Semester 1 (1st year 1st semester)

Course Title: China Panorama
Course Code: 2150001030
Course Credit: 3 Credits Theory

Course Outline: Chinese Panorama is a compulsory course for foreign students designed as a comprehensive introduction to Chinese culture. By surveying the long history of China's cultural evolution and rich heritage, the course aims to provide a basic context of Chinese culture for foreign students. It is a crucial course for humanity, patriotism and personality education, laying the foundation for international cultural exchange. Explain the historical development, geographical environment, political system, social customs, economy, science and technology, education, literature and art, family and other aspects of knowledge of China.

References:

1. *Guo Peng, China Panorama, 2011, High Education Press.*
2. *Zhang Dainian, Chinese Culture Panorama,2004,Beijing Normal University Press.*

Course Title: Comprehensive Chinese I
Course Code: 2150002030
Course Credit: 4 Credits Theory

Course Outline: This course is designed to give beginning students in Chinese a foundation in speaking and pronunciation, listening and comprehension, reading and writing in both pinyin and characters (Hànzì), and Chinese grammar. Throughout, students will develop a basic understanding of Chinese culture. By the end of this course, students will be able to introduce themselves and carry out simple conversations on topics including family, dates and times, and hobbies and interests. It is designed for beginners. After learning, students can master 300-400 words and around 250 Chinese characters, have basic communication skills (shopping, order, travel, appointment, etc.), and pass HSK 2**.**

References:

1. *Great Wall Chinese: Essentials in Communication 1 – Textbook (English and Chinese Edition)*
2. *Great Wall Chinese: Essentials in Communication 1 – Workbook*

Course Title: Advanced Mathematics I
Course Code: 2126103050
Course Credit: 5 Credits Theory

Course Outline:Function, Domain and Range of a Function. Translation and reflection of a function. Even and odd functions, inverse functions, one to one and many to one function. Limit, continuity and differentiability, tangent line, differentiation of different types of functions. Calculus: Analysis of Function I: Slope and concavity, analysis of function.

References:

1. *Advanced Engineering Mathematics, 10th Edition, by Erwin Kreyszig*
2. *Calculus (9th Edition) - Dale Varberg, Edwin Purcell and Steve Rigdon*

Course Title: Physical education I
Course Code: 2150013010
Course Credit: 2 Credits Lab

Course Outline: Tai-Ji (Chi) is an internal form of Wushu, or gongfu, which is the term used to describe Chinese martial arts. Tai Ji is known for its unique blend of totally integrated exercise, one which works all of the body's systems deeply yet gently. In this beginning course, we will focus on cultivating awareness, concentration, relaxation and balance from the inside out. Through the practice of mindful breathing and slow precise body movements, we can strengthen both our body and mind. We will also discuss how the practice of Tai Ji and its philosophy can benefit our daily lives.

Course Title: Fundamentals of Computer Technology and Network
Course Code: 2064100020
Course Credit: 2.5 Credits Theory

Course Outline: Introduction to Computing; Early history of computing devices; Computers; Major components of a computer; Hardware: processor, memory, I/O devices; Software: Operating system, application software; Basic architecture of a computer; Basic Information Technology; The Internet; Number system: binary, octal, hexadecimal, and binary arithmetic; Basic programming concepts; Program development stages: flow charts; Programming constructs: data types, operators, expressions, statements, control statements, functions, arrays. To introduce students to a broad range of network-related topics, including: protocols, transmission media, architecture, hardware, and operating systems. In addition, students will study elements of network maintenance, security, and troubleshooting.

References:

1. *Introduction to Information Systems by James A. O'Brien, 8th Edition.*
2. *Fundamentals of Computers by V. Rajaraman and N. Adabala, 6th Edition.*
3. *Computer Networks Tanenbaum 5th edition Pearson Education India.*

Semester 2 (1st year 2nd semester)

Course Title: Metal Working Practice
Course Code: 2020609030
Course Credit: 2 Credits Lab

Course Outline: Lab on Molding, Casting, Forging, Welding, and Making a Product Using Machine Tools(Lathe, Milling, Planner, Cutting Saw).

Course Title: Comprehensive Chinese II
Course Code: 2150003030
Course Credit: 4 Credits Theory

Course Outline It is designed for learners who have mastered 300-400 words and have basic communication skills (shopping, order, travel, appointment, etc.). After learning, students can master 800 vocabulary and around 500 Chinese characters, further communication skills (party, train travel, hotel stay, talk about weather, habits and health, etc.)

References:

1. *Great Wall Chinese: Essentials in Communication 2 – Textbook (English and Chinese Edition)*
2. *Great Wall Chinese: Essentials in Communication 2 – Workbook*

Course Title: General Physics I
Course Code: 2126151035
Course Credit: 3.5 Credits Theory

Course Outline: Motion in 2D and 3D, Applications of Newton's laws of motion, Static and Kinetic friction, Work-Kinetic energy theorem, Power, Conservative forces, Conservation of energy, Gravitation, Gravitational field, Kepler's Law, Center of mass motion, Conservation of linear momentum for a system of particles, Elastic and inelastic collision in 1D, Angular velocity and acceleration, relation between linear and angular velocity, Calculating rotational inertia, Parallel-axis theorem, Conservation of angular momentum. Electric charge, Coulomb's law, Calculation of Electric fields for different charge distributions; Dipole in an electric field; Gauss' law and its applications; Electric potential and its calculation for different charge distributions; Capacitance and its calculation for different geometrical shapes, energy stored by a capacitor; dielectrics and Gauss' law; Concept of electric current, resistance and Ohm's law, DC circuits, Kirchhoff's rules, RC circuits, Magnetic field, The Hall effect, Biot-Savart law, Ampere's law, Faraday's Law, LR circuits, LC circuits and LRC circuits.

References:

1. *Fundamentals of Physics by Halliday, Resnick & Walker, 10th Edition (Extended)*
2. *Physics for scientists and engineers with modern physics / Douglas C.Giancoli.—4th ed.*
3. *University Physics with Modern Physics by Young and Freedman, 13th Edition*

Course Title: Advanced Mathematics II
Course Code: 2126104050
Course Credit: 5 Credits Theory

Course Outline: Differentiation of different types of functions. \An overview of area problem, Newton's anti-derivative method in finding area, Indefinite integral, fundamental theorem of calculus, Definite integral, Area between two curves. Different types of Integration (Principles of Integral evaluation, Integration by parts, Trigonometric Substitution). Analysis of function II: Relative Extrema and Polynomials, Partial Derivatives, The Chain Rule. Differential Equation.

References:

1. *Advanced Engineering Mathematics, 10th Edition by Erwin Kreyszig*
2. *Calculus (9th Edition) - Dale Varberg, Edwin Purcell and Steve Rigdon*

Course Title: Object Oriented Programming (OOP)
Course Code: 2061002030
Course Credit: 3 Credits Theory

Course Outline: Philosophy of Object Oriented Programming (OOP); Advantages of OOP over structured programming; Abstraction and Encapsulation, classes and objects, access specifiers, static and non-static members; Constructors, destructors and copy constructors; Array of objects, object pointers, and object references; Inheritance: single and multiple inheritances; Polymorphism:overloading, abstract classes, virtual functions and overriding; Exceptions; Object Oriented I/O; Template functions and classes; Multi-threaded Programming.

Reference Books:

1. *"C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo*
2. *"Object-Oriented Programming in C++" by Robert Lafore*

Course Title: Practices Object Oriented Programming
Course Code: 2064112010
Course Credit: 1 Credits Lab

Course Outline:Laboratory work based on advanced topics in Object Oriented Programming with project work.

References:

1. *"Object-Oriented Programming in C++" by Robert Lafore*
2. *"C++ Primer" by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo*

Course Title: Physics Experiment I
Course Code: 2126152030
Course Credit: 2 Credits Lab

Course Outline: Determination of acceleration due to gravity using a simple pendulum; determination of projectile motion and collision of a ball. Verification of Newton's second law of motion by Atwood's machine. Measurement of the moment of inertia of a flywheel about its axis of rotation; Measurement of Young's modulus of a wire using Searle's apparatus; measuring the surface tension of water using the capillary tube method. Verification of Ohm's law and verification of the laws of series and parallel combinations of resistances. Measurement of the temperature coefficient of resistance of a wire. Determination of DC and AC voltages and frequencies using a cathode ray oscilloscope. Investigation of the DC voltage and frequency of a full-wave bridge-rectifier circuit. Measurement of the RC time constant in an RC circuit; internal resistance/emf of a cell.

Semester 3 (2nd year 1st semester)

Course Title: General Physics II
Course Code: 2126152035
Course Credit: 3.5 Credits Theory

Course Outline: Specific heat, First law of thermodynamics, Working principle of Carnot cycle and efficiency of heat engines; Second law of thermodynamics, idea of entropy, change in entropy for different processes, Thermodynamic functions and Maxwell's thermodynamic relations, Clausius-Clapeyron equations. Wave motion, characteristics of wave motion, equation of a simple harmonic progressive wave, particle velocity and wave velocity, energy of a progressive wave, formation of a stationary wave, analytical treatment of stationary waves, velocity of a particle in a stationary wave, change of density at places traversed by a stationary wave, acceleration of a particle in the stationary wave, energy of a stationary wave, distinction between progressive and stationary waves, wave velocity and group velocity, velocity of a transverse wave along a stretched string, laws of vibration of a stretched string, Melde's experiment.

References:

1. *Fundamentals of Physics by Halliday, Resnick & Walker, 10th Edition (Extended)*
2. *University Physics with Modern Physics by Young and Freedman, 13th Edition*

3. *PHYSICS for Scientists and Engineers by Tipler, 4th Edition*

Course Title: Linear Algebra
Course Code: 2126105025
Course Credit: 2.5 Credits Theory

Course Outline: This course provides an introduction to linear algebra topics. Emphasis is placed on the development of abstract concepts and applications for vectors, systems of equations, matrices, determinants, vector spaces, multi-dimensional linear transformations, eigenvectors, eigenvalues, diagonalization, and orthogonality. Upon completion, students should be able to demonstrate an understanding of the theoretical concepts and select and use appropriate models and techniques for finding solutions to linear algebra-related problems with and without technology.Upon completing the requirements for this course, the student will be able to use analytical and graphical representations to apply vector operations in multiple dimensions ;Solve systems of linear equations using multiple manual and technology-based methods; these methods will include but are not limited to Gaussian and Gauss-Jordan ; Use eigenvalues, eigenvectors, and diagonalization to solve problems in appropriate situations; Use matrix operations and linear transformations to solve problems in appropriate situations ;Demonstrate knowledge of orthogonal projections and orthogonal complements of subspaces, and apply it to appropriate situations; Use the fundamental concept of a basis for a subspace to give a precise definition of dimensions and rank, and to solve problems in appropriate situations; ;Demonstrate proficiency in using CAS technology to analyze, solve, and interpret the various applications.

Reference Books:

1. *Operating System Concepts, 7th edition, by Silberschatz, Galvin, Gagne*
2. *Modern Operating Systems, 4th edition, Tanenbum, Bos*

Course Title: Comprehensive Chinese 3
Course Code: 2150004030
Course Credit: 4 Credits Theory

Course Outline: It is designed for learners who have mastered 700-800 words and have further communication skills (gathering, traveling by train, staying in hotels, talking about the weather, habits and health, etc.) and pass HSK level 3.

References:

1. *Great Wall Chinese: Essentials in Communication 3 – Textbook (English and Chinese Edition)*
2. *Great Wall Chinese: Essentials in Communication 3 – Workbook*

Course Title: Discrete Mathematics
Course Code: 2061006030
Course Credit: 3 Credits Theory

Course Outline: The Foundations: Logic and Proofs: propositional logic, applications of Propositional logic, propositional equivalences, predicates and quantifiers, nested quantifiers, rules of Inference, introduction to proofs; Basic Structures: Sets, Functions, Sequences, Sums, and Matrices; Number Theory: The division algorithm, divisibility and the Euclidean Algorithm; prime numbers, Congruence, applications of congruence; Induction and Recursion: Mathematical Induction, Recursive Definitions and Structural Induction, Program Correctness; Counting: The addition and Multiplication rules, the principle of Inclusion-Exclusion, The pigeon-hole principle, permutations, Combinations, Generalized Permutations and Combinations, Generating Permutations and Combinations; Relations and Functions: Symmetry, transitivity, reflexivity, equivalence classes, Congruence, closure of relations, partial orderings; Graphs: Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths; Trees: Introduction to Trees, Tree Traversal, Spanning Trees.

Reference Books:

1. *Discrete Mathematics and its Applications, Seventh Edition by Kenneth H. Rosen*

Course Title: Digital Logic Circuit
Course Code: 2061004030
Course Credit: 3 Credits Theory

Course Outline: · Introduction: Number System, Number Base Conversation, Complements, Signed Number. Arithmetic Operation- Binary, Octal, Hexadecimal Binary Codes e.g. BCD, ASCII, Grey etc. Boolean Algebra: Theorems & Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms and Simplification. Logic Gates: Switching Circuits, Electronic Logic Gates, Gate Symbols, Design and operation of NOT, OR, AND, NOR, NAND, XOR, XNOR Gates. Analysis of Combinational Circuits Algebraic Method, Truth Table Method. Synthesis of Combinational Logic Circuits: AND-OR NAND Networks, OR-AND and NOR, AND-OR-Invert Circuits. Combinational Logic Design: Circuits (gate level), Design Hierarchy and procedures. Two-level and multi-level implementations, Arithmetic operation using gates (add, subtract,multiply), Logic Minimization, K-Map, Unate Covering, Quine McCluskey Method, CAD tools for two level minimization, ESPRESSO Algorithm and other popular (multiplexers, encoders) modules design. Programmable Logic Devices: Technologies, Performance, Classical and Mid-Complexity Architectures (PLDs, CPLDs, FPGAs) and Modern Architectures (SoPC).

Sequential Logic Design: Latches, Flip-Plops, State Machine Design & Minimization (Mealy and Moore models) and Design Problems. Sequential Circuits: Design of Synchronous Counters, Ripple counters, parallel Load counters, Introduction of Registers and shift Register: Memory Design: Random Access Memory (RAMS), Static RAMS, Dynamic RAMS, Memory organizations and Read only Memories (ROM)

Reference Books:

1. *Digital Logic Circuit Analysis and Design by Vicor P. Nelson and H. Troy Nagle, Bill D.Carroll, J. David Irwin.*
2. *Logic and Computer Design Fundamentals by M.M. Mano and C.R. Kime, Prentice-Hall, 4th Ed.*
3. *Introduction to Digital Logic Design by J.P. Hayes, Addison-Wesley, 1993.*

Course Title: Digital Logic Circuit Course Exercise
Course Code: 2064109010
Course Credit: 1 Credit Lab

Course Outline: The lab exercises focus on the practical implementation and testing of digital logic circuits. Students work on breadboard-based experiments to implement and test basic logic circuits. They also learn to design and simulate digital circuits using software tools like Quartus or Xilinx ISE. Complex circuits are implemented and tested on programmable logic devices.

Reference Books:

1. *“Digital Design and Computer Architecture" by David Harris and Sarah Harris*
2. *“Digital Logic Circuit Analysis and Design" by Victor Nelson and Troy Nagle*
3. *“Digital Fundamentals" by Thomas L. Floyd and R. Brock Baird*
4. *“Introduction to Logic Design" by Alan B. Marcovitz*

Course Title: Data Structures
Course Code: 2061005035
Course Credit: 4 Credits Theory

Course Outline: · Data Structures and Complexity of Algorithms, Time Space Tradeoff . Linear and Binary Searching; Sorting and Recursion - Discussion of Common Sorting Techniques: Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Merge Sort, Radix Sort; Factorial and Tower of Hanoi Problem; Linked Lists - Abstract Data Types, List ADTs, and

Linked. Singly, Two Way and Circular Linked Lists; Stacks and Queues - Stacks and Queues and their Implementation Strategies; Prefix, Infix and Postfix Expressions, their Transformation and Evaluation Algorithms; Hashing - Hash Indices and Hash Functions, Static and Dynamic Hashing, Collisions in Hash Indices and Collision Resolving Techniques; Trees - Tree Concepts, Binary Tree, BST, Heaps, Heap Sort, Huffman Encoding Technique, AVL Tree, B Tree and B+ Tree; Graphs - Graph Terminologies, Representing Graphs, Graph Searching: BFS and DFS, Shortest Path Problems, Minimum Spanning Tree, Minimum Spanning Tree Algorithms, and Topological Sorting; Problem Solving Strategy - Greedy Algorithms, Divide and Conquer Strategy, Dynamic Programming and Backtracking.

Reference Books:

1. *Data Structures. Schaum's Outline Series.*
2. *E. Horowitz and S. Sahni, Fundamentals of Data Structures, London Pitman.*
3. *Robert L. Kruse, Data Structures and Program Design, Prentice Hall, 2nd Ed.*

Course Title: Data Structure Course Exercise
Course Code: 2064101010
Course Credit: 1 Credit Lab

Course Outline: Define data structures for computer programming; Explain ADTs along with their advantages and disadvantages; Details of array, stack, queue, linked list and trees and their applications. Explain different types of algorithms to search and sort and manipulate data using such data structure; Sorting Algorithm: Selection Sort, Bubble Sort, Counting Sort; Searching Algorithm: Linear and Binary Search; Demonstrate algorithms for efficient searching, insertion and deletion operation for every data structure by computer programs; Explain Tree; Basic terminology (Node, Vertex, Leaf, Left subtree, Right subtree, Height, Depth, m-ary tree), Binary tree, Binary tree representation, Binary tree traversal, Simulations.; Binary search tree. Explain Graphs: Definition and terminology, Representation techniques using 2D arrays and linked lists

Reference Books:

1. *Introduction to Algorithms (Second Edition), Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,*
2. *Fundamentals of Computer Algorithms, Ellis Horowitz, Sartaz Sahni, and Rajasekaran, Published by W.H. Freeman and Company, 1998. Indian Edition published by Galgotia Publications, 2000.*

Semester 4 (2nd year 2nd semester)

Course Title: Comprehensive Chinese 4
Course Code: 2150005030
Course Credit: 5 Credits Theory

Course Outline: It is designed for learners who have mastered 1200 words and 700-800 Chinese characters, have complex communication skills (interview, bank business, wedding, gift giving, etc.)and pass HSK level 4.

Reference Books:

1. *Great Wall Chinese: Essentials in Communication 4 – Textbook (English and Chinese Edition)*
2. *Great Wall Chinese: Essentials in Communication 4 – Workbook*

Course Title: Probability and Statistics
Course Code: 2126106030
Course Credit: 3 Credits Theory

Course Outline: Introduction to Statistics: Concept of Data and Variables, Data Collection and Descriptive Statistics, Inferential Statistics, Populations and Samples; Descriptive Statistics: Frequency Tables and Graphs, Relative Frequency Tables and Graphs, Grouped Data, Histograms, Ogives, Stem and Leaf Plots, Sample Mean, Sample Median, Sample Mode, Sample Variance and Standard Deviation, Sample Percentiles and Box Plots, Chebyshev's Inequality, Normal Data Sets, Paired Data Sets, and Sample Correlation Coefficient; Elements of Probability: Basic Terminology in Probability, Sample Space and Events, Venn Diagrams and Algebra of Events, Axioms of Probability, Conditional Probability, Bayes' Theorem and Independent Events; Random Variables and Expectation: Random Variables, Types of Random Variables, Jointly Distributed Random Variables, Expectation, Property of Expected Values, Use of Expected Values in Decision Making, Variance, Covariance and Variance of Sums of Random Variables and Moment Generating Functions; Special Random Variables: Binomial Random Variables, Poisson Random Variables, Uniform Random Variables, Normal Random Variables, Exponential Variables, Gamma Distribution, Chi-Square Distribution, t-Distribution and F-Distribution; Distributions of Sampling Statistics: Central Limit Theorem, Sampling Distribution for Normal Population, and Sampling from a Finite Population; Parameter Estimation: Maximum Likelihood Estimators, Interval Estimates, Estimating the the difference in Means of Two Normal

Populations, Approximate Confidence Interval for the Mean,Confidence Interval of the Mean of the Exponential Distribution and Bayes' Estimator

Reference Books:

1. *Sheldon M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Elsevier/Academic Press, 3rd Ed.*
2. *M. Nurul Islam, An Introduction to Statistics and Probability, Book World, 3rd Edition.*
3. *Lipschutz, Lipschutz Seymour, 2000 Solved Problems in Discrete Mathematics, McGraw-Hill, 1st Ed*

Course Title: Principle of Computer Org.
Course Code: 2061008035
Course Credit: 3.5 Credits Theory

Course Outline: Introduction: Function and structure of a computer, Functional components of a computer, Interconnection of components, Performance of a computer; Number representation and arithmetic: Binary, octal, and hexadecimal numbers, One's and two's complements and other representations, Addition and subtraction; Digital logic and integrated circuits: Boolean algebra and truth tables, Boolean functions (Gates, Functions, Simplification), Integrated circuits (Combinational circuits - adders, shifters, decoders, multiplexers and ROM's; Flip-flops; Sequential circuits - registers, counters and RAM); Representation of Instructions: Machine instructions, Operands, Addressing modes, Instruction formats, Instruction sets, Instruction set architectures - CISC and RISC architectures; Introduction to Assembly Language: Programming with Assembly language, the assembly process, Linking and loading, Register-level debugging, Processing Unit: Organization of a processor - Registers, ALU and Control unit, Data path in a CPU, Instruction cycle, Organization of a control unit - Operations of a control unit, Hardwired control unit, Micro-programmed control unit; Memory Subsystem: Semiconductor memories, Memory cells - SRAM and DRAM cells, Internal Organization of a memory chip, Organization of a memory unit, Error correction memories, Interleaved memories, Cache memory unit - Concept of cache memory, Mapping methods, Organization of a cache memory unit, Fetch and write mechanisms, Memory management unit - Concept of virtual memory, Address translation, Hardware support for memory management; Input/Output Subsystem: Access of I/O devices, I/O ports, I/O control mechanisms - Program controlled I/O, Interrupt controlled I/O, and DMA controlled I/O, I/O interfaces - Serial port, Parallel port, PCI bus, SCSI bus, USB bus, Firewall and InfiniBand, I/O peripherals - Input devices, Output devices, Secondary storage devices; Multiprocessing Systems: Shared memory multiprocessor, Message-passing multiprocessor, Hardware multithreading.

Reference Books:

1. *D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann, 1998.*
2. *C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGraw-Hill, 2002.*
3. *W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002.*

Course Title: Prin. and App. of Database
Course Code: 2061040030
Course Credit: 3 Credit Theory

Course Outline: Introduction to Database Systems: Evolution of file processing systems, role of databases in organizations, core components of a database Environment Data Modeling: the Entity- Relationship Diagram and its symbols and constructs; The Relational Model and Normalization: relational model, normalization, transformation of an entity-relationship data diagram into a relational model; SQL - A Standard Navigation Language for Relational Databases; Overview of Object-Oriented Databases: object-oriented data model, implementation of object persistence using relational databases.

Reference Books:

1. *Database System Concepts by Avi Silberschatz, Henry F. Korth and S. Sudarshan Sixth Edition*

Course Title: Software Engineering
Course Code: 2061042030
Course Credit: 3 Credits Theory

Course Outline: Comprehend introduction to the modern study of software engineering.; Discuss the present software engineering practices; Discuss various process models used software engineering; Describe requirements engineering and design process; Comprehend the technologies used in coding and testing; Discuss the software project management and planning; Prepare software requirement specification and design document based on standard SRS and Design document templates.; Assess and prepare a project plan using standard project planning process and tools.; Assess project associated risks and prepare Risk management documentation.; Apply appropriate data structures to implement the efficient algorithms; Explain classical tools and techniques for algorithms analysis and design.;

Reference Books:

1. *Software Engineering: A Practitioner's Approach, 7th Edition, Roger S. Pressman*
2. *Software Engineering, Sommereville*

3. *Object Oriented Software Engineering, Ivar Jacobson, Magnus Christerson, Patrik Jonsson, Gunnar Overgaard*

Course Title: Computer Networks
Course Code: 2061043035
Course Credit: 3.5 Credits Theory

Course Outline: Introduce students with modern and up to date concepts on computer networks, beginning at the application layer and works its way down toward the physical layer.; Application Layer protocols – HTTP, FTP, DNS, SMTP.; Transport Layer- TCP & UDP protocols; TCP congestion control, Flow control, three way handshake; Network layer - Introduction of IPv4 addressing; Subnetting – FLSM, VLSM, routing algorithms simulation using Dijkstra and Bellman-ford.; Data Link Layer - Introduction different multiple access protocols; Error Detection and Correction (CRC),; Switching- Circuit & Packet Switching, network delay calculation.

Reference Books:

1. *Kurose J.F and Ross K.W – "Computer Networking: A Top-Down Approach Featuring the Internet" – 7rd Edition*
2. *William Stallings – "High-Speed Networks and Internets: Performance and Quality of Service" – 2nd Edition.*

Course Title: JAVAEE Architecture and Program Design
Course Code: 2060107030
Course Credit: 3 Credits Theory

Course Outline: The Java Enterprise Edition or Java EE course covers the fundamentals components of Oracle's enterprise Java computing platform. The framework supports network and web services, and supports large-scale, multi-tiered, scalable, reliable, and secure network applications. Topics covered will include J2EE architecture, Web Server, Servlets, and JSPs. J2EE Architecture; Multi-tiered client-server architecture; Configure Http Server and/or Web Server Architecture (specially Apache Tomcat 7.0); Servlet Architecture; JSP Architecture; Model View Controller (MVC) Architecture; Implement multi-tiered application using J2EE technologies.

Reference Books:

1. *Java: The Complete Reference by Herbert Schildt*
2. *Beginning Java EE 7 by Antonio Goncalves*
3. *Java EE Development with Eclipse by Deepak Vohra*

Course Title: Prin. and App. of Database Course Exercise
Course Code: 2064103010
Course Credit: 1 Credit Lab

Course Outline: Database Design: Students learn the principles of database design, including entity-relationship modeling, normalization, and schema design. They practice designing databases that accurately represent real-world scenarios.; Database Creation: Students learn to create databases using a popular DBMS such as MySQL, Oracle, or Microsoft SQL Server. They gain experience in setting up the database structure, defining tables, and establishing relationships between them.; Querying and Manipulating Data: Students learn SQL (Structured Query Language) and its various commands for querying and manipulating data. They practice writing SQL queries to retrieve specific information from the database, perform data manipulation operations, and update records.; Database Administration: Students explore the responsibilities of a database administrator, such as user management, security, and backup and recovery. They learn how to create user accounts, grant privileges, enforce data integrity, and ensure data backup and restore procedures.; Database Applications: Students work on building database applications, integrating front-end interfaces with the back-end database. They learn about application development frameworks, such as Java JDBC or .NET Entity Framework, and practice creating applications that interact with the database.

Reference Books:

1. *Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan*
2. *"Database Management Systems" by Raghu Ramakrishnan and Johannes Gehrke*

Course Title: Computer Culture.
Course Code: 2061001030
Course Credit: 3 Credit Theory

Course Outline: Fundamental concepts: confidentiality, integrity and availability, assurance, authenticity and anonymity; threats and attacks, security principles; Encryption, symmetric and asymmetric key encryption; Security: OS access control, Web and mobile application security, software security, hardware security, memory protection, database security; Security Attacks: malware, DDos, Trojan and backdoors, buffer overflow, social engineering.

Course Title: Fundamentals of programming course exercise.

Course Code: 2064100010
Course Credit: 1 Credit Lab

Course Outline: Introduction to Python, Variables, Operators, and Control Flow, Functions and Modules, Exception Handling, Data Structures and Algorithms, Object-Oriented Programming (OOP),Numpy and pandas for data cleaning, matplotlib for data visualization, Sklearn for (ML) model building, Jupyter notebook

Reference Books:

1. *Python for Data Analysis, 2nd Edition By Wes McKinney (2017)*

Course Title: Practice of Electronics I
Course Code: 2020609020
Course Credit: 2 Credits Lab

Course Outline: This course develops a basic understanding of the fundamentals and principles of analog and digital circuits and electronic devices. This understanding is a critical step towards being able to design new electronic circuits or use them appropriately as part of a larger engineering system. Hence, the course seeks to develop foundational concepts and skills, but does so through a series of application-oriented topics such as the design of DC power supplies, speed control of electric motors, audio amplification and simple digital control. Learning opportunities include: online presentations with integrated practice exercises; tutorials in which small teams work together to explore, discuss, analyse and explain electronic circuits; and practicals in which theory is put to practical application. Important topics covered include: the key electrical variables and the application of fundamental circuit laws and theorems to DC and AC resistive circuits; power supply applications of diodes and switch-mode transistors; the operating principles of DC, induction, and synchronous machines; analysis of simple operational and single-MOSET amplifiers; Boolean logic and binary arithmetic; and combinational and sequential logic circuits. The course is designed to be a broad introduction to electronic systems for students from diverse engineering disciplines. Completing the course will provide the necessary foundation to understand the role, capabilities and constraints of electronics in contemporary engineering systems.

Semester 5 (3rd year 1st semester)

Course Title: Software Requirements Engineering
Code: 2060150020
Credit: 2 Credits Theory

Course Outline: Review of – The Nature of Software, Software Engineering, The Software Process, Software Engineering Practices, Generic Software Process Model, Process Assessment and Improvement, Prescriptive Process Models, Specialized Process Model and Agile Development. Requirements Engineering, Establishing the groundwork, Eliciting Requirements, Negotiating Requirements, Validating Requirements, Requirements Analysis, Scenario-Based Modeling, UML Models, Data Modeling Concept, Class Based Modeling, Requirements Modeling Strategies, FlowOriented Model, Behavioral Model, Requirements Modeling for WebApps.

References:

1. *R. S. Pressman, Software Engineering. A Practitioner's Approach, 7/e or higher, McGraw Hill*
2. *Ian Sommerville. Software Engineering, 9th or higher Edition, Addison-Wesley.*

Course Title: System Analysis and Design
Code: 2060154020
Credit: 2 Credits Theory

Course Outline: Design Concept - The Design Process, Design Concepts, The Design Model; Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing, Alternative Architectural Designs, Architectural Mapping Using Data Flow; Component-Level Design: What Is a Component, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development; User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Web App Interface Design, Design Evaluation.

References:

1. *Software Engineering – A Practitioner's Approach. 7th Edition, Roger S. Pressman*
2. *Software Engineering. 9th Edition, Ian Sommerville*

Course Title: Operating System
Course Code: 2061041035

Course Credit: 3.5 Credits Theory

Course Outline: Introduction: What is operating system? History of operating system Operating system concepts Operating system structure Processes and Threads Processes Threads Interprocess communication Scheduling Classical IPC problems Memory Management No memory abstraction Virtual memory Page replacement algorithms Design issues for paging systems Implementation issues File Systems Files Directories File system management Input / Output Principles of I/O hardware Principles of I/O software I/O software layers Disks Clocks Thin clients Deadlocks Resources Detection Recovery Avoidance Prevention Virtualization and Cloud Course.

Reference Books:

1. *Operating System Concepts, 7th edition, by Silberschatz, Galvin, Gagne*
2. *Modern Operating Systems, 4th edition, Tanenbum, Bos*

Course Title: Algorithm Analysis and Design
Course Code: 2061044020
Course Credit: 2 Credits Theory

Course Outline: The study of efficient algorithms and effective algorithm design techniques. Techniques for analysis of algorithms, Methods for the design of efficient algorithms :Divide and Conquer paradigm, Greedy method, Dynamic programming, Backtracking, Basic search and traversal techniques, Graph algorithms, Elementary parallel algorithms, Algebraic simplification and transformations, Lower bound theory, NP-hard and NP-complete problems. Techniques for the design and analysis of efficient algorithms, Emphasizing methods useful in practice. sorting; Data structures for sets: Heaps, Hashing; Graph algorithms: Shortest paths, Depth-first search, Network flow, Computational geometry; Integer arithmetic: gcd, primality; polynomial and matrix calculations; amortized analysis; Performance bounds, asymptotic and analysis, worst case and average case behavior, correctness and complexity. Particular classes of algorithms such as sorting and searching are studied in detail. The course includes a compulsory 3 hour laboratory work alternate week.

Reference Books:

1. *Introduction to The design & analysis of algorithms (2nd edition), Anany Levitin.*
2. *Donald E. Knuth,"Art of Computer Programming, Volume 1: Fundamental Algorithms ", Addison-Wesley Professional; 3rd edition, 1997*

Course Title: OS Course Exercise
Course Code: 2061042035
Course Credit: 1 credit Lab

Course Outline: OS Course Exercise work based on advanced topics in Operating System with project work.

Reference Books:

1. *Operating System Concepts, 7th edition, by Silberschatz, Galvin, Gagne*
2. *Modern Operating Systems, 4th edition, Tanenbum, Bos*

Course Title: Multimedia Techniques
Code: 2060289020
Credit: 2 Credits Theory

Course Outline: This course presents fundamental concepts and emerging technologies for multimedia computing.affine transformations (translation, rotation, scaling, and shear), homogeneous coordinates, concatenation, current transformation and matrix stacks. Three dimensional graphics: classical three dimensional viewing, specifying views, affine transformation in3D, projective transformations. Ray Tracing. Shading: illumination and surface modeling, Phong shading model, polygon shading. Rasterization: line drawing via Bresenham's algorithm, clipping, polygonal fill, BitBlt. Introduction to hidden surface removal (z buffer). Discrete Techniques: buffers, bitblt, reading and writing bitmaps and pixel maps, texture mapping, compositing.

Reference Books:

1. *Multimedia Systems: Algorithms, Standards, and Industry Practices (Advanced Topics) 1st Edition*

Course Title: HSK 4
Course Code: 2150007030
Course Credit: 2 Credits Theory

Course Outline: Chinese for HSK 4 aims at the fourth level of HSK. It is the counterpart of Level 4 of the Chinese Language Proficiency Scales for Speakers of Other Languages and the B2 Level of the Common European Framework of Reference for Languages. Chinese for HSK 4 is a 10-week course. It consists of two parts: Part I, which is a 6-week program, covers vocabulary and grammar delivered mainly through dialogues and passages; Part II takes 4 weeks to complete, and the foci are exercises and testing strategies . Chinese for HSK 4 includes:

424 new HSK 4 vocabularies; Detailed explanation of 96 key words and grammar points; Analyze reading and listening materials from Official Examination Paper of HSK Level 4;Review the words you have learned in HSK 1 、HSK 2, and HSK 3 courses ; New words and texts via audio; Quizzes for each lesson and HSK test papers;

Reference Books:

1. *HSK Standard Course 4A - Textbook (English and Chinese Edition)*
2. *HSK Standard Course 4B : Textbook (Chinese Edition)*

Semester 6 (3rd year 2nd semester)

Course Title: Principle of Compilers
Course Code: 2060200020
Course Credit: 2 Credits Theory

Course Outline: Compiler modules; Lexical analysis; Parsing theory; Symbol tables; Type systems; Scope; Semantic analysis; Intermediate representations; Runtime environments;finite state machines, context free languages, LL and LR parsing methods, syntax directed translation, error recovery Code generation; Code optimization and portability. Analyze the principles, algorithms and data structures involved in the design and constructions of compilers.

Reference Books:

1. *Compilers-Principles, techniques and tools (2nd Edition), V. Aho, Sethi and D. Ullman*
2. *Principles of Compiler Design (2nd Revised Edition 2009), A. A. Puntambekar*
3. *Basics of Compiler Design, Torben Mogensen*

Course Title: Software Project Management
Code: 2060153020

Credit: 2 Credits Theory

Course Outline: Introduction to Project management: Historical background and evolution, Terminologies, Software project management objectives, Scope, focus and basic rules Principles of software project management: Basic PM Skills, SPM framework, elements, stakeholders, boundaries, challenges of SPM Software Project planning: Planning objective, project plan, variations, structure of SPM plan, project estimation, estimation methods, models and decision process. PM organization and scheduling: WBS, types of WBS, functions, activities, tasks, life cycles, phasing and purpose of phasing, building project schedule, network diagrams: PERT, CPM, Bar charts, Gantt charts Software project management techniques: Use of methodologies, Managing risks and issues, Managing Quality, Configuration, Change, Crisis, Documentation, Release. Project monitoring and control: Dimensions of monitoring and control, earned value indicators (BCWS, CV, SV, CPI, SPI), backlog management, dispute and error tracking, RMMM charts Industry scenarios: Domain analysis, Business case analysis, Dynamicity, Success and failure factors, case studies.

References:

1. *Stellman, Andrew, and Jennifer Greene. Applied software project management. " O'Reilly Media, Inc.", 2005.*
2. *Phillips, Joseph. IT project management: on track from start to finish. McGraw-Hill, Inc., 2002.*
3. *Rubin, Kenneth S. Essential Scrum: A practical guide to the most popular Agile process. Addison-Wesley, 2012.*

Course Title: Software Design pattern
Code: 2060038025
Credit: 2 Credits Theory

Course Outline: Design Concept - The Design Process, Design Concepts, The Design Model; Architectural Design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Assessing, Alternative Architectural Designs, Architectural Mapping Using Data Flow; Component-Level Design: What Is a Component, Designing Class-Based Components, Conducting Component-Level Design, Component-Level Design for WebApps, Designing Traditional Components, Component-Based Development; User Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps, Web App Interface Design, Design Evaluation

References:

1. *Bernd Bruegge, Allen H. Dutoit Object-Oriented Software Engineering: Using UML, Patterns and Java, 3rd Edition.*
2. *Design patterns Elements of reusable object-oriented software, Erich Gamma, Richard Helm, Ralph Johnson, john Vlissides.*

Course Title: Software Project Management Project
Code: 2064301020
Credit: 2 Credits Lab.

Course Outline: Project evaluation and selection, scope management, team building, stakeholder management, risk assessment, scheduling, quality, rework, negotiation, and conflict management. Professional issues including career planning, lifelong learning, software engineering ethics, and the licensing and certification of software professionals.

Course Title: Software Engineering Project
Course Code: 2060421010
Course Credit: 1 Credit Lab.

Course Outline: Concepts of software engineering: requirements definition, modular, structure design, data specifications, functional specifications, verification, documentation, software maintenance, Software support tools. Software project organization, quality assurance, management and communication skills.use these concepts and make individual projects.

Course Title: Human-Computer Interaction Technology
Code: 2060283020
Credit: 2 Credits Theory

Course Outline: Foundations of human computer interaction: understanding and conceptualizing interaction; Understanding users: human perception, ergonomics, cognition, psychology; Task Analysis; User Interface Design, interface programming, graphical user interfaces, user survey, user journey and experience, mobile devices, multimodal interfaces and ubiquitous computing, user-centered system development and evaluation, user- centered software development and evaluation; Prototyping; Interaction design for new environments; Affective and social computing; Assistive and augmentative communication, assistive technology and rehabilitation; Human machine interface, brain computer interface; Experimental research ethics.

References:

1. *Andy Downton,"Engineering the Human-Computer Interface (Essex Series in Telecommunications and Information Systems)", McGraw Hill, 1993.*

Semester 7 (4th year 1st semester)

Course Title: Software Testing Project Course Exercise
Course Code: 2064302020
Course Credit: 2 Credits Lab

Exercise Outline: The students will be divided into small groups having at most 3 members and a class project will be given to them for preparing a system test case. They must validate the requirements and create Mock UIs during the preparation of test cases. Besides, each of the students will relate their learnings on unit, regression, performance and security testing, debugging, behavior driven development via different tools like JUnit, Selenium, Apache JMeter, Sprajax, Sqlninja, Bugzilla, Cucumber

Course Title: Software Testing Technology
Course Code: 2060152020
Course Credit: 2 Credits Theory

Course Outline: The Psychology and Economics of Software Testing, Software Testing Life Cycle (STLC), Software Testing Terminology and Methodology, V&V Model, Dynamic Black Box Testing – Boundary Value Analysis, Equivalence Partitioning, State Transition based Testing, Decision Table based Testing, Cause-Effect Graphing based Testing and Error Guessing, Dynamic White Box Testing – Basis Path Testing, Data Flow Testing and Mutation Testing, Inspections, Walkthroughs, Technical Reviews, Unit Testing, Integration Testing, Function Testing, System Testing, Acceptance Testing, Regression Testing, Test Management – Test Organization, Test Plan, Test Design and Specifications, Software Metrics, Software Quality, Quality Control and Quality Assurance, Quality Management and Project Management, Software Quality Metrics, Testing Internet Applications - Security and Performance Testing, Debugging, Test Driven Development (TDD), Behavior Driven Development (BDD)

References:

1. *Bill Hetzel.The Complete Guide to Software Testing,1993.*
2. *Ron Patton.TheSoftware Testing (2nd Edition). SAMS Publishing, 2006.*

Course Title: Data Mining and Warehouse

Code: 2060288020
Credit: 2 Credits Theory

Course Outline: Introduction to Data Mining, Knowing Data (Data objects, similarities and dissimilarities, statistical descriptions and visualizations), Data Pre-processing, Data Warehousing and Online Analytical Processing, Data Cube technology, Mining frequent patterns, Classification and Cluster Analysis, Research trends in Data mining and warehousing**.**

References:

1. *Introduction to Data Mining (Second Edition) Book by Michael Steinbach, Pang-Ning Tan, and Vipin Kumar.*

Course Title: Introduction of Information Security
Code: 2060112020
Credit: 2 Credits Theory

Course Outline: Introduction to computer security, CIA TRIAD, Threats and Attacks, Passive and Active attacks and examples of passive as well as active attacks, security mechanisms, network security model; Hashing, Cryptography, Introduction to Symmetric key and Asymmetric key encryption; One way authentication protocols, Needham Schroeder protocol, Needham-Schroeder Symmetric key protocol Anomaly in Needham Schroeder Symmetric key protocol, Needham-Schroeder Asymmetric key protocol (Kerberos); IP Sec, Intrusion Detection System (IDS) (Firewall), TLS, HTTPS, TELNET, SSH, Wire-shark; Wireless network security: WEP, WPA, WPA2; Secure Hash Algorithm (SHA), Digital Signature Standard (DSS); Advanced network security topics.

References:

1. *Introduction to Information Security: A Strategic-Based Approach 1st Edition by Timothy Shimeall (Author), Jonathan Spring (Author).*
2. *Information Security (2th edition): Mark Rhodes-Ousley.*

Course Title: Computer Graphics
Code: 2060339020
Course Credit: 2 Credits Theory

Course Outline: Introduction: History of computer graphics, graphics architectures and software, imaging: pinhole camera, human vision, synthetic camera, modeling vs. rendering OpenGL: architecture, displaying simple two-dimensional geometric objects, positioning

systems, working in a windowed environment Color: Color perception, color models (RGB, CMY, and HLS), color transformations. Color in OpenGL. RGB and Indexed color. Input: working in a network environment, client-server computing; input measure, event, sample and request input, using callbacks, picking. Geometric transformations.

References:

1. *Computer Graphics, Principle and Practices – James D. Foley, Andries van Dam, Steven K. Feiner and John F. Hughes.*

Course Title: Mobile Device Programming
Code: 2060284020
Credit: 2 Credits Theory

Course Outline: Web architecture and HTTP: History and architecture of the World Wide Web, overview of the HyperText Transfer Protocol, other related protocols; Hyper Text Markup Language: The concept of markup, overview of HTML (table, form, frame, window, link etc.); Cascading Style Sheets: Overview of CSS (selectors, different CSS properties and values); Client side scripting: Variables, data types, control structure, functions, Document Object Model (DOM), event handlers, properties, methods, cookies; Server side scripting: Concepts, variables, data types, control structure, functions, objects, regular expressions, mails, cookies, sessions and a related web framework; Database: Content generation, data exchange; Layered or Multi-tier Architecture for Web Applications; MVC; Content Management System.

References:

1. *Android Programming: The Big Nerd Ranch Guide (2nd Edition)*

Course Title: Net Programing
Code: 2060286020
Credit: 2 Credits Theory

Course Outline: course will cover the practical aspects of multi-tier application development using the .NET framework. The goal of this course is to introduce the students to the basics of distributed application development. We will introduce the students to Web Service development and .NET remoting. Technologies covered include the Common Language Runtime (CLR), .NET framework classes, C#, ASP.NET, and ADO.NET. We will also cover service oriented architecture, design, performance, security, content management systems and deployment issues encountered in building multi-tier distributed applications.

References:

1. *.Net Programming: A Practical Guide Using C# 1st Edition by Pradeep Tapadiya (Author).*

Course Title: Production Practice
Code: 2064104040
Credit: 4 Credits Lab

Course Outline: Each of the students should complete the software project separately. They will be marked based on their individual software. Students will be encouraged to develop software which requires significant “problem solving” effort. The project should be sufficiently large and the size of the project will mostly depend on “problem solving” effort. Besides, students must showcase the skills they have acquired from their so far completed courses.

Course Title: Artificial Intelligence and Expert System
Code: 2060290020
Credit: 2 Credits Theory

Course Outline: Intelligent Agents and their Environments - The concept of a Rational Agent, Specifying the Task environment (PEAS description), Different characteristics of environments (Fully vs Partially observable, Static vs Dynamic, Episodic vs Sequential etc.) and Different types of agents (Reflex, Goal-based, Utility-based etc.),Search - Formulating a search problem , Uninformed Search strategies: BFS, DFS, DLS, ID-DFS, their working principles, complexities, relative advantages and disadvantages, Informed (heuristic) Search strategies: Greedy Best-first search, A* search: Working principle, Characteristics of heuristics (admissibility and consistency), Proof of A*’s optimality, Local search: Hill Climbing, Searching with non-deterministic actions: AND-OR search trees and Searching with partial observability: Belief state-space search, Adversarial Search - Formulation of a Game tree, The minimax algorithm, Alpha-Beta pruning: Its rationale, working principle and Additional techniques such as Move ordering and Search cut-off, Probabilistic Reasoning - Bayes’ rule and its uses, Bayesian Network: Building a Bayes-net and making inference from it, Markov Chains and Hidden Markov Models: Transition and Sensor models, Building and HMM, applications of HMM, Inference in temporal models: Filtering, Prediction, Most Likely explanations (Viterbi algorithm) etc. and Particle Filters: basic working principle, Making Decisions - Decision theory and Utility theory: Lottery, Utility functions, Maximum Expected Utility principle, Constraints of Utility (Orderability, Transitivity etc) and Markov Decision Processes: Policies, Rewards, Optimal policies and the Utility of States, Value Iteration, Supervised Learning - Basic concepts of classification and supervised learning: Training set, Test set, Overfitting, Underfitting etc., Decision trees: Basic understanding, Learning a Decision tree through entropy calculation, Nearest Neighbor

classifier: Basic working principle, Relative advantages and disadvantages, Naive Bayes classifier: Basic working principle, Calculating classification procedures, Relative advantages and disadvantages, Artificial Neural Network: Basic working principle, Basic structure and calculation of a perceptron, Basics of backpropagation algorithm and Support Vector Machines: Basic working principle, Unsupervised Learning (Clustering) - Basic concepts and applications of Clustering, Different types of Clustering: Partitional vs. Hierarchical, Exclusive vs Overlapping vs Fuzzy, Complete vs Partial, K-means Clustering: Basic working principle, characteristics, advantages, disadvantages, Agglomerative Hierarchical Clustering: Basic concepts, Representations (Dendrograms and Nested cluster diagrams), Different techniques to define cluster proximity: Single link, Complete link, Group average, Centroid method, their relative advantages and disadvantages and DBSCAN: Basic principle and applications, Classification of points (Core, Border and Noise), Reinforcement Learning - Understanding basics of Reinforcement Learning: MDPs, Policies, Rewards, Utilities etc., Passive and Active Reinforcement Learning

References:

1. *Artificial Intelligence: A modern Approach (4th Edition). Stuart J.Russell and Peter Norvig.*

Course Title: Distributed Programming
Code: 2060157020
Credit: 2 Credits Theory

Course Outline: Foundations - Characterization of DS, System Models, Networking and Internetworking, Interprocess Communication, Remote Invocation, Indirect Communication and Operating System Support Middleware - Dist. Objects and Components, Web Services and Peer-toPeer Systems System services – Security, Distributed File Systems and Name Services Distributed algorithms - Time and Global States, Coordination and Agreement Shared data, Transactions and Concurrency Control, Distributed Transactions, and Replication, New challenges -Mobile and Ubiquitous Computing.
Short Lab: Introduction to Message passing technology and its applications, Sockets Programming, Remote Procedure Calls code implementation, Synchronization assignments, Group Communication code implementation, Distributed mutual exclusion assignment, Implementation of Election Algorithms, Implementation of Distributed File system: MapReduce, Spanner, Distributed Systems Design assignments: Cloud Services and Content Delivery Networks configuration.

References:

1. *Distributed Systems (3th Edition). Maarten van steen, Andrew S.Tanenbaum.*

Semester 8 (4th year 2nd semester)

Course Title: Graduation Design
Code: 2064108130
Credit: 12 Credits

Outline: Each student can perform a software development or research project. For a research project a student has to submit a thesis. For a software development project, a student should submit documents having the following: Project proposal, Software Requirements Specification, Software Design Specification, Software Test Plan and User Manual. Besides, each of the students has to give multiple intermediate presentations to report their project progress.