PROBABILITY AND STATISTICS

ENSH 304

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : I**
Practical	**: 0**	

Course Objectives:

The objective of this course is to equip students with foundational knowledge in probability and statistics, focusing on core concepts essential for engineering applications. Students will develop essential skills in statistical data analysis, enabling them to apply various statistical techniques to address real-world engineering challenges. Additionally, the course emphasizes the interpretation and effective communication of statistical results, preparing students to make informed, data-driven decisions in their professional practice.

1 Descriptive Statistics and Basic Probability (6 hours)

1.1 Introduction to statistics and its importance in engineering
1.2 Measure of central tendency and measure of variation
1.3 Graphical representation of data: Histograms, box plots and scatter plots
1.4 Basic probability concepts, additive law, multiplicative law
1.5 Conditional probability and Bayes' theorem

2 Probability Distributions and Sampling Distribution (14 hours)

2.1 Random variables: Discrete and continuous
2.2 Expectation and variance of discrete and continuous random variables
2.3 Discrete probability distributions: Binomial, Poisson, negative Binomial
2.4 Continuous probability distributions: Normal, Gamma, Chi-Square
2.5 Population and sample
2.6 Sampling distribution of mean and proportion
2.7 Central limit theorem

3 Statistical Inference (14 hours)

3.1 Point estimations and properties of estimators
3.2 Confidence intervals for mean and proportions
3.3 Hypothesis testing, parametric and non-parametric tests, procedure of hypothesis
3.4 Hypothesis testing of mean (Single mean, two means, paired t-test and one-way)
3.5 Goodness of fit tests and independence of attributes (Chi-square and Kolmogorov–Smirnov test)

4 Correlation and Regression (6 hours)

4.1 Correlation analysis and test of linear correlation
4.2 Simple regression analysis, the concept of explained, unexplained, and total
4.3 Multiple regression analysis

5 Statistical Quality Control (5 hours)

5.1 Quality control and its importance in engineering
5.2 Control charts for variables (X-bar, R-chart, P-chat)
5.3 Six sigma concepts

Tutorial (15 hours)

1. Visualize data, compute central tendency, and variance in engineering proble ms using computer software
2. Solve different engineering problems involving probability
3. Solve different engineering problems involving discrete probability distribution and its interpretation
4. Solve different engineering problems involving continuous probability distributi on and its interpretation
5. Analyze numerical engineering datasets, perform normality tests, confidence i ntervals, significance tests of means, and ANOVA
6. Analyze categorical engineering datasets, perform crosstabulation, proportion tests, Chi-Square tests, and draw conclusions using computer software
7. Calculate the correlation coefficient and perform correlation tests on engineeri ng data
8. Fit and interpret simple/multiple regression models on engineering data using computer software
9. Use control charts for process monitoring on sample engineering data.
10. Create control charts using computer software

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks distribution*
1	6	10
2	14	15
3	14	20
4	6	10
5	5	5
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Ronald, E.W., Raymond, H.M., Sharon, L.M. (2012). Probability & Statistics for Engineers & Scientists (9th edition). Boston USA: Prentice Hall.
2. Richard A.J. (2018). Probability and Statistics for Engineers (9th edition). Edinburgh Gate: Pearson Education Limited
3. Sheldon M.R. (2009). Introduction to Probability and Statistics for Engineers and Scientists (4th edition). London: Elsevier Inc.
4. Jay L.D. (2012). Probability and Statistics for Engineering and Sciences. Boston: Thomson Brooks/Cole
5. Brian S.E., Ibrsten H. (2010). A Handbook of Statistical Analyses Using R (2nd edition). London: CRC Press Taylor & Francis Croup
6. Andy F. (2018). Discovering Statistics Using IBM SPSS Statistics (5th edition). London: SAGE Publications.

DATABASE MANAGEMENT SYSTEM

ENCT 301

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : I**
Practical	**: 3**	

Course Objectives:

The objective of this course is to provide a comprehensive understanding of the principles and practices involved in the design and implementation of database systems. It enables students to develop data models, and perform data modification, processing, and management efficiently. The course also introduces advanced concepts such as object-oriented databases, data warehousing, data processing, and big data management.

1 Introduction (3 hours)

1.1 Application and evolution of database

1.2 Data abstraction (Physical, logical, and view level) and data independence

1.3 Schema and instances

2 Data Models (7 hours)

2.1 Introduction to data models (Entity-relationship, relational, object model, hierarchical, network, graph data models)

2.2 E-R model

2.2.1 Entities and entity sets

2.2.2 Attributes and keys

2.2.3 Strong and weak entity sets

2.2.4 Relationship and relationship sets (Mapping cardinalities)

2.2.5 Specialization, generalization and aggregation

2.3 Relational model

2.3.1 Concept of relational model, key constraints

2.3.2 Converting ER model into relational model

3 Relational Query Languages (7 hours)

3.1 Relational algebra

3.2 Concept of DDL, DML and DCL

3.3 Overview of the SQL query language-DDL and DML queries

3.4 Set operations

3.5 Aggregate functions – GROUP BY – HAVING

3.6 Joins and types of joins
3.7 Nested sub queries
3.8 Database modification (Insert, update, delete)
3.9 Views
3.10 Triggers and stored procedures
3.11 Privilege and roles management – GRANT and REVOKE statements

4 Database Constraints and Normalization (6 hours)

4.1 Integrity constraints and domain constraints
4.2 Assertions
4.3 Functional dependencies
4.4 Different normal forms (1NF, 2NF, 3NF, BCNF)

5 Query Processing and Optimization (4 hours)

5.1 Query processing, optimization and evaluation
5.2 Transformation of relational expressions
5.3 Techniques of implementing query optimization - Cost based optimization and heuristic optimization
5.4 Query evaluation -Materialization and pipelining
5.5 Denormalization for performance
5.6 Materialized view
5.7 Performance tuning

6 File Structure and Hashing (5 hours)

6.1 Disks and storage
6.2 Records organizations
6.3 Ordered indices
6.4 B+ tree index
6.5 Hashing concepts - Static and dynamic hashing

7 Transaction Processing and Concurrency Control (5 hours)

7.1 Transaction and transaction model - State diagram
7.2 Acid properties
7.3 Concurrent execution of transactions
7.4 Serializability (Conflict and view serializability)
7.5 Lock based protocols
7.6 Deadlock handling and prevention
7.7 Multiple granularity

8 Crash Recovery (4 hours)

8.1 Failure classification
8.2 Recovery and atomicity

8.3 Log-based recovery
8.4 Shadow paging
8.5 High availability using remote backup systems

9 Advanced Database Concepts (4 hours)

9.1 Concept of object-oriented databases
9.2 Distributed database model
9.3 Concept of data warehousing and online analytical processing
9.4 Basic concepts of NoSQL and big data

Tutorial (15 hours)

1. Designing ER model for sample cases
2. Converting an ER diagram to a relational schema
3. Practice with simple relational algebra queries
4. Insert, update and delete with relational algebra queries using assignment operator
5. Executing DDL commands to create a database, define primary and foreign key constraints
6. Simple queries with SELECT and filtering
7. Complex queries with joins and sub-queries
8. Aggregating data with GROUP BY and HAVING
9. Database manipulation with INSERT, UPDATE and DELETE queries
10. Creating and using views
11. Creating users, roles and using GRANT and REVOKE statements
12. Triggers and stored procedures
13. Identifying functional dependencies and normal forms
14. Decomposing a table into BCNF and 3NF
15. Introduction to NoSQL databases with MongoDB

Practical (45 hours)

1. Database server installation and configuration
2. DB client installation and connection to DB server. Introduction and practice with SELECT command with the existing DB
3. Further practice with DML queries – Select, insert, update and delete
4. Advanced queries with joins and subqueries
5. Aggregation and grou8ping
6. Practice with DDL commands – Create/alter/drop table, integrity constraints and views
7. Triggers and stored procedures
8. Query processing, optimization, performance tuning and database administration
9. Group project work

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	**Hours**	**Marks distribution***
1	3	3
2	7	9
3	7	9
4	6	9
5	4	6
6	5	8
7	5	8
8	4	4
9	4	4
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Silberschatz, A., Korth, H.F., Sudarshan, S. (2019). Database system concepts. McGraw-Hill.
2. Elmasri, R., Navathe, S.B. (2021). Fundamentals of database systems. Pearson.
3. Ramakrishnan, R., Gehrke, J. (2002). Database management systems. McGraw-Hill.
4. Connolly, T.M., Begg, C.E. (2021). Database systems: A practical approach to design, implementation, and management. Pearson.

COMPUTER NETWORKS

ENCT 304

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : I**
Practical	**: 3**	

Course Objectives:

The objective of this course is to provide fundamental concepts and principles of computer networks. It focuses on various network architectures, protocols, standards, and the networking device functionalities. The course also aims to equip students with the skills to design, implement, test and troubleshoot basic network configurations.

1 Introduction (5 hours)

1.1 Computer network, importance and applications
1.2 Types of computer networks
1.3 Network topologies
1.4 Client/server and P2P networks
1.5 Protocols and standards, need of standardization
1.6 Layered network architecture, OSI and TCP/IP reference models
1.7 Addressing at different layers
1.8 Networking devices: Repeater, hub, bridge, switch, router, gateway

2 Physical Layer (5 hours)

2.1 Network monitoring: Bandwidth, throughput, delay, round-trip-time
2.2 Multiplexing - FDM, TDM, WDM
2.3 Switching - circuit switching, packet switching, datagram and virtual circuit switching
2.4 Transmission media - Guided (twisted pair, coaxial, optical fiber) and unguided media (radio waves, microwaves, infrared)
2.5 Ethernet cable standards (twisted pair and optical fiber)
2.6 Data encoding: Manchester, NRZ-I, MLT3, 4B/5B

3 Data Link Layer (8 hours)

3.1 Data link layer functions - Framing, error control, flow control, access control
3.2 Error control codes: Parity, checksum, CRC
3.3 Data link protocols: PPP, HDLC
3.4 Logical link control (LLC) and media access control (MAC) sublayers
3.5 Random access protocols: ALOHA, CSMA, CSMA/CD, CSMA/CA

3.6 Token based protocols: Token bus, token ring, FDDI
3.7 Ethernet (IEEE 802.3) and its evolution, bridged and switched Ethernet
3.8 WLAN (Wi-Fi) and IEEE 802.11
3.9 VLAN and its importance
3.10 Virtual circuit switching: ATM, MPLS

4 Network Layer (12 hours)

4.1 Network layer functions and services
4.2 Connection oriented and connectionless network services
4.3 Logical addressing and its importance
4.4 IPv4 addressing and classes, private and public IP address, sub-netting and super-netting, VLSM, CIDR
4.5 Unicast, multicast and broadcast addresses
4.6 Routing and types of routing: Static and dynamic, unicast and multicast, interior and exterior, distance vector and link state
4.7 Routing protocols: RIP, OSPF, EIGRP, BGP
4.8 Network address translation (NAT)
4.9 IPv6 addressing, need and features of iPv6
4.10 Protocols: IPv4, ARP, ICMP, IPv6, ICMPv6
4.11 Transition from IPv4 to IPv6 and strategies
4.12 Traffic shaping and congestion control mechanisms

5 Transport Layer (5 hours)

5.1 Transport layer functions and services
5.2 Elements of transport layer protocols: process-to-process communication, addressing, multiplexing and de-multiplexing, segmentation and reassembly, error control, flow control
5.3 Transport protocols: TCP and UDP
5.4 TCP services: connection setup and release, reliable, stream oriented, flow-control, error-control
5.5 Introduction to socket and socket programming

6 Upper Layers and Network Design (6 hours)

6.1 Functions and services of session, presentation and application layers
6.2 Introduction to upper layer protocols: DHCP, HTTP, HTTPS, FTP, SMTP, POP, IMAP
6.3 DNS, its function and DNS queries
6.4 Network management tools and protocols (SNMP)
6.5 Basics of web, e-mail, DNS and proxy server configurations
6.6 VoIP, FoIP and IP interconnection
6.7 Network design and configuration guidelines

7 Advanced Topics (4 hours)

7.1 Introduction to software-defined networking (SDN), basic architecture, importance and applications
7.2 Network security and its importance
7.3 Overview of content delivery networks (CDNs), named data networking (NDN), intent based networking (IBN)
7.4 Quantum network, network virtualization and recent trends in networking

Tutorial (15 hours)

1. Comparison of OSI and TCP/IP models
2. Comparison of twisted-pair, coaxial, and fiber optic in terms of cost, bandwidth, applications and so on
3. Datalink layer frames and framing techniques
4. Comparison of CSMA/CD and CSMA/CA
5. IP address classes, reserved IP addresses, subnetting (FLSM and VLSM), supernetting, comparison between IPv4 and IPv6
6. Comparison of different routing protocols with their applications
7. TCP and UDP protocols, their applications
8. TCP 3-way handshake with message flow
9. Application protocols to services (HTTP → Web, SMTP → Email, FTP → File transfer, DNS → Name resolution)
10. Working of DNS

Practical (45 hours)

1. Network cabling: Preparation of network cables and their uses
2. Network commands which are very important for testing and troubleshooting
3. Basic router configurations, basic network setup: IP address, subnet mask, default gateway
4. Subnetting and supernetting
5. Configuration of static routes and default routes
6. Dynamic routing configurations: RIP, EIGRP, OSPF, BGP
7. Configuration of switch, VLAN configuration and inter-VLAN routing
8. Server configurations: DHCP, web, DNS
9. Wireless network setup and packet analysis
10. Network troubleshooting: Diagnosing and resolving network issues
11. Network design: Design a complete network on given requirements using simulators like Cisco packet tracer or GNS3 or Mininet or equivalent tool
12. Presentation and review

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks distribution*
1	5	6
2	5	6
3	8	12
4	12	15
5	5	6
6	6	9
7	4	6
Total	**45**	**60**

* There may be minor deviations in marks distribution.

References

1. Forouzan, B. A. (2012). Data communications and networking. McGraw-Hill.
2. Kurose, J. F., Ross, K. W. (2017). Computer networking: A top-down approach. Pearson.
3. Tanenbaum, A.S., Feamster, N. (2021). Computer networks. Pearson.
4. Stevens, W.R., Fall, K.R. (2011). TCP/IP illustrated: The protocols. Addison-Wesley.
5. RFCs and online resources for protocol specifications.

COMPUTER ORGANIZATION AND ARCHITECTURE

ENCT 303

Lecture : 3 **Year : III**
Tutorial : 1 **Part : I**
Practical : 3/2

Course Objectives:

The objective of this course is to provide the organization and architectural concept of computer system including processor architecture, computer arithmetic, memory system, I/O organization, multiprocessor and multicore.

1 Introduction (5 hours)

1.1 Organization and architecture
1.2 Structure of a computer, single processor, multi-core computer
1.3 Performance assessment
  1.3.1 Clock speed and instruction per second
  1.3.2 Instruction execution rate: CPI, MIPS rate, MFLOPS rate, arithmetic mean, harmonic mean, speed metric, geometric mean, rate metric, Amdahl’s law, speed up
1.4 Computer function
  1.4.1 Instruction fetch and execute
  1.4.2 Instruction cycle state diagram
1.5 Computer component, interconnection structure, bus interconnection, PCI
1.6 RISC architecture, overlapped register windows, Berkeley RISC

2 Central Processing Unit (CPU) (7 hours)

2.1 Processor bus organization
2.2 Processor register organization: Control word, examples of microoperations
2.3 Stack organization: Register stack, memory stack, reverse polish notation, evaluation of arithmetic expressions
2.4 Instruction formats: CPU organization, zero and more address instruction formats
2.5 Addressing modes: Types, examples, strengths and weaknesses
2.6 Instruction set
  2.6.1 Data transfer instruction
  2.6.2 Data manipulation instruction: Arithmetic, logical and shift operations
  2.6.3 Program control instruction
2.7 Status bit conditions
2.8 Interrupt: Definition, types, processing and ISR

3 Control Unit (5 hours)

3.1 Hardwired control unit
3.2 Microprogrammed control unit
3.3 Microinstructions, control memory organization, Wilkes control
3.4 Microinstruction sequencing: Design considerations, sequencing techniques, address generation, microinstruction encoding
3.5 Application of microprogramming
3.6 Microinstruction execution

4 Memory System (7 hours)

4.1 Characteristics of memory system
4.2 Memory classification and hierarchy
4.3 Semiconductor memory and its types, read only memory, read/write memory
4.4 Ram modules and interfaces: DDR, DIMM and SODIMM
4.5 Cache memory
    4.5.1 Cache principles
    4.5.2 Elements of cache design: Cache size, mapping function, replacement algorithms, write policy, block size, single and multi-level caches and unified versus split cache
4.6 External memory
    4.6.1 Magnetic disk
    4.6.2 RAID: Level 1 to 5
    4.6.3 Optical memory
    4.6.4 Magnetic tape
    4.6.5 SSD

5 Computer Arithmetic (8 hours)

5.1 ALU (Arithmetic and logic unit)
5.2 Integer representation: Sign-magnitude representation, two's complement representation, converting between different bit lengths, fixed-point representation
5.3 Integer arithmetic
    5.3.1 Addition and subtraction algorithm
    5.3.2 Multiplication algorithm
    5.3.3 Division algorithm
5.4 Floating-point arithmetic
    5.4.1 Floating-point representation: Principles, IEEE standard for binary floating-point arithmetic algorithm
    5.4.2 Addition and subtraction algorithm
    5.4.3 Multiplication algorithm
    5.4.4 Division algorithm

6 Pipelining and Vector Processing (4 hours)

6.1 Pipelining and its importance
6.2 Instruction and arithmetic pipelining
6.3 Pipelining hazards: Data, structural and control hazards
6.4 RISC pipeline
6.5 Parallel processing
6.6 Vector processing
    6.6.1 Vector operations
    6.6.2 Matrix multiplication
    6.6.3 Memory interleaving
    6.6.4 Superscalar processors
    6.6.5 Supercomputers
6.7 Array processors: Attached array processor and SIMD array processor

7 Input/Output (5 hours)

7.1 External devices
7.2 I/O modules: Module function, module structure
7.3 Programmed I/O, I/O commands, I/O instructions, flowchart
7.4 Interrupt driven I/O, interrupt processing and flowchart
7.5 Direct memory access (DMA): Drawbacks of programmed and interrupt-driven I/O, DMA function, typical DMA block diagram and possible DMA configuration
7.6 I/O channels and processors: The evolution of the I/O function, characteristics of I/O channels
7.7 The external interface: Types of interfaces, point-to point and multiple configurations, small computer system interface (SCSI)

8 Multiprocessor System (4 hours)

8.1 Multiprocessor computers and their characteristics
8.2 Multi-core computers and their architecture
8.3 Interconnection structure: Time-shared common bus, multiport memory, crossbar switch, multistage switching network and hypercube system
8.4 Interprocessor arbitration
8.5 Interprocessor communication and synchronization

Tutorial (15 hours)

1. Numerical examples on performance assessment
2. Design of arithmetic circuit, logic circuit and ALU
3. Coding examples covering different instruction formats
4. Microprogramming examples in CU
5. Cache memory mapping: Hit and miss ratio
6. Numerical examples for various arithmetic algorithms
7. Memory and I/O interfacing

Practical **(22.5 hours)**

There will be about 6 lab exercises based on various arithmetic algorithm, cache memory and vector processing using any high-level language, MATLAB or other simulator.

1. Addition and subtraction algorithm
2. Multiplication algorithm
3. Division algorithm
4. Cache mapping techniques
5. ALU implementation
6. Vector processing implementation

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks distribution*
1	5	6
2	7	10
3	5	6
4	7	10
5	8	10
6	4	6
7	5	6
8	4	6
Total	**45**	**60**

* There may be minor deviation in marks distribution.

References

1. Stallings, W. (2018). Computer organization and architecture. Prentice Hall of India.
2. Mano, M. M. (2008). Computer system architecture. Pearson Education.
3. Hennessy, J. L., Patterson, D. A. (2000). Computer architecture: A quantitative approach. Harcourt Asia.

WEB APPLICATION PROGRAMMING

ENCT 302

Lecture	**: 3**	**Year : III**
Tutorial	**: 1**	**Part : I**
Practical	**: 3**	

Course Objectives:

The objective of this course is to provide comprehensive understanding of web technologies for developing responsive and interactive web applications. The course emphasizes the use of modern front-end frameworks and tools, as well as techniques for integrating front-end interfaces with back-end APIs and databases. By the end of the course, students will be able to design, implement and evaluate contemporary applications while exploring current trends and future directions in web development.

1 Introduction (6 hours)

1.1 Overview of web applications and evolution of web architecture
1.2 Client-server architecture, HTTP, HTTPS, URLs, DNS, web browsers
1.3 Html basics: Syntax, tags, attributes, forms and inputs, tables, lists, multimedia, semantic HTML5 elements
1.4 CSS basics: Selectors, properties, values, box model
1.5 CSS framework: Bootstrap

2 JavaScript and Client-Side Programming (12 hours)

2.1 JavaScript essentials
  2.1.1 Data types, variables, control structures, functions
  2.1.2 Dom manipulation, events, and form validation
  2.1.3 Local storage and session storage
  2.1.4 GUI interactions
  2.1.5 JavaScript library: jQuery
2.2 Modern JavaScript (ES6+)
  2.2.1 Arrow functions, destructuring, spread/rest operators
  2.2.2 Callbacks, promises, async/await
  2.2.3 Modules and imports
2.3 Client-side applications
  2.3.1 Client-side web application development using React JS library
  2.3.2 Traditional multi-page apps vs. single-page apps (SPAs)
  2.3.3 Component-based UI and props
  2.3.4 State management and data flow
  2.3.5 Client-side routing and navigation without reloads
  2.3.6 Fetch API: Fetching, displaying data, handling errors and loading states

2.3.7 Comparison of modern JavaScript libraries: React, Angular, Vue

3 Server-Side Web Programming (9 hours)

3.1 MVC architecture in web development
3.2 Role of backend in web applications
3.3 Backend web framework: Django
3.4 Handling requests and responses
3.5 Form data handling and sessions
3.6 Routing, middleware, templating concepts
3.7 Overview and comparison of backend frameworks: Django, flask, fastapi, dot NET MVC framework, ruby on rails, java spring boot, node.js
3.8 Database integration: Relational versus NoSQL, CRUD operations, ORM concept
3.9 Authentication and authorization: Cookies, sessions, JWT
3.10 Middleware for logging, error handling, and security

4 Web Services and APIs (7 hours)

4.1 API basics: Role in web applications
4.2 REST principles and design, RESTful APIs
4.3 JSON versus XML data exchange
4.4 Data validation and serialization
4.5 Microservices

5 Web Application Security (6 hours)

5.1 Common vulnerabilities: XSS, SQL injection, CSRF
5.2 Security best practices: Input validation, sanitization, https, secure cookies, env variables
5.3 Authentication practices and token handling
5.4 Security in full-stack apps: CORS, safe sessions

6 Web Application Deployment and Modern Trends (5 hours)

6.1 Full-stack development
6.2 Testing and QA
6.3 DevOps, continuous integration (CI) and continuous delivery (CD)
6.4 Progressive web apps (PWAs), responsive design and usability

Tutorial (15 hours)

1. Walkthrough of client-server request flow (DNS→HTTP/HTTPS→ Browser)
2. Guided coding: HTML page with semantic tags, styled with CSS grid/flexbox
3. JavaScript and client-side programming
4. Hands-on exercises with DOM manipulation, event handling
5. Form validation and local storage demo

6. Guided task: Small SPA with component-based UI and fetch API integration
7. Discuss request/response cycle with server framework
8. Guided coding: Simple CRUD using Django/Flask (e.g., library system)
9. Session handling and authentication example
10. REST principles with examples
11. Hands-on exercise: Build a simple REST API endpoint and test with fetch/postman
12. Demonstration of XSS and SQL Injection vulnerabilities
13. Guided exercise: Secure login form with input validation and session/token handling
14. Discussion on PWAs, serverless, microservices
15. Case study/tutorial: Compare a traditional app vs. PWA features

Practical **(45 hours)**

1. Build a responsive personal portfolio page using semantic HTML5, CSS grid/flexbox, and media queries
2. Create a dynamic to-do list app with DOM events, localstorage, and JavaScript event handling (using jQuery)
3. Develop a CRUD application (e.g., library system) using a server-side framework (Django/Flask/FastAPI)
4. Create a frontend in React that fetches data from your backend API and displays it dynamically.
5. Extend the CRUD app with user authentication (Login/logout), form validation, and secure token/session handling
6. Develop a comprehensive project that encompasses the complete process of front-end and back-end web application development and deployment. The project should be carried out over at least six to seven lab sessions, covering the following stages: Project proposal, front-end UI/UX design, back-end and database design, API design and integration, testing and deployment, and culminating in a final presentation and demonstration

Final Exam

The questions will cover all the chapters in the syllabus. The evaluation scheme will be as indicated in the table below:

Chapter	Hours	Marks distribution*
1	6	8
2	12	16
3	9	12
4	7	9
5	6	8
6	5	7
Total	45	60

* There may be minor deviation in marks distribution.

References

1. Copes, F. (2019). The JavaScript Handbook. (https://flaviocopes.com/the-javascript-handbook-2019-edition/)
2. Nixon, R. (2025). Learning PHP, MySQL & JavaScript: A Step-by-Step Guide to Creating Dynamic Websites. O’Reilly Media.
3. Vincent, W. S. (2025). Django for Beginners: Build websites with Python and Django.
4. Richardson, L., & Amundsen, M. (2013). RESTful Web APIs: Services for a Changing World. O’Reilly Media.
5. Hoffman, A. (2024). Web Application Security: Exploitation and Countermeasures for Modern Web Applications (2nd ed.). O’Reilly Media.