- Contributions of women and students in the freedom movement for separate homeland for Muslims of British India

Two-Nation Theory:

- Evolution of the Two-Nation Theory (Urdu-Hindi controversy, Partition of Bengal, Simla Deputation 1906, Allama Iqbal's Presidential Address 1930, Congress Ministries 1937 Lahore Resolution 1940).
- Role of communalism and religious differences.

Introduction to the Constitution of Pakistan:

- Definition and importance of a constitution.
- Ideological factors that shaped the Constitution(s) of Pakistan (Objectives Resolution 1949).
- Overview of constitutional developments in Pakistan.

Constitution and State Structure:

- Structure of Government (executive, legislature, and judiciary).
- Distribution of powers between federal and provincial governments.
- 18th Amendment and its impact on federalism.

Fundamental Rights, Principles of Policy and Responsibilities:

- Overview of fundamental rights guaranteed to citizens by the Constitution of Pakistan 1973 (Articles 8-28).
- Overview of Principles of Policy (Articles 29-40).
- Responsibilities of the Pakistani citizens (Article 5).

Constitutional Amendments:

- Procedures for amending the Constitution.
- Notable constitutional amendments and their implications.

Recommended Readings:

- Akbar S. Ahmed. Jinnah. Pakistan and Islamic Identity: The Search for Saladin
- Burki, Shahid Javed. (1980). State & Society in Pakistan. Macmillan Press Ltd.
- Chawla, M. Iqbal. (2011). Wavell and the dying days of the Raj: Britain's penultimate viceroy in India. OUP.
- G. W. Choudhury. (n.d.). Constitutional development in Pakistan, new edition, Peace Publication.
- G.W. Choudhury. Constitution-Making in Pakistan: The Dynamics of Political Order
- Hamid Khan. Constitutional and Political Development of Pakistan” by
- Ian Talbot. Pakistan: A New History
- Javed Iqbal. Ideology of Pakistan
- K.K. Aziz. The Making of Pakistan: A Study in Nationalism
- Khalid Bin Sayeed. Pakistan the Formative Phase
- Khan, H. (2001). Constitutional and political history of Pakistan. OUP.
- I.H. Qureshi. The Struggle for Pakistan
- Lawrence Ziring. Pakistan in the Twentieth Century: A Political History
- M.R Kazimi. (2023). Pakistan Studies. Karachi, OUP.
- Mahboob Hussain. The Parliament of Pakistan”
- Safdar Mahmood. Pakistan: Political Roots and Development
- Sharif-ul-Mujahid. Ideology of Pakistan
- Stephen P. Cohen. The Idea of Pakistan
- The Constitution of Pakistan 1973. Original.
- Zahid, Ansar. (1980). History & Culture of Sindh. Karachi: Royal Book Compan.

Course Name:	<i>Pre-Calculus-I</i>
Course Code:	MATH1127
Credit Hours:	3 (3+0)
Pre-requisites:	None

Aims & Objectives:

This subject develops the concepts of Mathematics and its applications in daily life. The students are taught different mechanisms as well as issues at different levels are discussed.

Course Content:**Introduction of Mathematics**

History, Applications of mathematics, Number systems

SETS and Functions

Set, All type of sets, Operations on sets, Complex Numbers and its methods of simplification, Polar form of complex number, Functions and their types, Inverse of function, Graphs, Relevant Problems and their solutions

Matrices and Determinants

Matrix, all types of matrices, Operations on matrices, Determinants of 2×2 and 3×3 matrix, Solution of simultaneous linear equations by using matrices, Elementary Row and Column operation on a matrix, Echelon and Reduced Echelon forms of Matrices, System of Linear equations, Homogeneous Linear equation, Cramer's rule, Relevant Problems and their solutions

Quadratic Equations

Introduction, Solution of Quadratic Equations, Polynomial Function, Remainder Theorem and its applications, Relevant Problems and their solutions

Partial Fractions

Rational fraction, Proper rational fraction, Improper rational fraction, Resolution of all types of fraction, Relevant Problems and their solutions

Mathematical Induction and Binomial Theorem

Binomial theorem and its application on different types of functions, Relevant Problems and their solutions

Fundamentals of Trigonometry

Introduction, Units of Measures of Angles, Angles in Standard Position, Trigonometric Functions, Trigonometric Functions of any angle, Fundamental Identities of Geometric Functions, Signs of Trigonometric Functions, The value of Trigonometric Functions of Acute Angles 30° , 45° and 60° , The value of Trigonometric Functions of Angles 0° , 90° , 180° , 270° , 360° , Proves of Fundamental Identities with different types of functions, Half angle Identities, Sum, Difference and product of Sines and Cosines, Period of Trigonometric Functions, Relevant Problems and their solutions

Reference Books & Material

Complete solution in PDF form

Recommended Text Book

Thomas Calculus 12th Edition

Course Name:	<i>Pre-Calculus-II</i>
Course Code:	MATH1128
Credit Hours:	3 (3+0)
Pre-requisites:	Pre-Calculus-I

Aims & Objectives:

This subject develops the concepts of Mathematics and its applications in daily life. The students are taught different mechanisms as well as issues at different levels are discussed.

Course Content:**Introduction of Mathematics**

History, Applications of mathematics

Functions, Limits and Continuity

Definition of Functions, Graph of Algebraic Functions, Polynomial Functions, Linear Function, Identity Function, Constant Function, Rational Function, Explicit Function, Implicit Function, Exponential Function, Logarithmic Function, Trigonometric Functions, Inverse Trigonometric Functions, Parametric form of Function, Even Function, Odd Function, Composition of Functions, Definition of Limit, Limit Theorems, Application of Limit on Algebraic and Geometric Function, Continuity of a Function, Relevant Problems and their solutions

Differentiation

Independent and Dependent variables, Average rate of change, Derivative and slope, By Definition Derivative, Rules of Derivation, Derivation of Algebraic and Geometric Functions, Taylor' Theorem, Relevant Problems and their solutions

Integration

Introduction of Integration, Formulas of Integration, Simple problems related with Integration, Relevant Problems and their solutions

Integration

Integration by parts, Integration by substitution method, Integration involving limit, Area of region bounded by the curve, Relevant Problems and their solutions

Introduction to Analytical Geometry

Quadrants, The Distance Formula, Slope of straight line, Equation of a straight Line, Intercepts

form, Translation and Rotation of axes, Relevant Problems and their solutions

Conic Section

Introduction, General form of an Equation of a Circle, Center, Radius and Diameter of a Circle, Relevant Problems and their solutions, The Equation of a Circle when end points of its diameter are given, Relevant Problems and their solutions

Recommended Book

1. Howard Anton 10th Edition

Course Name:	<i>Civics and Community Engagement</i>
Course Code:	POLS2111
Credit Hours:	2 (2+0)
Pre-requisites:	None

Course Description:

This course is designed to provide students with fundamental knowledge about civics, citizenship, and community engagement. Students will learn about the essentials of civil society, government, civic responsibilities, inclusivity, and effective ways to participate in shaping the society which will help them apply theoretical knowledge to the real-world situations to make a positive impact on their communities.

Course Objectives:

The overall objectives of this course are to:

- Teach students about the significance and role of active citizenship for the promotion of a harmonious and developed society
- Educate students about the importance of skills and aptitude of community linkages in developing a sustainable society
- Highlight the importance of community involvement for a tolerant and productive citizenship and society
- Provide an opening to the students for developing their civic bond with the community

Learning outcome:

1. By the end of this course, students will be able to:
2. Demonstrate fundamental understanding of civics, government, citizenship and civil society.
3. Understand the concept of community and recognize the significance of community engagement for individuals and groups.
4. Recognize the importance of diversity and inclusivity for societal harmony and peaceful co-existence.

Course Contents:

1. Introduction to Civics and Citizenship
 - Definition of civics, citizenship, and civic engagement.
 - Historical evolution of civic participation.
 - Types of citizenship: active, participatory, digital, etc.
 - The relationship between democracy and citizenship.
2. Civics and Citizenship
 - Concepts of civics, citizenship, and civic engagement.
 - Foundations of modern society and citizenship.
 - Types of citizenship: active, participatory, digital, etc.
3. State, Government and Civil Society
 - Structure and functions of government in Pakistan.

- The relationship between democracy and civil society.
- Right to vote and importance of political participation and representation.

4. Rights and Responsibilities

- Overview of fundamental rights and liberties of citizens under Constitution of Pakistan 1973
- Civic responsibilities and duties.
- Ethical considerations in civic engagement (accountability, non-violence, peace dialogue, civility, etc.)

5. Community Engagement

- Concept, nature and characteristics of community
- Community development and social cohesion
- Approaches to effective community engagement.
- Case studies of successful community driven initiatives.

6. Advocacy and Activism

- Public discourse and public opinion
- Role of advocacy in addressing social issues.
- Social action movements.

7. Digital Citizenship and Technology

- The use of digital platforms for civic engagement.
- Cyber ethics and responsible use of social media.
- Digital divides and disparities (access, usage, socioeconomic, geographic, etc.) and their impacts on citizenship.

8. Diversity, Inclusion and Social Justice

- Understanding diversity in society (ethnic, cultural, economic, political etc.).
- Youth, women and minorities engagement in social development.
- Addressing social inequalities and injustices in Pakistan.
- Promoting inclusive citizenship and equal rights for societal harmony and peaceful co-existence.

SUGGESTED PRACTICAL ACTIVITIES (OPTIONAL)

As part of the overall learning requirements, the course may have one or a combination of the following practical activities:

1. **Community Storytelling:** Students can collect and share stories from community members. This could be done through oral histories, interviews, or multimedia presentations that capture the lived experiences and perspectives of diverse individuals.
2. **Community Event Planning:** Students can organize a community event or workshop that addresses a specific issue or fosters community interaction. This could be a health fair, environmental cleanup, cultural festival, or educational workshop.

3. Service-Learning: Students can collaborate with a local nonprofit organization or community group. They can actively contribute by volunteering their time and skills to address a particular community need, such as tutoring, mentoring, or supporting vulnerable populations.
4. Cultural Exchange Activities: Students can organize a cultural exchange event that celebrates the diversity within the community. This could include food tastings, performances, and presentations that promote cross-cultural understanding.

SUGGESTED INSTRUCTIONAL / READING MATERIALS

- "Civics Today: Citizenship, Economics, & You" by McGraw-Hill Education
- "Citizenship in Diverse Societies" by Will Kymlicka and Wayne Norman.
- "Engaging Youth in Civic Life" by James Youniss and Peter Levine.
- "Digital Citizenship in Action: Empowering Students to Engage in Online Communities" by Kristen Mattson.
- "Globalization and Citizenship: In the Pursuit of a Cosmopolitan Education" by Graham Pike and David Selby.
- "Community Engagement: Principles, Strategies, and Practices" by Becky J. Feldpausch and Susan M. Omilian.
- "Creating Social Change: A Blueprint for a Better World" by Matthew Clarke and Marie-Monique Steckel
- "Nationhood and the Nationalities in Pakistan, Economic and Political Weekly by Alavi, H. (1989).
- 'Imagined Communities: Reflections on the Origin and Spread of Nationalism by Anderson', B. R. O. (1991)
- 'The Idea of a Pakistani Nationhood', Polity by Syed, A. H. (1980)

Course Name: *Ethics*
Course Code: HUMN1111
Credit Hours: 2 (2+0)
Pre-requisites: None

Course Objectives:

- This course will serve as an introduction to religious ethics in general and to personal ethics in particular.
- You will consider the positions of historical thinkers as well as contemporary philosophers.
- You will gain understanding of specific topics in character building.

Topics

1. What is Ethics?
2. Religious Ethics: A Comparative Study
3. Ethical Values
 - i. Hinduism
 - ii. Buddhism
 - iii. Zoroasterianism
 - iv. Judaism
 - v. Christianity and Islam
4. Ethics: Philosophical Perspective
 - i. Ram Chander Ji
 - ii. Mahatma Gandhi
 - iii. Siddharta
 - iv. Amanual Kant
 - v. Saint Paul
 - vi. Flourence Nightingale
 - vii. Aurbindu Ghoos
 - viii. Imam Ghazali
5. Mannerism
 - i. Good Manners
 - ii. Bad Manners
6. Ethics: Social Perspective
 - i. Role of Family
 - ii. Role of Community
 - iii. Role of Educational Institutions

7. Defense Mechanism

- i. Conscience
 - a. Sin
 - b. Self-Ego
- ii. Law
 - a. Crime
 - iii. Character Building

8. Prejudice

9. Regionalism

10. Provincialism

Recommended Books:

- *Ethical Theory: An Anthology 5th ed. Russ Shafer -Landau. Wiley-Blackwell.2013*
- *The Fundamentals of Ethics 2nd ed. Russ Shafer-Landau. Oxford University Press. 2011.*

Note: In addition to the above, any other text or book referred by Instructor can also be included

Seerat of the Holy Prophet Muhammad (SAW)

Title	Description
Semester	Student can opt this course in any Semester
Nature of Course	Regular
Course Code	ISLA2211
No. of Cr. Hrs.	2 (2+0)
Total Teaching weeks	16 Weeks
Objectives of the Course	<p>۱۔ طلباء کو مطالعہ سے سیرۃ طیبہ کی ضرورت و اہمیت سے آگاہ کرنا</p> <p>۲۔ نعمی شخصیت میں مطالعہ سے سیرۃ طیبہ کے کردار کو واضح کرنا</p> <p>۳۔ بعثت نبوی کے موقع پر اقوام عالم کی عمومی صورت حال سے آگاہ کرنا</p> <p>۴۔ طلباء کو عہد نبوی کی معاشرت، سیاست، معیشت سے آگاہ کرنا</p>

Course Description

S.No.	Title	Description
1	سیرۃ النبی صلی اللہ علیہ وسلم: نعارف و اہمیت	<p>مطالعہ سے سیرت کی معاشرتی و سماجی اہمیت ۲۔</p> <p>مطالعہ سے سیرت کی معاشی و سیاسی اہمیت</p> <p>۳۔ مطالعہ سے سیرت کی عقلی و منطقی اور استدلالی حوالے سے</p> <p>اہمیت ۴۔ مطالعہ سے سیرت کے شخصیت و کردار پر اثرات</p>
2	پیغمبر اسلام صلی اللہ علیہ وسلم کی زندگی کا مطالعہ کیوں کیاجائے؟	<p>مادی اور بیزادی ذرائع</p> <p>۲۔ ماحول اور حالت</p> <p>۳۔ اعلیٰ خدائی مشن کے لیے محمد صلی اللہ علیہ وسلم کا انتخاب</p> <p>۴۔ حرب فجار اور حلف النضول</p>
3	اللہ تعالیٰ کی پیغام کی تبلیغ و اشاعت	<p>۱۔ ہجرت حبشہ ۲۔</p> <p>معاشرتی بائیکاٹ ۳۔</p> <p>معراج اور معجزات</p>
4	اسلام میں خواتین کا کردار	<p>۱۔ اسلام میں خواتین کا کردار قبل از ہجرت</p> <p>۲۔ اسلام میں خواتین کا کردار بعد از ہجرت</p> <p>۳۔ قومی شہزادہ بزدلی میں عورت کا کردار</p>
5	ہجرت مدینہ اور انصار و یہود	<p>۱۔ مؤاخات مدینہ کی عصر حاضر میں اہمیت</p> <p>۲۔ مہنق مدینہ کے نناظر میں یہود و نصاریٰ کے ساتھ</p>

معاشرتی تعلقات		
6	غزوات نبوی کے اثرات	۱۔ غزوات نبوی کے سیاسی اور دفاعی اثرات ۲۔ غزوات نبوی کے معاشی اثرات ۳۔ غزوات نبوی کے سماجی اور دعوتی اثرات
7	صلی اللہ علیہ وسلم کے داخلی سیاسی اقدامات	۱۔ یہود سے تعلقات ۲۔ مشرکین اور منافقین سے تعلقات ۳۔ قبائل عرب سے تعلقات
8	اللہ علیہ وسلم کے خارجی تعلقات	۱۔ غیر ملکی سربراہوں سے حضور صلی اللہ علیہ وسلم کی مراسلت ۲۔ غیر ملکیوں کے ساتھ وفد کا تبادلہ ۳۔ نواح مکہ مدینہ سے دعوت اسلامی کفر و غ ۴۔ حضور صلی اللہ علیہ وسلم کی خارجی سیاست کے اثرات
9	ت اور سیرت طیبہ: ایک مطالعہ	۱۔ غیر مسلم اقلیت کا تعارف ۲۔ اقلیتوں کے حقوق کا سیرتی مطالعہ ۳۔ اسلامی ریاست میں غیر مسلموں کے حقوق و فرائض ۴۔ اقلیتوں کے حقوق اور اسلام و فوبیا
01	عہد نبوی۔ تہذیبی مطالعہ	۱۔ عہد نبوی کا معاشرتی و معاشی نظام ۲۔ عہد نبوی کا مذہبی نظام ۳۔ عہد نبوی کا نظام حکومت
00	نبی کریم ﷺ کی تعلیمی جدوجہد	۱۔ علم کے لیے ایک جماعت کا قیام ۲۔ خواتین کے لیے تعلیم کا اہتمام ۳۔ نسل نو کے لیے تعلیم کا انتظام ۴۔ تشکیل و فود برائے توسیع و استحكام تعلیم

نصابی کتب

نمبر شمار	نام مؤلف	نام کتاب
0	ابن ہشام	السیرة النبویة
2	مولانا شبلی نعمانی، سید سلیمان ندوی	سیرة النبی صلی اللہ علیہ وسلم
3	فاضل محمّد سلیمان سلمان منصور پوری	رحمة اللعالمین
4	مولانا سید ابوالحسن علی ندوی	نبی رحمت صلی اللہ علیہ وسلم
5	ڈاکٹر سید مظہر صدیقی	عہد نبوی کا نظام حکومت
6	ڈاکٹر خالد علوی	اسراں کا ل

حوالہ جاتی کتاب

نمبر شمار	نام مؤلف	نام کتاب
1	ڈاکٹر اکرم الضیاء ال عمری	السیرة النبویة الصحیحة
2	مولانا عبدالرؤف دانا پوری	اصح السیر
3	مولانا صنی الزحمن مبارک پوری	الرحیق المختوم
4	پیر محمد کرم شاہ الزہری	ضیاء النبی صلی اللہ علیہ وسلم
5	سید ابوالاعلیٰ مودودی	سیرت سرور عالم صلی اللہ علیہ وسلم
6	پروفیسر رب نواز	آنحضور ﷺ کی تعلیمی جدوجہد