FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Syllabus

2074

Mahendranagar, Kanchanpur

Far Western University

Faculty of Science and Technology

Course Structure of Bachelor of Science in Computer Science and Information Technology (B.Sc.CSIT)

Year	First Semester			Second Semester		
	Course Code	Course Title	Cr Hrs.	Course Code	Course Title	Cr Hrs.
FRESHMAN	CSIT.111	English Grammar and Composition	3	CSIT.121	Data Structure and Algorithms	3
	CSIT.112	Information Technology Fundamentals	3	CSIT.122	Digital Logic Design	3
	CSIT.113	Calculus and Analytical Gemometry	3	CSIT.123	Linear Algebra	3
	CSIT.114	Electronic Principles TH	3	CSIT.124	Mechanics and Electrodynamics TH	3
	CSIT.114	Electronic Principles PR	1	CSIT.124	Mechanics and Electrodynamics PR	1
	CSIT.115	Programming Fundamentals and C Programming	3	CSIT.125	Microprocessor System	3
		TOTAL CREDITS	16		TOTAL CREDITS	16
Year	Third Semester			Fourth Semester		
SOPHOMORE	CSIT.211	Computer Organization and Architecture	3	CSIT.221	Applied Statistics	3
	CSIT.212	Discrete Structures	3	CSIT.222	Data Communication and Network	3
	CSIT.213	Introduction to Management	3	CSIT.223	Database Management System	3
	CSIT.214	Object Oriented Programming With C++	3	CSIT.224	Numerical Methods	3
	CSIT.215	Operating System	3	CSIT.225	System Analysis and Design	3
	CSIT.216	Statistics and Probability	3	CSIT.226	Theory of Computation	3
		TOTAL CREDITS	18		TOTAL CREDITS	18

Year	Fifth Semester			Sixth Semester		
	CSIT.311	Design and Analysis of Algorithm	3	CSIT.321	Introduction to Cryptography	3
	CSIT.312	Artificial Intelligence	3	CSIT.322	Java Programming I	3
	CSIT.313	Compiler Design	3	CSIT.323	Research Methodology for Computer Science	3
	CSIT.314	Simulation and Modelling	3	CSIT.324	Software Engineering	3
	CSIT.315	Graphics and Visual Computing	3	CSIT.325	Web Technology II	3
	CSIT.316	Web Technology I	3	CSIT.326	Minor Project I	2
		TOTAL CREDITS	**18**		**TOTAL CREDITS**	**17**

Year	Seventh Semester			Eighth Semester		
SENIOR	CSIT.411	E-commerce	3	CSIT.421	Parallel Computing	3
	CSIT.412	Advanced Java Programming	3	CSIT.422	Internship	4
	CSIT.413	Object Oriented Analysis and Design	3	CSIT.423.2	Advanced Database Design (Elective III)	3
	CSIT.414	Minor Project II	3	CSIT.424.2	Distributed Database Management System (Elective IV)	3
	CSIT.415.2	Database Administration (Elective I)	3	CSIT.425.2	E-Business and E-Governance (Elective V)	3
	CSIT.416.1	Data Mining and Warehousing (Elective II)	3			
		TOTAL CREDITS	**18**		**TOTAL CREDITS**	**16**

Total Credit Hours required for Bachelor of Science Computer Science & Information Technology (B. Sc. CSIT): 137

We recommend students to choose any one of following Four Tracks

Track 1: Programming Track
Net Centric Computing (Elective I), Any One from Elective II, Enterprise Application Development with Java (Elective III), Mobile Application Development (Elective IV), Any One from Elective V

Track 2: Database Track
Database Administration (Elective I), Any One from Elective II, Advanced Database Design (Elective III), Distributed Database Management Systems (Elective IV), Any One from Elective V

Track 3: Networking Track
System Administration (Elective I), Any One from Elective II, Network Administration (Elective III), Wireless Networks (Elective IV), Any One from Elective V

Track 4: Algorithmic Track
Image Processing and Pattern Recognition (Elective I), Any One from Elective II, Neural Network (Elective III), Cloud Computing (Elective IV), Any One from Elective V

List of Electives

Elective I (Any ONE)

1. *Net Centric Computing (*CSIT.415.1*)*
2. *Database Administration* (CSIT.415.2)
3. *System Administration(CSIT.415.3)*
4. *Digital Image Processing (CSIT.415.4)*

Elective II (Any ONE)

1. *Data mining and warehousing(*CSIT.416.1*)*
2. *Geographical Information System(*CSIT.416.2*)*
3. *Management Information Systems(*CSIT.416.3*)*
4. *Neural networks(*CSIT.416.4*)*

Elective III (Any ONE)

1. Enterprise Application Development with Java(CSIT.423.1)
2. Advanced Database Design(CSIT.423.2)
3. Network Administration(CSIT.423.3)
4. Real-time Systems(CSIT.423.4)

Elective IV (Any ONE)

5. Mobile Application Development(CSIT.424.1)
6. Distributed Database Management Systems(CSIT.424.2)
7. Wireless Networks(CSIT.424.3)
8. Cloud Computing(CSIT.424.4)

Elective V (Any ONE)

9. Information Retrieval(CSIT.425.1)
10. E-business and E-governance(CSIT.425.2)
11. Embedded System Programming(CSIT.425.3)
12. Human Computer Interaction(CSIT.425.4)

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	11 questions	8	8×5 = 40	40%	24
Group C: Long answer type question/case studies	6 questions	4	4×10 =40	40%	24
			100	100%	60

*Scoring scheme will not follow negative marking.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self study
- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

First Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Far-western University
Faculty of Science and Technology
English

Course Title: English Grammar and Composition
Course No.: CSIT.111
Level: B.Sc. CSIT
Year: First
Semester: First

Credit: 3
Number of hours per week: 3
Total hours: 48

This is a compulsory English course for B.Ed. students irrespective of their major subjects. The course exposes the students to the basic grammar that they require in their day-to-day academic settings at the undergraduate level. The grammar is introduced in context through the texts and further practice is provisioned through exercises. The course also helps students sharpen their reading and writing skills through various texts and composition exercises. Additionally, the course will also introduce critical thinking skills and they will be given opportunities to practice those skills in class through a variety of texts and tasks.

2. Objectives

General objectives of this course are to:

a) help students produce grammatically correct English
b) develop writing skills for the academic work at undergraduate level.
c) expose them to the variety of reading texts
d) give them practice in writing exercises
e) introduce them to the academic vocabulary items used in academic settings
e) develop in students the ability to think critically

3. Contents in detail with Specific Objectives

Specific Objectives	Contents in Detail
• Make sentences using appropriate tenses in speech and writing • Use modals in the correct syntagmatic patterns • Supply correct prepositions, adjectives and adverbs • Use the right verbs in the given contexts • Use conditionals, clauses, questions in the given contexts	**Unit One. Grammar (20 hours)** 1.1. Tenses 1.2. Modals 1.3. Determiners pronouns and noun phrases 1.4. Prepositions, adjectives and adverbs 1.5. Verb structures 1.6. Word formation 1.7. Conditionals, clauses, questions, indirect speech 1.8. Sentences and varieties of English

• Predict and preview texts using a variety of strategies • Read for main ideas • Read and comprehend different text types • Read for details • Locate specific information in texts • Use graphic organizer to comprehend the texts • Identify source of information	**Unit Two. Reading (10 hours)** 2.1. Prediction and previewing skill 2.2. Skimming skill 2.3. Reading for comprehension 2.4. Reading for details 2.5. Scanning skill 2.6. Reading strategies 2.7. Reading sources
• Develop and analyze paragraphs of different genres • Plan and make outline for writing • Revise, edit and rewrite • Write summaries • Write personal response to the texts • Write different letters • Write different types of essays	**Unit Three. Writing (10 hours)** 3.1. Paragraph writing 3.2. Preparing outlines 3.3. Process writing: plan, draft, revise, edit 3.4. Summary writing 3.5. Responding to texts 3.6. Writing letters 3.7. Writing essays
• Use dictionary to find meaning • Identify different types of information in the dictionary • Use academic words in their writing • Find appropriate meaning of new vocabulary in different contexts • Use phrasal verbs in the given contexts • Analyze the composition of words	**Unit Four. Vocabulary (10 hours)** 4.1. Using a mono-lingual dictionary 4.2. Differentiate literal meaning and idiomatic meaning 4.3. Learning selected words from the Academic Word List (AWL) 4.4. Guessing meaning in contexts 4.5. Learning phrasal verbs 4.6. Understanding the composition of words and phrases

• Explain ideas to demonstrate comprehension • Reflect on the ideas in the texts • Connect ideas across texts or readings • Relate personal experience to the topic • Synthesize information from texts and personal experience • Evaluate experiences and events • Consider social responsibility on various levels	**Unit Five. Critical Thinking (5 hours)** 5.1. Comprehension skills 5.2. Reflection on the ideas in the texts 5.3. Connecting ideas across texts or readings 5.4. Relating personal experience to the topic 5.5. Synthesizing skills 5.6. Evaluating experiences and events 5.7. Considering social responsibility on various levels

References

1. Gramer, M.F. and Ward, C. S. (2011). Q: Skills for Success (Reading and Writing) – 3. New York. Oxford University Press. *(All Units)*
2. Lloyd, M. and Day, J. (2011). Active Grammar, Level 3. Cambridge. Cambridge University Press. *(Unit I)*

Dictionary

3. Hornby. A.S. (2010). Eighth Edition. Oxford Advanced Learner's Dictionary. Oxford: Oxford University Press

Information Technology Fundamentals

Course Title: Information Technology Fundamentals
Course No.: CSIT.112
Nature of the Course: Theory+Lab
Level: B.Sc. CSIT
Year: First
Semester: First

Credit: 3
Number of hours per week: 3
Total hours: 48

1. Course Introduction

Fundamental concept of Information technology, Computer systems, computer hardware and Software, input, output and storage devices, Binary system, programming languages, Data files and DBMS, fundamental concept of telecommunication, networking and internet and application of computer systems.

2. Objectives

This course introduces fundamental concepts of Information Technology and Computer Systems.

3. Contents in detail with Specific objectives

Specific Objectives	Contents
• What is data and information? • Describe processing cycle. • Describe what is hardware and software. • Understand the evolution of computers, from refining of abacus to supercomputers. • Understand the advancement in technology that has changed the way computers operate, efficient, size, and cost. • Classify different computers, networks, software's • Understand computer programming languages • Classify different programming languages • Understand the purpose of programming languages, facilities and various common examples.	**Unit I: Computer Concepts (4 Hrs)** Ideas of Information, Information Processing and Data. The Data Processing Cycle. Examples of computer applications. Definition of Hardware; broad classes of computers (mainframe, mini and microcomputers) and networks. Computer programs. The computer as a programmable device. Classes of software (system and application). Programming languages: purpose, facilities and common examples.
• Understand the basic units of computer system (Anatomy of a Digital Computer) • Understand how the basic digital computer is organized • Describe the purpose of basic units of computer systems.	**Unit II: Computer Hardware (4 Hrs)** The Central Processing Unit (Control Unit, Arithmetic and Logic Unit, Main Memory). Peripherals. The organization of a simple computer. The storage of programs and data. Data and Control paths in the computer (buses or highways). The Fetch-execute Cycle.

• Learn about the digital symbols, base. • Understand with the coding schemes for the internal storage of characters. • Understand what are on-line and off-line peripherals and data. • Understand what is verification and validation of data.	**Unit III: Data (2 Hrs)** Its Representation and Input: The Stages (collection, Preparation, verification, input methods). Input Devices and Media. On-line and Off-line peripherals. Verification and Validation methods.
• Familiarise with the various types of input devices along with their advantages, disadvantages, and applications.	**Unit IV: Input Devices (2 Hrs)** Description of common input devices and media (such as keyboards, light pens, mice, magnetic stripe readers, punched media, magnetic and optical character recognition, mark readers...), including simple physical principles of operation and practical applications.
• Familiarize with the various types of output devices to get desired result that may be in various from viz text, graphics, audio, and video; along with their advantages, disadvantages, and applications.	**Unit V: Output Methods, Devices and Media (2Hrs)** Description of Displays, Printers, Plotters and Computer Output on Microfilm, including simple physical principles of operation and applications.
• Understand the purpose of memory. • Familiarize with the different category of memories, units of storage, access time. • Discuss various types of primary and secondary memories with their storage organization.	**Unit VI: Computer Storage (4 Hrs)** Levels of storage: register, main and backing store. Units of storage (bytes and words) and capacities (Kbytes, Mbytes, Gbytes and TBytes). Definition of Access Time. Principles of construction of magnetic tape drives, magnetic disc drives (floppy and hard drives), CD-ROM and DVD; recordable and rewritable compact discs: CD-R and CD-RW.
• Learn about the binary number system and its advantages. • Representation of various number systems, methods of number system conversions. • Specify the rules to perform four principle arithmetic operations- addition, subtraction, multiplication, division of binary numbers with the help of suitable examples • Define two types of real numbers viz. fixed point representation, floating point representation; within floating point(non-normalized and normalized) and their representations in computer	**Unit VII: The Binary System (5 Hrs)** Reasons for employing binary in a computer. The advantages and disadvantages of binary. The binary representation of numbers, characters and program instructions. Octal and Hexadecimal forms. Conversion between decimal, binary, octal and hexadecimal integers. Binary addition. Arithmetic overflow. Boolean logic. Simple AND, OR and NOT functions in two and three variables. Truth Tables. Half-adder and Full-adder logic. Logic diagrams.

memory • Understand truth table and half-adder and full-adder operations	
• Discuss the prominent concepts to natural languages and computer languages. • Acquaints with the different generations of programming languages with their advantages and disadvantages • Elaborates the stages required during translation process (HLL, Assembly language to machine code). • Understand the concept of visual programming language and platform independent. • Outlook on the basic role of operating system in modern day computers; • Learn about the different types of operating systems; • Provide an overview of UNIX/LINUX operating system.	**Unit VIII: Programming Languages (7 Hrs)** Ideas of generations of programming languages: fourth generation (4GL), third generation ('high level'), assembly and binary machine code. Suitable applications for each level; comparisons between the levels. Translator programs - compilers, interpreters and assemblers; source code and object code. The concept of 'visual' languages. Java and the platform independence of its programs. The concept of operating system, functions of operating system, component of operating system, types of operating system. An overview of UNIX operating system.
• Understand the concept behind database, file, record, field and character. • Understand different types of data files and access methods.	**Unit IX: Data Files (4 Hrs)** Definitions of file, record, field and character. The concepts of file organization file access and file processing (updating). The main types of data file such as master and transaction. Serial, sequential and indexed sequential organization. Direct access and serial access. Updating sequential (tape or disc) files and indexed sequential files. Concepts of a simple database.
• Explain the computer related terms, communication networks, and flow of information through different forms of channel. • Understand the concept of serial and parallel transmission, different transmission modes.	**Unit X: Simple Telecommunications (4 Hrs)** Serial and Parallel transmission compared. Simplex, Half-duplex and Duplex modes. Modems and Multiplexors. Simple Interfaces. Character Codes. Basic communications facilities and the concept of bandwidth.
• Understand the various applications of computer systems in different organizations in terms of purpose, hardware, data, processes, outputs, advantages and limitations.	**Unit XI: Common Applications of Computer Systems (4 Hrs)** Non-technical descriptions (purpose, hardware, data, processes, outputs, advantages and limitations) in banking, education, engineering, police, hospitals, credit reference, meteorology, airline reservation and stock control.

• Describe computer networks and its various types. • Discuss various computer network topologies. • Understand the concept of WWW, Internet in terms of their uses, advantages and disadvantages. • Learn about the different browsers and its uses. • Learn various internet application viz email, FTP. • Understand fundamental concepts of HTTP and its uses.	**Unit XII: Networking and the Internet (6 Hrs)** Concepts of Local Area Networks, Wide Area Networks and the Internet. Computer network topologies. The World Wide Web: the concept, its uses and possible disadvantages. Internet Service Providers. Web pages: construction and access; the role of Hypertext Markup Language (HTML) and Java. The concept of electronic mail and its basic uses. The basic functions of browsers.

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	**Total questions to be asked**	**Total questions to be answered**	**Total marks**	**Weightage**	**External exam marks**
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	11 questions	8	8×5 = 40	40%	24
Group C: Long answer type question/case studies	6 questions	4	4×10 =40	40%	24
			100	100%	60

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Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.
Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.
Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.
Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.
Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.
Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.
Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.
Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.
Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self study
- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

6. Recommended Books:

- Longmans , **Glossary of Computing Terms, British Computer Society,** ISBN 0582-36967-3 or ISBN 0582-47594-5
- C S French , **Computer Science,** Fifth edition; Continuum; ISBN 0-8264-5460-7
- Geoffrey Knott and Nick Waites, **Computing**, Third edition; Business Education Publishers; ISBN 1901-888215
- Capron and Johnson, **Computers: Tools for an Information Age**, Eighth edition; Prentice Hall; ISBN 0-13-122723-8
- Ray Bradley; Stanley Thornes, **Understanding Computer Science,** ISBN 0-7487-4046-5
- Alexis Leon, Mathews Leon, **Fundamentals of Information Technology**, Leon TechWorld
- V. Rajaraman , **Fundamentals of Computers**

7. Lab Work

This is the first and introductory course in BSCS and the main objective in lab work in this course is to familiarize students with different operating systems software, use it and operate it. Develop skills to use various desktop applications required for doing day-to-day activities like Microsoft Office Software packages. Course instructor can assign various practical assignments related to the course covered during the theory classes. No specific lab work is required for this course.

Far Western University

Four Years B.Sc. CSIT

Syllabus for Computer Science

Course Title: Calculus and Analytical Geometry **Credit: 3**
Course No: CSIT.113 **Number of period per week: 3**
Nature of the Course: Theory **Total hours: 45**
Year: First, Semester: First
Level: B.Sc.CSIT

1. **Course Introduction**
   The course aims to acquaint the students with the basic concepts of sequence and series of real numbers differential and integral calculus, multivariate calculus and the multiple integrals.
2. **Objectives**
   The general objectives of the course are as follows:
   - To acquaint the students with basic concepts of analysis on sequence and series of real numbers.
   - To enable the students, to understand the differential and integral calculus and its further application.
   - To know the brief idea of vector valued function, multiple integral and multivariate calculus.
3. **Contents in detail with Specific objectives**

Specific Objectives	**Unit 1: Sequence of Real numbers - 5 hours**
• Define the sequence of real numbers with examples • Discuss the meaning of convergent, divergent & oscillatory sequences with examples. • Define the meaning of bounded set, bounded sequence with examples.	1.1 Definition notation and examples. 1.2 Convergent, divergent and oscillatory sequence, definition and examples. 1.3 Bounded set, Bounded sequence definition and examples. 1.4 Monotonic sequence
	Unit 2: Series of Real Numbers - 10 hours
• Give the concept of series of real number with^r sequence of partial sum. • Derive the necessary and sufficient condition for the convergence of series. • Explain the concept of convergence of geometric series with proof. • Explain the concept of comparison test. • Give the proof of convergences of $\sum\frac{1}{n^p}$.	2.1 Sequence of partial sum. 2.2 Convergence of series. If $\sum u_n$ is convergent then $u_n \to 0$ as $n \to \infty$ (with proof) 2.3 Convergence of geometric series (with proof) 2.4 Series of positive terms, comparison test and its limit form (without proof) 2.5 Convergences of $\sum \frac{1}{n^p}$, $P \in R$ (with proof)
	Unit 3: Differential Calculus - 4 hours
• Give the meaning of n^{th} derivative. • Derive Leibnitz theorem and state its application. • Discuss the term partial differentiation and its application.	3.1 n^{th} derivative 3.2 Leibnitz theorem (with proof) and its application 3.3 Partial differentiation
	Unit 4: Integral Calculus - 6 hours
• Give the concept of integration • State and prove the properties of definite integral. • Define the improper integral of different types. • Discuss the meaning of Beta and Gamma function and its important properties. • Derive reduction formula for $\sin^n x$, $\cos^n x$ etc.	4.1 Method of integration. 4.2 Properties of definite, integral. 4.3 Improper integral 4.4 Beta Gamma function and their properties. 4.5 Reduction formula
polar forms. • Discuss the integration in polar coordinates.	5.1 Classifying conic section by eccentricity, 5.2 Plane curves, parametric and polar equations. 5.3 Integration in polar coordinates.

- Explain the meaning of vector in space, lines and planes in space.
- Discuss the term cylindrical and quadric space with their equations.
- Define vector valued function and space curves.
- Define the term tangent, curvature and torsion & derive TNB system completely.
- Give the concept of calculus & multivariate calculus.
- Discuss the concept of functions, limits & continuity of two or more variable.
- Derive the directional derivative and define gradient vectors.
- Define extreme values.
- Give the concept of multiple integral.
- Define double integrals in the rectangular polar coordinate.
- Using multiple integral techniques obtain the areas, moments and centre of mass.
- Discuss triple integrals.

Unit 6: Vectors and Vector valued function - 6 hours

6.1 Vectors in the space.

6.2 Lines and planes in space

6.3 Cylindrical and quadric spaces.

Unit 7: Vectors and Vector valued function - 4 hours

7.1 Double integrals in rectangular polar coordinates.

7.2 Finding areas, moments and centre of mass.

7.3 Triple integrals in rectangular coordinates and application.

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coefficient.

8.3 Directional derivative and gradient vectors.

8.4 Extreme values.

8.5 Lagranges multiplier.

Note: The figures in the parenthesis indicates the approximate periods for the respective units.

Evaluation System:

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Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self study
- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Text Books and References

Text Books

i. Real Analysis: R.G. Bartle, D. Sherbert, 3rd Edition, John wiley & sons India Edition.
ii. Thomas and Fenns: Calculus and Analytical Geometry, 9th Edition, 2004 (Thomas, Jr G.D and Finney Ross L, Publisher Pearson Ed. Pvt. Ltd.

Reference Books

i. (i) Advanced Engineering mathematics: Kreyszing Erwin John Wiley & sons (1991) 5th Ed.
ii) Calculus with analytical Geometry: E.W Swokowski & second Alter Edition.

Course Title: Electronic Principles **Credit: 3+1**
Course No: CSIT.114 **Number of period per week: 3**
Nature of the Course: Theory+Lab **Total hours: 45**
Year: First, Semester: First
Level: B.Sc.CSIT

1. Course Introduction

The course intends to enable the students to be acquainted with the basic concepts and principles of electronics. Students will be familiarized with the fundamentals of circuit analysis, semiconductors, transistors, amplifiers, oscillators, etc.

2. Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in electronics.
- to apply this knowledge base for studying major courses in CSIT.
- to introduce the concepts and methods of electronics needed for application in various branch of CSIT

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand and use Kirchoff's current and voltage law • Distinguish between current source and voltage source • Learn Thevenin's and Norton's theorems and their applications	**Unit I: Circuit Analysis (6)** Kirchoff's current and voltage law, concept of current source, voltage source, application of Kirchoff's current and voltage law to simple circuits, Thevenin's and Norton's theorems and their applications
• Distinguish Intrinsic and extrinsic semiconductors and understand their working • Understand the formation of p-n junction • Explain the diode characteristics • Use diode as a rectifier • Use Zener diode as a voltage regulator • Understand the concept of photodiode and LED	**Unit II: Semiconductors (5)** Intrinsic and extrinsic semiconductors, formation of p-n junction, diode characteristics, diode as a rectifier, Zener diode, photodiode and LED
• Explain the structure and working of bipolar junction transistors • Use CB, CC, CE configurations and explain their characteristics • Derive the relation between α and β • Use of transistor as an amplifier and as a switch	**Unit III: Bipolar Junction Transistor** (8) Structure and working of bipolar junction transistor, CB, CC, CE configurations, CE mode characteristics, relation between α and β, Concept of transistor as an amplifier and transistor as a switch, DC load line and Q point

- Explain the working of JFET and MOSFET
- Understand the I-V characteristics and parameters
- Develop idea of MOS capacitor and memory devices
- Applications of FET as a Voltage Variable resistance (VVR), inverter, switch

Unit IV: Field Effect Transistor (8)
JFET and MOSFET, I-V characteristics and parameters, Idea of MOS capacitor, memory device, CMOS, Applications - FET as a Voltage Variable resistance (VVR), inverter, switch, DRAM

- Understand the classification of amplifier
- Learn frequency response and Q point
- Explain DC coupling and effect on frequency response
- Learn the concept of feedback and amplifiers
- Use of Op-amp as comparator
- Use of amplifiers

Unit V: Amplifiers (12)
General classification of amplifier based on frequency response and Q point, idea of multistage amplifier, Concept of DC coupling and effect on frequency response, concept of feedback, Concept of operational amplifier, characteristics of Op-amp, Op-amp as comparator, Virtual ground concept, Applications - Unity gain amplifier, buffer, inverting amplifier, non-inverting amplifier, Adder, subtractor, integrator and differentiator

- Understand the Barkhausen criteria
- Explain the working of Hartley, Colppits and Phase shift oscillators

Unit VI: Oscillators (5)
Barkhausen criteria, Concept of Hartley, Colppits and Phase shift oscillators

- Differenciate unregulated and regulated power supplies
- Develop the concept of regulators and current boosters

Unit VII: Regulated Power Supplies (4)
Unregulated and regulated power supply, concept of load and line regulation, Shunt and Series regulators, current boosters

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	11 questions	8	8×5 = 40	40%	24
Group C: Long answer type question/case studies	6 questions	4	4×10 =40	40%	24
			100	100%	60

*Scoring scheme will not follow negative marking.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self study
- Assignments
- Presentation by Students
- Term Paper writing

- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Prescribed Text

- *Principles of Electronics*: A. P. Malvino, Tata Mc-Graw Hill Publication, 7th Edition

Reference

- *Basic Electronics*: B. L. Theraja, S.Chand & Company Ltd
- *Electronic Devices and Circuits:* T. F. Bogart, Universal Book Stall, New Delhi
- *Principles of Electronics*: V. K. Meheta, S.Chand & company Ltd. 5th Edition
- *Basic Electronics and Linear Circuits*: N. N. Bhargava, D. C. Kulshreshtha, S. C. Gupta, Tata McGraw Hill Publishing company
- *Electronic Devices and circuits*: Boylstead, Tata Mc-Graw Hill

Course Title: Electronic Principles PR **year: 1st**
Course No: CSIT.114 **Semester: 1**
Nature of the Course: Practical **Credit: 1**
Year: First, Semester: First
Level: Bachelor of Science in Computer Science

Objectives:
By the end of the course the student should be able to:

- measure correctly the basic physical quantities
- determine errors in measurements
- analyze raw data and make valid conclusions
- validate corresponding theoretical component
- develop proper laboratory skills
- design basic physics experiments
- interpret experimental results and draw logical conclusions
- relate theoretical concepts to practical skills

Laboratory Works:

- To draw I-V characteristics of Ohmic and non Ohmic resisters and find voltage current ration.
- To study the junction diode and LED characteristics.
- To study the temperature dependence of resistance of a given semiconductors
- To determine the impedance of a given LCR circuit.
- To study characteristics of NPN transistor.
- To determine dielectric constant by using Lissagous pattern.
- To construct CE amplifier for the determination of the voltage gain of the amplifier.
- To study the characteristic of a Zener a diode (Switches) and use it to regulate power supply.
- To construct and study the working of NOT-AND-OR, NAND and NOR gates.
- To construct and study the working of OR, NAN and NOR gates.

Note:

- Student must perform 6 Hours of lab work (2 Hours x 3 times or 3 Hours x 2 times) every week
- In every semester, at least Eight experiments are to be performed. Additional experiments may be added subject to availability of time.
- The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation	20 %
Final Exam Written	60 %
Final Exam Oral	20 %

Books:

1. *B.Sc. Practical Physics*: C. L. Arora, S Chand and Company Ltd.
2. *Practical Physics:* G. L. Squires, Cambridge University Press.
3. *Practical Physics*, P. K. Shukla and A. Srivastava, New Age International (P) Limited

Course Title: Programming Fundamentals and ‘C’ Programming
Course No.: CSIT.115
Nature of the Course: Theory+Lab
Level: B.Sc. CSIT
Year: First
Semester: First

Credit: 3
Number of hours per week: 3
Total hours: 48

1. Course Introduction

The course intends to enable the students to be acquainted with the basic concepts of programming methodology, ‘C’ Programming language.

2. Objectives

At the end of this course the students should be able:

- To develop a programming logic.
- To teach basic principles of programming.
- To develop skills for writing programs using ‘C’.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define algorithm, use of algorithms • Describe different notations of algorithms • State standard notations and common functions • Classify different Pseudo-code Conventions • Develop fundamental algorithms • Write different algorithms for different problems • Differentiate different programming approaches and their benefits. • Understand the basic structure of C program • Understand different types of data types and qualifiers in terms of memory requirement and range. • Write various programs using different data types, qualifiers.	**Unit I: Introduction To Algorithms and C (8 Hrs)** **Fundamentals of algorithms:** Notion of an algorithm. Pseudo-code conventions like assignment statements and basic control structures. **Algorithmic problems** : Develop fundamental algorithms for (i)Exchange the values of two variables with and without temporary variable, (ii) Counting positive numbers from a set of integers, (iii) Summation of set of numbers, (iv) Reversing the digits of an integer, (v) Find smallest positive divisor of an integer other then 1, (vi) Find G.C.D. and L.C.M. of two as well as three positive integers (vii) Generating prime numbers. **Different approaches in programming:** Procedural approach, Object Oriented approach, Event Driven approach. **Structure of C:** Header and body, Use of comments, Compilation of program. **Data Concepts:** Variables, Constants, data types like: int, float char, double and void. Qualifiers: Short and ling size qualifiers, signed and unsigned qualifiers. Declaring variables. Scope of the variables according to block. Hierarchy of data types.
• Write various ‘C’ programs to perform various types of operations on the data values which are to be processed. • Input various types of data and obtain the output in a desired form • Alter the sequence of the execution of the program • Set up loops to repeat a set of	**Unit II : Basic of C (4 Hrs)** **Types of operators:** Arithmetic, Relational, Logical, Compound Assignment, Increment and decrement, Conditional or ternary, Bitwise and Comma operators, Precedence and order of evaluation. Statements and Expressions. **Type Conversions :** Automatic and Explicit type conversion **Data Input and Output function :** Formatted I/O: printf(), scanf(), Character I/O format : getch(), gerche(), getchar(), getc(), gets(),

statements, desired number of times • transfer control to different statements in the program	putchar(), putc(), puts() **Iterations:** Control statements for decision making: (i) Branching: if statement, else.. If statement, switch statement (ii) Looping: while loop, do… while, for loop. (iii) Jump statements: break, continue and goto.
• Understand what arrays are • What is the need for arrays • How arrays can be used in C Language • Declare and use one dimensional and two dimensional arrays • Understand the need for character and string variables • Declare and use character and string variables • Use functions to handle character and string data • Understand the Purpose of Sorting • Understand the different methods of Sorting. • Identify the advantages of different algorithms of Sorting • Be able to write programs in C to implement the algorithms for Sorting • Explain what is meant by Efficiency of an algorithm • Compare algorithms for Efficiency	**Unit III : Arrays, Strings and Sorting Techniques (8 Hrs)** **Arrays :** (One and multidimensional), declaring array variables, initialization of arrays, accessing array elements. **Strings:** Declaring and initializing String variables. Character and string handling functions. **Sorting Algorithms :** Bubble, Selection, Insertion and Merge sort, Efficiency of algorithms, Implement using C.
• Understand what Functions are and why are they needed. • Be able to define a Function in terms of its arguments and return values • Understand when and how to use Functions • Understand what are Macros and why they are needed • Explain how Macros are different from functions? • Understand what is Recursion? • Explain the Advantages of Recursion • Write programs for some standard situations for recursive functions such as Fibonacci Sequence and Towers of Hanoi • Be able to understand situations where recursion is needed • Understand the concept of a storage class • Understand the different storage classes • Understand the concept of scope,	**Unit IV: Functions, Storage Classes and Recursion (8 Hrs)** **Functions:** Global and local variables, Function definition, return statement, Calling a function by value, Macros in C, Different between functions and macros. **Storage classes :** Automatic variables, External variables, Static variables, Register variables. **Recursion:** Definition, Recursion function algorithms for factorial, Fibonacci sequence, Tower of Hanoi. Implement using C

visibility and longevity of a variable • Understand which storage class should be used under what circumstances • Learn the advantages and disadvantages of each storage class	
• Understand what are structures and why they are needed • Be able to define a structure • Be able to read and assign values to elements in a structure • Be able to understand the relationship between arrays and structures • Be able to define structures within structures • Be able to understand the relationship between structures and functions • Be able to understand what are unions • Write programs involving the use of structures	**Unit V: Structure and Union (4 Hrs)** **Structure:** Declaration of structure, reading and assignment of structure variables, Array of structures, arrays within structures, within structures, structures and functions. **Unions :** Defining and working with union
• Understand the pointers • Write dynamic programs • Understand strength of pointers • Store data in files • Read data from files • Understand File Handling Functions	**Unit VI: Pointers and File Handling (6 Hrs) Pointer:** Fundamentals, Pointer variables, Referencing and dereferencing, Pointer Arithmetic, Chain of pointers, Pointers and Arrays, Pointers and Strings, Array of Pointers, Pointers as function arguments, Functions returning pointers, Pointer to function, Pointer to structure, Pointers within structure. **File Handling:** Different types of files like text and binary, Different types of functions fopen(), fclose(), fputc(), fscanf(), fprintf(), getw(), putw(), fread(), fwrite(), fseek() **Dynamic Memory Allocation:** malloc(), calloc(), realloc(), free() and size of operator.
• Define a Linear Link List and list its features. • Understand the advantages & shortcomings of link list over an array. • Differentiate between Link List & Array. • Write & Explain the basic operations of Linear Link List. • Understand how to implement a link list. • Write a program in C to implement linear link list.	**Unit VII : Link Lists (4 Hrs)** **Linear Link lists:** Representation of link list in memory, Algorithms for traversing a link list, searching a particular node in link list, insertion into link list (insertion at the beginning of a node, insertion after a given node) deletion from a link list. Implement using C.

• Define a stack and its features. • Write Algorithms for the basic operations of Stack. • Understand the difference between Stack & Array. • Understand how an Array is used to implement a Stack. • Write a program in C to implement Stack.	**Unit VIII: Stacks (3 Hrs)** **Stacks:** Definition, Array representation of stacks, Algorithms for basic operators to add and delete an element from the stack, Implement using C.
• Define a queue and state its features. • State the applications that use queues. • State the basic operations of a queue. • Differentiate between straight queue and circular queue. • Implement queues using arrays and linked lists.	**Unit VIII: Queues (3 Hrs)** **Queues:** Representation of queue, Algorithm for insertion and deletion of an element in a queue, Implement using C.

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	40
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

External evaluation:

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	11 questions	8	8×5 = 40	40%	24
Group C: Long answer type question/case studies	6 questions	4	4×10 =40	40%	24
			100	100%	60

*Scoring scheme will not follow negative marking.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Self study
- Assignments
- Presentation by Students
- Term Paper writing
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Recommended Books:

- Introduction to Algorithms (Second Edition): *Cormen*, Leiserson, Rivest, Stein, PHI (Chapter 1, 2, 3, 10).
- Data Structures (Schaum's outline series in computers): Seymour Lipschutz McGraw-Hill book Company (Chapter 2, 5, 6, 9)
- Programming in ANSI C (Third Edition) : E Balguruswamy TMH (Chapters 2 to 13)
- Fundamental Algorithms (Art of Computer Programming Vol. I: Knuth Narosa Publishing House.
- Mastering Algorithms with C, Kyle Loudon, Shroff Publishers
- Algorithms in C (Third Edition): Robert Sedgewick, Pearson Education Asia.
- Data Structures A Pseudo code Approach with C: Richard F. Gilberg, Behrouz A. Forouzan, Thomas.
- Let us C by Yashwant Kanetkar, BPB
- Programming in ANSI C by Ram Kumar, Rakesh Agrawal, TMH
- Programming with C (Second Edition): Byron S. Gottfried. (Adapted by Jitender Kumar Chhabra) Schaum's Outlines (TMH)
- Programming with C: K.R. Venugopal, Sudeep R. Prasad TMH Outline Series.
- Unix and C : M.D. Bhave and S. A. Pateker, Nandu Printer and publishers private limited.

Course Title: Programming Fundamentals and 'C' Programming **Credit: 1**

Nature of the Course: Lab. **Number of hours per week:**

Level: CSIT.115 **(2 hrX3times or 3 hr x 2 times) 6**

Year: First **Total hours: 48**

Semester: First

hout the semester and Practical examination will be conducted at the end of academic year. The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation (Lab Book or Journal)	20 %
Final Exam Written	60 %
Final Exam Oral	20 %

Following are the guideline for the lab work:

1. There should be a lab book for the practical work related to the subject
2. The lab book will contain details of all practical's to be conducted in the lab
3. Students should read the lab book before coming to the lab
4. Every practical should have:
    a. Title
    b. Objectives
    c. Description
    d. Examples
    e. Self Activities
        i. Objective questions
        ii. Sample programs to be typed and executed
    f. Task list to be decided by the lab in-charge.
    g. Outputs to be verified by the lab in-charge.
5. Each practical should be conducted in the following manner:
    a. Explanation by lab in-charge – 10 minutes
    b. Self activities by students
    c. Lab in-charge will allocate tasks to each student (selection from a list / modify given task / specify new task)
    d. At the end of the slot, the lab in-charge has to verify the outputs and give a remark (Complete / Incomplete / Needs Improvement)

Assignment List for Lab Work

All the students will have to complete the following set of programming. Lab in-charge may assign additional assignment depending upon the time available.

1. Assignment to demonstrate use of data types, simple operators (expressions)
2. Assignment to demonstrate decision making statements (if and if-else, nested structures)
3. Assignment to demonstrate decision making statements (switch case)
4. Assignment to demonstrate use of simple loops
5. Assignment to demonstrate use of nested loops
6. Assignment to demonstrate menu driven programs.
7. Assignment to demonstrate writing C programs in modular way (use of user defined functions)
8. Assignment to demonstrate recursive functions.
9. Assignment to demonstrate use of arrays (1-d arrays) and functions
10. Assignment to demonstrate use of multidimensional array(2-d arrays) and functions
11. Assignment to demonstrate use of pointers
12. Assignment to demonstrate concept of strings (string & pointers)
13. Assignment to demonstrate array of strings.
14. Assignment to demonstrate use of bitwise operators.
15. Assignment to demonstrate structures (using array and functions)
16. Assignment to demonstrate structures and unions

17. Assignment to demonstrate command line arguments and pre-processor directives.
18. Assignment to demonstrate file handling (text files)
19. Assignment to demonstrate file handling (binary files and random access to files)
20. Assignment to demonstrate graphics using C

Recommended Books

- Deitel, C.: **How to Program**, 2/e (With CD), Pearson Education.
- Al Kelley, Ira Pohl: "**A Book on C**", Pearson Education.
- Brian W. Keringhan & Dennis M. Ritchie: "**The C programming Language**", PHI
- Bryons S. Gotterfried: "**Programming with C**," TMH
- Stephen G. Kochan: "**Programming in C**", CBS publishers & distributors.
- Yashavant Kanetkar: "**Let us C**", BPB Publications
- Herbert Schildt - **Complete C Reference**
- Forouzan and Gilberg: **Structured Programming approach using C,** Thomson learning publications

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Second Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Course Title: **Data Structure and Algorithms** Credit: **3**
Course No.: **CSIT.121**
Nature of the Course: **Theory+Lab** Total hours: **48**
Level: **B.Sc.CSIT** Year: **First** Semester: **Second**

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1. Course Description

Study of basic data structure vocabulary and the concept of an algorithm.

2. Course Objectives

- To introduce, fundamental data structures and problem solving paradigms
- To introduce time complexity analysis of problems.
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Outline the classification of data type • Give typical examples of data type • Explain the relevance of data structures in programming.	**Unit 1. Introduction to data structures (3 Hrs.)** 1.1 Preliminary data type and Abstract data type 1.2 Data structure, Need and Types of Data Structure 1.3 Comparison between ADT and Data Structure 1.4 Review of Array, Structure and Pointer
• Define an algorithm • Explain an algorithm's performance • Describe algorithm analysis • Explain the notion used in algorithm analysis	**Unit 2: Algorithm analysis (2 Hrs.)** 2.1 Algorithm – definition, characteristics 2.2 Algorithm vs. Program 2.3 Space complexity, time complexity 2.3 Asymptotic notations (Big O, Omega Ω, Big Θ)
• Describe an array, its dimensionality and declaration • Explain the aim of sorting algorithm • Describe the types of sorting • Explain the classes of sorting algorithm • Choose appropriate searching strategy	**Unit 3: Array Data Structure (8 Hrs.)** 3.1 Introduction to Arrays - array representation 3.2 Advantages and Drawbacks of Arrays 3.2 sorting algorithms with efficiency: Bubble sort, Selection sort, Insertion sort, Merge sort, Quick Sort, Heap Sort, Radix sort, Bucket Sort, Concept of stable and unstable sorting 3.3 Searching Algorithms: Linear Search, Binary Search
• Describe a Linked List • Explain the operations and implementations of Lists. • Understand advantages and limitations of Different types of Linked List • Create and use balanced Trees	**Unit 4: Linked List (10 Hrs.)** 4.1 Introduction to Linked List Data Structure 4.2 Implementation of List – static & dynamic representation, 4.3 Singly Linked List, Circular Linked List, Doubly Linked List, Doubly circular Linked List 4.4 Operations on List: Insertion, Deletion, Searching, Merging

	4.5 Applications of Linked List – polynomial manipulation 4.6 Generalized linked list – concept & representation
• Describe the stack data structure • Identify two basic modes of implementing a stack • Outline the applications of stacks in computing	**Unit 5: Stacks (7 Hrs.)** 5.1 Introduction: Definition, Stack as ADT 5.2 Operations on stack 5.3 Implementation of Stack: Using Arrays and using Linked List 5.4 Application - infix to postfix & prefix, postfix evaluation, bracket matching, recursion 5.5 Concept of Multiple stacks
• Describe a queue data structure • Outline the different applications of queues in computing • Explain the operations on a queue • Understand the different type of queue implementation	**Unit 6: Queues (6 Hrs.)** 6.1 Introduction: Definition, Queue as ADT 6.2 Operations on Queue 6.3 Implementation of Queue: Using Arrays and using Linked List 6.4 Applications- Printing, Scheduling etc 6.4 Circular queue, Dequeue, Priority Queues 6.5 Concept of Multiple Queues
• Give a basic definition of a binary tree and BST • Perform different tree operations • Evaluate arithmetic expressions by means of tree traversals. • Explain the implementation of AVL search trees.	**Unit 7: Trees (6 Hrs.)** 7.1 Concept & Terminologies 7.2 Binary tree, Binary Search Tree 7.3 Implementation of Trees: Static and Dynamic 7.4 Operations on BST – create. Insert, delete, traversals (preorder, inorder, postorder), counting leaf, non-leaf & total nodes 7.5 Balanced Trees: AVL trees and Rotations, Red Black Trees 7.6 Applications: Expression tree
• Describe the graph theory its applications • Understand different representations of graph • Explain graph traversal. • Implement MST and shortest Path Algorithm	**Unit 8: Graph (6 Hrs.)** 8.1 Concept & terminologies 8.2 Graph Representation 8.3 Traversals – BFS & DFS 8.4 Minimum Spanning Trees: Kruskals Algorithm 8.5 Shortest Path Algorithms: Dijkstra Algorithm

6. Recommended Books:

1. Horowitz Sahani, **Fundamentals of Data Structures,** Galgotia Publication
2. Data Structure Using C & C++, Langsam Yedidyah, Augenstein Moshe J., Tennenbaum Aaron M., PHI
3. ISRD Group, **Data Structures using C,** Tata McGraw Hill
4. Nitin Upadhyay, SK, **The Design and Analysis of Algorithm**, Kataria & Sons

Course Title: Data Structure and Algorithms LAB **Credit: 1**

Course No.: CSIT.121

Nature of the Course: LAB

Level: B.Sc. CSIT Year: First Semester: Second

Laboratory Work Guidelines: Students will have to complete the assigned practical work throughout the semester and Practical examination will be conducted at the end of academic semester. The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation (Lab Book or Journal)	25 %
Final Exam Written	50 %
Final Exam Oral	25 %

Following are the guideline for the lab work:

1. There should be a lab book for the practical work related to the subject
2. The lab book will contain details of all practical's to be conducted in the lab
3. Students should read the lab book before coming to the lab
4. Every practical should have:
    a. Title
    b. Objectives
    c. Description
    d. Examples
    e. Self Activities
        i. Objective questions
        ii. Sample programs to be typed and executed
    f. Task list to be decided by the lab in-charge.
    g. Outputs to be verified by the lab in-charge.
5. Each practical should be conducted in the following manner:
    a. Explanation by lab in-charge – 10 minutes
    b. Self activities by students
    c. Lab in-charge will allocate tasks to each student (selection from a list / modify given task / specify new task)

d. At the end of the slot, the lab in-charge has to verify the outputs and give a remark (Complete / Incomplete / Needs Improvement)

Assignment List for Lab Work

All the students will have to complete the following set of programming using the "C" Programming language. Lab in-charge may assign additional assignment depending upon the time available.

1. Sorting Algorithms – Bubble sort, Insertion, selection, quick sort and merge.
2. Static/Dynamic stack implementation, infix to postfix, infix to prefix and evaluation of Postfix.
3. Static and Dynamic Queue Implementation.
4. Singly Linked List, Doubly Linked List and Circular Linked List.
5. Polynomial addition (Using Linked list).
6. Binary Tree Traversal: Create, add, delete, and display nodes.
7. Graph: in degree, out degree, DFS, BFS.
8. Shortest path Dijkstra algorithm.
9. Adjacency matrix to adjacency list conversion.

Recommended Books

5. Horowitz Sahani, **Fundamentals of Data Structures,** Galgotia Publication
6. ISRD Group, **Data Structures using C,** Tata McGraw Hill
7. Ashok Kamthane, **Introduction to Data Structures using C**
8. Bandopadhyay & Dey, **Data Structures using C,** Pearson
9. Nitin Upadhyay, SK, **The Design and Analysis of Algorithm**, Kataria & Sons

Course Title: Digital Logic Design **Credit: 3**
Course No.: CSIT.122
Nature of the Course: Theory+Lab **Total hours: 48**
Level: B.Sc.CSIT **Year: First** **Semester: Second**

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1. Course Description

General concepts to be used in the design and analysis of digital systems and introduces the principles of digital computer organization and design.

2. Course Objectives

- Introduce fundamental digital logics and switching networks. Exposure of Boolean algebra and its application for circuit analysis.
- Introduction to multilevel gates networks, flip-flops, counters and logic devices.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand the concept of Data and Information. • Differentiate between the Analog Verses digital Signals. • Deal with the different number system in arithmetic. • Understand the binary codes and arithmetic with binary codes. • Work with error handling and error detection codes. • Learn the basics about the ASCII, EBCDIC & UNICODE and use the codes in arithmetic.	**Unit 1: Data and Information** **(8 Hrs.)** 1.1. Features of Digital Systems 1.2. Number Systems- Decimal, Binary, Octal, Hexadecimal and their inter conversions 1.3. Representation of Data: Signed Magnitude, one's complement and two's complement, 1.4. Binary Arithmetic, Fixed point representation and Floating point representation of numbers. 1.5. **Codes:** BCD, XS-3, Gray code, hamming code, alphanumeric codes (ASCII, EBCDIC, UNICODE), **1.6.** Error detecting and error correcting codes.
• Understand the concept of Boolean Logic • Learn the concept of Logic gates with the help of Diagrams. • Understanding the Universal Gates and their circuit implications. • Learn about Exclusive OR & NOR gates. • Understand the Boolean algebra and laws of Boolean Algebra .	**Unit 2: Boolean algebra and Logic Gates** **(6 Hrs.)** 2.1. Basic definition of Boolean Algebra 2.2. Basic Theory of Boolean Algebra, Boolean Functions, Logical operations 2.3. Logic Gates, IC Digital Logic Families. Basic gates (AND, OR, NOT gates) 2.4. Universal gates (NAND and NOR gates), other gates (XOR, XNOR gates) 2.5. Boolean identities, De Morgan Laws.
• Understand the building and working of KARNAUGH MAP. • Simplify Boolean expressions • Learn the Quine McClusky Method	**Unit 3: Simplification of Boolean Functions** **(7 Hrs.)** 3.1. K-map, two and three Variable Maps, Four variable Maps 3.2. Product of Sums, sum of product simplification 3.3. Don't care conditions

	3.4. NAND and NOR implementation 3.5. Quine McClusky method.
• Understand the basics of Combinational Circuits. • Design Combination circuits • Learn working of parallel and Decimal adder	**Unit 4: Combinational Circuit Design (7 Hrs.)** 4.1. Half adder, full adder, 4.2. Code converters 4.3. Multiplexers and demultiplexers 4.4. Encoders, decoders 4.5. Combinational Circuit design 4.6. Binary Parallel Adder 4.7. Decimal Adder 4.8. BCD Counter
• Understand the basics of Sequential Logic Circuits. • Know about different types of flip-flops • Analyze and design synchronous sequential circuits • Analyze asynchronous sequential circuits	**Unit 5: Sequential Circuit Design (7 Hrs.)** 5.1. Flip-flops: RS, JK, D, and T , Latches 5.2. Analysis of synchronous sequential circuit 5.3. Design of synchronous sequential Circuits: Counters, state diagram, state reduction, state assignment 5.4. Analysis of asynchronous sequential circuit 5.5. Problems of asynchronous sequential circuit design
• Understand counters & Shift Registers. • Learn electronics part of memories • Describe digital logic families	**Unit 6: Memories, Registers, and Programmable Logic Devices (6 Hrs.)** 6.1. Resisters, Shift registers 6.2. Memories: ROM, PROM, EPROM 6.3. PLD, PLA 6.4. Digital Logic Families: TTL, ECL, and CMOS
• Understand basics of VHDL • Design simple circuits by using VHDL	**Unit 7: VHDL** 7.1. RTL Design, Combinational Logic, Types, Operators, Packages, sequential Circuits, Subprogram, **7.2.** Example: Adders, Counters, Flip-flops, Multiplexers, Demultiplexers

6. Recommended Books:

- R. P. Jain, " **Modern Digital Electronics**", 3rd Edition, McGraw Hill
- M. Morris Mano, "**Logic & Computer Design Fundamentals**", Pearson Education.
- Morris Mano, **Digital logic and computer design**, PHI 23rd Reprint October 2000.
- Raj Kamal "Digital System Principles and Design" Pearson Education 2nd Edition, 2007
- Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition
- A.Anand Kumar, **Fundamentals of Digital Electronics**, PHI Publications 2001
- Myke Predko, **Programming and Customizing the 8051 Microcontroller**, Tata McGraw Hill publishing.
- James Antonakosm, **An Introduction to the Intel family Microprocessors, A hands on Approach utilizing the 80x86 microprocessor family**, Person Education Asia
- Peter Abel, **IBM PC Assembly Language and Programming**, Prentice Hall of India .
- Dr. N. S. Gill and J. B. Dixit, " **Digital Design and Computer Organisation**", University Science Press

Course Title: **Digital Logic Design LAB** Credit: **1**
Course No.: **CSIT.122**
Nature of the Course: **LAB**
Level: B.Sc. CSIT Year: **First** Semester: **Second**

Laboratory Work Guidelines: Students will have to complete the assigned practical work throughout the semester and Practical examination will be conducted at the end of academic year. The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation (Lab Book or Journal)	25 %
Final Exam Written	50 %
Final Exam Oral	25 %

Following are the guideline for the lab work:

1. There should be a lab book for the practical work related to the subject
2. The lab book will contain details of all practical's to be conducted in the lab
3. Students should read the lab book before coming to the lab
4. Every practical should have:
   a. Title
   b. Objectives
   c. Description
   d. Examples
   e. Self Activities
      i. Objective questions
      ii. Sample programs to be typed and executed
   f. Task list to be decided by the lab in-charge.
   g. Outputs to be verified by the lab in-charge.
5. Each practical should be conducted in the following manner:
   a. Explanation by lab in-charge – 10 minutes
   b. Self activities by students
   c. Lab in-charge will allocate tasks to each student (selection from a list / modify given task / specify new task)
   d. At the end of the slot, the lab in-charge has to verify the outputs and give a remark (Complete / Incomplete / Needs Improvement)

Assignment List for Lab Work

The main objective of Practical work in the course is to familiarize students with

- Digital components, Logic Gates, its types, specifications, data sheets etc.
- Know various Test and Measurement instruments
- Use of various Test and Measuring Instruments

All the students will have to complete the following Sample Lab work list. Lab in-charge may assign additional assignment depending upon the time available.

1. Familiarization with logic gates
2. Encodes and decodes
3. Multiplexer and de-multiplexer
4. Design of simple combination circuits
5. Design of adder/subtractor
6. Design f Flip-Flop
7. Clock driven sequential circuits
8. Conversion of parallel data into serial format
9. Generation of timing signal for sequential system

Recommended Books

- M. Morris Mano, "**Logic & Computer Design Fundamentals**", Pearson Education.
- Morris Mano, **Digital logic and computer design**, PHI 23rd Reprint October 2000..
- Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition
- A.Anand Kumar, **Fundamentals of Digital Electronics**, PHI Publications 2001
- Myke Predko, **Programming and Customizing the 8051 Microcontroller**, Tata McGraw Hill publishing.
- James Antonakosm, **An Introduction to the Intel family Microprocessors, A hands on Approach utilizing the 80x86 microprocessor family**, Person Education Asia
- Peter Abel, **IBM PC Assembly Language and Programming**, Prentice Hall of India .

Course Title: Linear Algebra **Credit: 3**
Course CSIT.123
Nature of the Course: Theory **Total hours: 45**
Year: First, Semester: Second
Level: B.Sc. CSIT .

1. Course description

The course intends to enable the students to understand the basics of linear algebra. In this course students will be able to study linear equation and matrices, linear transformation, vector space. At the same time students get much idea about matrix algebra, Eigen values and Eigen vectors.

2. Course objectives

The general objectives of the course are as follows:

- To acquaint the students with basics of linear algebra.
- To enable the students, to understand the concept of linear equation, and its solution.
- To know the basic concept of Eigen values and Eigen vectors and its further application.

Specific objectives and contents

Specific Objectives	**Contents**
	Unit 1: Linear equation & Matrices **- 8 hou**
• Define system of linear equations • Give the concept of row reduction and Echelon form and example. • Define the vector equation. • Discuss the matrix equation of the form Ax = b and its solution. • Explain the meaning of solution set of linear equation.	1.1 System of linear equations 1.2 Row reduction and Echelon form 1.3 vector equation 1.4 The matrix equations Ax = b 1.5 Solution set of linear system 1.6 Linear independence
	Unit 2: Matrix Algebra **- 6 hou**
• Define linear independence and Examples. • Discuss the inverse of a matrix. • Discuss the characterization of invertible matrix. • Explain partitioned matrices. • Discuss Leontief input output model and its application to computer graphics.	2.1 Matrix operation 2.2 The inverse of a matrix 2.3 Characterization of invertible matrices 2.4 Partitioned matrices 2.5 The Leontief input output model 2.6 Application to computer graphics
	Unit 3: Vector Spaces **- 8 hou**
• Define the meaning of vector spaces and its various examples. • Define vector subspace and examples. • Explain the term linear combination, linear dependence and independence. • Define Basis and dimension of vector space. • Compute the row rank and column rank of a matrix.	3.1 Definition and examples 3.2 Vector subspaces 3.3 Linear combination, linear dependence independence 3.4 Basis and dimension of a vector space. 3.5 Row and Column space of a matrix. 3.6 Row rank and column rank.

Unit 4: Linear Transformation - 8 hours

- Define linear transformation and how this concept used in matrix?
- Discuss the term Kernel and Image of linear transformation.
- Compute Kernel and Image of any function.
- State and prove Rank Nullity theorem and some examples related to this.
- Define linear isomorphism.
- State the meaning of L(V, N) how it is vector space?
- Discuss the matrix of linear transformation.

4.1 Linear transformation, representation by a matrix.
4.2 Kernel and image of linear transformation.
4.3 Rank nullity theorem
4.4 Linear isomorphism
4.5 L(V, W) is a vector space dimension of L(V, W) (statement only)
4.6 The matrix of liner transformation.

Unit 5: Inner Product Space - 7 hours

- Give the concept of Eucledian space and define dot product.
- Discuss the general inner product space.
- Define the term orthogonality, orthogonal projection and orthogonal basis.
- Discuss Gram-Schmidt orthogonalization process.
- Define orthogonal transformation.

5.1 The Eucledian space & dot product.
5.2 General Inner product spaces
5.3 Orthogonality, orthogonal projection onto a line, orthogonal basis.
5.4 Gram-schmidt orthogonalization.
5.5 Orthogonal transformation.

Unit 6: Eigen Values and Eigen Vectors - 8 hours

- Define Eigen values and Eigen vectors.
- Define characteristics equation.
- Discuss the term diagonalization.
- Obtain the relation between linear transformation and Eigen vectors.
- Define Complex Eigen values.
- State Caley Hamilton theorem

6.1 Eigen values and Eigen vectors
6.2 The characteristic equation,
6.3 Diagonalization
6.4 Eigen vectors and linear transformation.
6.5 Complex Eigen values
6.6 Caley Hammiton theorem (statement only)

Text Books and References

Text Books

i. David C. Lay: Linear Algebra and its applications. 3rd Edition, Pearson Edition
ii. S. Lang: Introduction to Linear Algebra, second Edition. Springer verlag, New York (1986)

Reference Books

i. I. Kolman, Bernard: Introductory Linear Algebra, with application, 7th Edition. Pearson Ed.
ii. G. Strang: Linear Algebra and its application 3rd Ed. Harcourt Brace Jovanovich Orlando (1986)

Course Title: Mechanics and Electrodynamics **Credit: 3+1**
Course No.: CSIT.124
Nature of the Course: Theory+Lab **Total hours: 48**
Year: First, Semester: Second
Level: B.Sc.CSIT

1. Course Description

The course intends to enable the students to be acquainted with the basic concepts and principles of Mechanics and Electrodynamics. Students will be familiarized with the fundamentals of Newton's laws of motion, conservation Laws, motion of charged particles electric and magnetic fields, harmonic oscillators, LCR circuits, electrostatics, magnetostatics and Maxwell's equations.

2. Course Objectives

At the end of this course the students should be able:

- to acquire sufficient basic knowledge in mechanics and electrodynamics.
- to apply this knowledge base for studying major courses in CSIT.
- to introduce the concepts and methods of mechanics and electrodynamics needed for application in various branch of CSIT

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand Newton's laws of motion • Explain and use conservation Laws • Learn the concept of Gravitational fields and potential energy • Explain the collisions phenomena	Unit I: Review of Basic Concepts of Mechanics (5) Newton's laws of motion, Conservation Laws (momentum and energy), potential energy, Gravitational fields, Collisions
• Write and explain the equation of motion of uncharged and charged particles • Explain the motion of charged particles in different electric and magnetic fields • Discuss the examples of cyclotron,	Unit II: Particle Dynamics (6) Equation of motion of uncharged and charged particles, Charged particles in constant and alternating electric field, Charged particles in a magnetic field - cyclotron, magnetic focusing, Charge particles in combined electric and magnetic field

magnetic focusing

• Understand the motion of harmonic oscillator and explain the examples of a diatomic molecule, pendulum with large oscillation • Concept of damped oscillations, driven oscillations and resonance • Understand LCR resonance circuits •	Unit III: Harmonic Oscillator (8) Harmonic oscillator, example of a diatomic molecule, pendulum with large oscillation, Damped oscillations, power factor, Q – factor, Driven oscillations, resonance, LCR and parallel resonance circuits
• Understand the concept of electric field and electric potential • Use Gauss's law to symmetric problems • Explain the Poisson's and Laplace's equations and their solutions • Express Laplace's equations in spherical cylindrical coordinates and rectangular coordinates • Application for calculating the electric field due to conducting sphere in a uniform E field • Explain the concept of method of images and its applications • Concept of electrostatic energy and its derivation for various cases	Unit IV: Electrostatics (9) Electric field and electric potential, Gauss's law and its applications, Solution of electrostatic problems, Poisson's and Laplace's equations, Solution of Laplace's equations in spherical cylindrical coordinates and rectangular coordinates, Examples conducting sphere in a uniform E field, method of images, point charge and a conducting sphere, line charge and line images, systems of conductors, Solution of Poisson's equation, Electrostatic Energy - Potential energy of a group of charges and charge distributions, energy density, energy of a system of charged conductors
• Understand the effect and working of dielectrics • Explain the modification of electric field in a dielectric media and polarization • Use Gauss's law in a dielectric medium • Understand the concept of displacement vector, electric susceptibility • Concept of boundary conditions on boundary value problems • Explain the molecular theory of dielectrics and induced dipoles	Unit V: Dielectrics (6) Electric field in a dielectric media, Polarization, field inside and outside a dielectric Gauss's law in a dielectric medium, displacement vector, electric susceptibility and dielectric constant, Boundary conditions on field vectors, boundary value problems in a dielectric medium, dielectric sphere in a uniform electric field, Molecular theory of dielectrics, induced dipoles

• Explain vector potential and magnetic field • Understand the magnetic forces between currents and its effects on charged particles • Understand and use Biot-Savart law to solve for the field • Expalin and derive the energy density in the magnetic field • Explain the magnetic energy of coupled circuits	Unit VI: Magnetostatics (6) Vector potential and magnetic field, Magnetic forces between currents, Magnetic effects on charged particles, Biot-Savart law and its applications, Energy density in the magnetic field, magnetic energy of coupled circuits
• Explain the physical meaning of the Maxwell's Equations • Understand the concept of displacement current • Calculate the electromagnetic energy • Formulate the electromagnetic wave equations without and with source	Unit VII: Maxwell's Equation (8) Maxwell's equations - displacement current, Electromagnetic energy, Wave equations without and with source, boundary conditions

. Prescribed Text

- *Mechanics*: D. S. Mathur, S. Chand and Company Ltd
- *Introduction to Electrodynamics*: David J. Griffith, Prentice Hall of India

7. Reference

- *Foundations of Electromagnetic Theory:* John R. Ritz, Frederick J. Milford and Robert W. Christy, Narosa Publishing House
- *Berkeley Physics Course, Vol. 1, Mechanics*, McGraw-Hill / Dev Publishers, New Delhi
- *Newtonian Mechanics*, P. French, MIT Introductory Physics Series, Viva Bools Pvt Ltd
- *Fundamentals of Physics*, D. Halliday, R. Resnick, J. R. Christman and J. Walker, Wiley

Far Western University
Four Years B.Sc. in CSIT
Course of Study 2069

Course Title: Physics Practical (**Mechanics and Electrodynamics PR**)
Year: First
Course No.: **CSIT.124** Semester: II
Nature of the Course: Practical Credit: 1

Objectives:

By the end of the course the student should be able to:

measure correctly the basic physical quantities
determine errors in measurements
analyze raw data and make valid conclusions
validate corresponding theoretical component
develop proper laboratory skills
design basic physics experiments
interpret experimental results and draw logical conclusions
relate theoretical concepts to practical skills

Laboratory works:

- To determine inter planer spacing of given crystal by electron diffraction method
- To determine the band gap of given sample
- To determine the nature of charge carrier of a given simple by Hall apparatus
- Study NOT, AND, OR, NAND, NOR, EX-OR, EX-NOR gates
- To study the characteristic of simple junction diode and Zener diode
- To construct and study CE amplifier
- To construct and study CC amplifier
- To construct and study CB amplifier
- To study output input and transfer characteristics of NPN transistor.

Note:

- Student must perform 6 Hours of lab work (2 Hours x 3 times or 3 Hours x 2 times) every week
- In every semester, at least Eight experiments are to be performed. Additional experiments may be added subject to availability of time.
- The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation	25 %
Final Exam Written	50%
Final Exam Oral	25%

Books:

1. *B.Sc. Practical Physics*: C. L. Arora, S Chand and Company Ltd.
2. *Practical Physics:* G. L. Squires, Cambridge University Press.
3. *Practical Physics,* P. K. Shukla and A. Srivastava, New Age International (P) Limited

Course Title: **Microprocessor Systems** Credit: **3**
Course No.: CSIT.125
Nature of the Course: **Theory +Lab** Total hours: **48**
Level: **B.Sc. CSIT** Year: **First** Semester: **Second**

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1. Course Description

This course contains of fundamental concepts of different microprocessors, assembly language programming, basic I/O Interfaces and Interrupt operations.

2. Course Objectives

The course objective is:

- To introduce the operation, programming, and application of microprocessor.
- To teach students how the various components of the computer works and their inter relationship from the processor to other units.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Explain what a microprocessor is? • Give historical development of the microprocessors • Discuss technological innovations of microprocessors.	**Unit 1. Introduction (3 Hrs.)** 1.1 Introduction to Microprocessors 1.2 Evolution of Microprocessors 1.3 Basic organization 1.4 Components of Microprocessor
• Understand SAP architectures • Compare SAP1 and SAP2 architecture • Discuss Instruction cycle of basic computers	**Unit 2: Basic Computer Architectures (10 Hrs.)** 2.1. SAP Architectures, Instructions, Microprogram; Bus, Registers, Memory, cycle controller, Adder, Subtractor 2.2. SAP-1 Instructions, Fetch & Execution, microprogram, fetch cycle, execution cycle, microprogram, controller implementation 2.3. SAP 2 Architecture, architectural differences with SAP-1, bi-directional registers, instruction set, flags.
• Understand and create Timing Diagrams • Explain Fetch and Execute Operations\ • Discuss Machine Cycle	**Unit 3: Instruction Cycle (3 Hrs.)** 3.1. Fetch Operation and Timing Diagram 3.2. Execute Operation and Timing Diagram 3.3. Machine Cycle and States

• Describe 8085 and 8086 microprocessor architectures • Understand Timing and Control Unit • Understand addressing modes • Chop and unchop instructions • Explain Interrupts and Data flow	**Unit 4: Intel 8085/8086 Microprocessors (8 Hrs.)** 4.1. Functional Block Diagram and Pin configuration 4.2. Timing and Control Unit 4.3. Registers, Data and Address Bus 4.4. Instructions, Operation Code and Operands 4.5. Addressing Modes 4.6. Interrupts, Flags, Instructions and Data Flow
• Be Familiar with 8085 instruction set • Write small assembly language programs • Use addressing modes • Learn assembling linking and debugging	**Unit 5: Assembly language programming (10 Hrs)** 5.1. Assembly language and assembly language format 5.2. 8085 assembly language instruction set and Assembly instruction format 5.3. Instruction Types, Mnemonics, and Operands 5.4. Macro assemblers, Linking, Assembler directives 5.5. Simple sequence programs, Flags, Branch, Jumps, Loops, Selection (conditional) statements 5.6. Addressing Modes and Arrays 5.7. Debugging.
• Describe IO and memory read/write operations • Explain what a interrupts is • Discuss the interrupts priorities • Understand interrupt vector and interrupt processing	**Unit 6: I/O, Memory and Interrupt Operations (5 Hrs.)** 6.1. Memory read & write 6.2. IO read & write 6.3. DMA with advantages and drawbacks 6.4. Interrupts, Types, Interrupt Priorities, and Interrupt Masking 6.5. Interrupt vector and interrupt processing 6.6. The 8259A Programmable Interrupt Controller(PIC) 6.7. Interrupt Examples
• Explain input and output device interfaces • Understand Timer Interface • Discuss interfacing of Serial devices	**Unit 7: Interfacing (5 Hrs.)** 7.1. Basic I/O Interfacing :Parallel I/O, Programmed I/O, I/O port address decoding, Interface examples – Keyboard matrix, Printer 7.2. Timer Interfacing: The 8254 Programmable Interval Timer (PIT), Timing applications. **7.3.** Serial I/O Interface: Asynchronous communication, interfacing serial I/O devices- mouse, modem, PC Keyboard.

• Discuss Modern processor architectures • Understand RISC and CISC architectures • Explain hyper threading	**Unit 8: Modern Processors (4 Hrs.)** 8.1. Technical overview (only features) of the architecture including Pentium-Pro, MMX 8.2. Hyper Threading, Core-2-duo, Concepts of RISC, RISC vs CISC architecture of SUN SPARC.

Recommended Books:

1. Ramesh S. Gaonkar, **Microprocessor Architecture, Programming, and Applications with 8085**, Prentice Hall
2. A. P. Malvino and J, A. Brown, **Digital Computer Electronics**, 3rd Edition, Tata McGraw Hill
3. D. V. Hall, **Microprocessors and Interfacing - Programming and Hardware,** McGraw Hill
4. P. K. Gosh and P.R. Sridhar, 0000 to 8085 **Introduction to 8085 Microprocessor for Engineers and Scientists**, 2nd edition, Prentice Hall, 2001.
5. Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition

Course Title: **Microcomputer Organization and Microprocessors LAB** Credit: **1**
Course No.: CSIT.125
Nature of the Course: **LAB** Total hours: **48**
Level: **B.Sc. CSIT** Year: **First** Semester: **Second**

Laboratory Work Guidelines: Students will have to complete the assigned practical work throughout the semester and Practical examination will be conducted at the end of academic semester. The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation (Lab Book or Journal)	25 %
Final Exam Written	50 %
Final Exam Oral	25 %

Following are the guideline for the lab work:

1. There should be a lab book for the practical work related to the subject
2. The lab book will contain details of all practical's to be conducted in the lab
3. Students should read the lab book before coming to the lab
4. Every practical should have:
   a. Title
   b. Objectives
   c. Description
   d. Examples
   e. Self Activities
      i. Objective questions
      ii. Sample programs to be typed and executed
   f. Task list to be decided by the lab in-charge.
   g. Outputs to be verified by the lab in-charge.
5. Each practical should be conducted in the following manner:
   a. Explanation by lab in-charge – 10 minutes
   b. Self activities by students
   c. Lab in-charge will allocate tasks to each student (selection from a list / modify given task / specify new task)
   d. At the end of the slot, the lab in-charge has to verify the outputs and give a remark (Complete / Incomplete / Needs Improvement)

Assignment List for Lab Work

The main objective of Practical work in the course is to familiarize students with Assembly Language instruction set and programming using various microprocessors such as 8085\8086\8088 using trainer kit. The programming should include: Arithmetic operation, base conversion, conditional branching etc. Lab in-charge should assign lab work to each student. Sample Lab work list may include:

1. Assembly language program using 8085 microprocessor kit.
2. Program should comprise the use of all types of instructions and addressing modes.
3. The programming should include the concept of Arrays and the concept of Multiplications and Division operations on Microprocessor.
4. Assembly language programming, using any type of Assembler, which should include the different functions of Int 10h, and Int 21h.

Recommended Books

6. Ramesh S. Gaonkar, **Microprocessor Architecture, Programming, and Applications with 8085**, Prentice Hall
7. A. P. Malvino and J, A. Brown, **Digital Computer Electronics**, 3rd Edition, Tata McGraw Hill
8. D. V. Hall, **Microprocessors and Interfacing - Programming and Hardware,** McGraw Hill
9. P. K. Gosh and P.R. Sridhar, 0000 to 8085 **Introduction to 8085 Microprocessor for Engineers and Scientists**, 2nd edition, Prentice Hall, 2001.
10. Malvino Leach, **Digital principals and applications**, Tata McGraw Hill, 4th Edition

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Third Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Course Title: Computer organization and architecture **Credit: 3**
Course No: CSIT.211 **Number of period per week: 3+3**
Nature of the Course: Theory + Tutorial **Total hours: 45+45**
Year: Second, Semester: Third
Level: B. Sc. CSIT

1. Course Introduction

In this course the term architecture is taken to include instruction set architecture (the programmer's abstraction of a computer), organization or micro architecture (the internal implementation of a computer at the register and functional unit level), and system architecture (the organization of the computer at the cache, and bus level).

2. Objectives

At the end of this course the students should be able to:

- Understand computer representation of data
- Demonstrate algorithms used to perform different operations on the data
- Describe different operations in terms of Microoperations
- Describe architecture of basic computer
- Understand microprogrammed control unit
- Describe and memory and I/O organization of a typical computer system
- Understand benefits of pipelined and multiprocessor systems

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand how numbers and text can be represented in digital form and their limitations. • Understand concept of overflow and detection of overflow. • Appreciate how errors can be detected using parity bits.	**Unit I: Data Representation (4)** 1.1. Data Representation: Binary Representation, BCD, Alphanumeric Representation, Complements, Fixed Point representation, Representing Negative Numbers, Floating Point Representation, Arithmetic with Complements, Overflow, Detecting Overflow 1.2. Other Binary Codes: Gray Code, self Complementing Code, Weighted Code, Excess-3 Code, EBCDIC 1.3. Error Detection Codes: Parity Bit, Odd Parity, Even parity, Parity Generator & Checker
• Understand register transfer language • Describe arithmetic, logic and shift operations in terms of microperations.	**Unit II: Register Transfer and Microoperations (6)** 2.1. Overview: Microoperation, Register Transfer Language, Register, Register Transfer, Control Function 2.2. Arithmetic Microoperations: Binary Adder, Binary

• Build circuit diagrams of arithmetic, logic and shift operations.	Adder-Subtractor, Binary Incrementer, Arithmetic Circuit 2.3. Logic Microoperations, Hardware Implementation, Applications of Logic Microoperations. 2.4. Shift Microoperations: Logical Shift, Circular shift, Arithmetic Shift, Hardware Implementation of Shifter.
• Learn computer organization and architecture using hypothetical computer system. • Describe Common bus system of basic computer. • Interpret instruction set of basic computer • Describe interrupt cycle of basic computer • Understand overall execution cycle of basic computer	**Unit III: Basic Computer Organization and Design (7)** 3.1. Instruction Code, Operation Code, Stored Program Concept 3.2. Registers and memory of Basic Computer, Common Bus System for Basic Computer. 3.3. Instruction Format, Instruction Set Completeness, Control Unit of Basic Computer, Control Timing Signals 3.4. Instruction Cycle of Basic computer, Determining Type of Instruction, Memory Reference Instructions, Input-Output Instructions, Program Interrupt & Interrupt Cycle. 3.5. Description and Flowchart of Basic Computer
• Understand microprogram and microprogrammed control unit • Describe microprogram sequencer • Design microprogrammed control unit	**Unit IV:** Microprogrammed Control**(4)** 4.1. Control Word, Microprogram, Control Memory, Control Address Register,Sequencer 4.2. Address Sequencing, Conditional Branch, Mapping of Instructions, Subroutines, Microinstruction Format, Symbolic Microinstructions 4.3. Design of Control Unit
• Understand different CPU organizations • Describe types of instructions on the basic of number of operands • Interpret operand using addressing modes. • Compare and Contrast RISC and CISC computer architectures	**Unit V: Central Processing Unit (4)** 5.1. Major Components of CPU, CPU Organization (Single Accumulator Organization, General Register Organization, Stack Organization) 5.2. Instruction Formats, Addressing Modes, Data Transfer and manipulation, Program Control, Subroutine Call and Return, Types of Interrupt 5.3. RISC vs CISC, Pros and Cons of RISC and CISC Overlapped Register Windows
• Differentiate parallel processing from pipelining • Understand pipelining and speedup gain due to pipelining • Use pipelining with arithmetic operation • Describe problems in pipelining and list their possible solutions • Give basic idea behind vector processing	**Unit VI: Pipelining (5)** 6.1. Parallel Processing, Multiple Functional Units, Flynn's Classification 6.2. Pipelining: Concept and Demonstration with Example, Speedup Equation, Floating Point addition and Subtraction with Pipelining 6.3. Instruction Level Pipelining: Instruction Cycle, Three & Four-Segment Instruction Pipeline, Pipeline Conflicts and Solutions 6.4. Vector Processing, Applications, Vector Operations, Matrix Multiplication

• Describe addition, subtraction, multiplication and division algorithm for signed magnitude data • Demonstrate addition, subtraction and multiplication algorithm for signed 2's complement data • Understand hardware implementation of all described algorithms	**Unit VII: Computer Arithmetic (4)** 7.1. Addition and Subtraction with Signed Magnitude Data (Hardware Implementation and Algorithm), Addition and Subtraction with Signed 2's Complement Data 7.2. Multiplication of Signed Magnitude Data (Hardware Implementation and Algorithm), Booth Multiplication (Hardware Implementation and Algorithm) 7.3. Division of Signed magnitude Data (Hardware Implementation and Algorithm), Divide Overflow
• Understand interface between I/O devices and CPU. • Compare strobe and handshaking mechanism of data transfer • Describe modes of data transfer along with their pros and cons • Explain methods of handling prioritized interrupts • Differentiate DMA from input-output processors	**Unit VIII: Input Output Organization (4)** 8.1. Input-Output Interface: I/O Bus and Interface Modules, I/O vs Memory Bus, Isolated vs Memory-Mapped I/O 8.2. Asynchronous Data Transfer: Strobe, Handshaking (Source and Destination Initiated) 8.3. Modes Of Transfer: Programmed I/O, Interrupt-Initiated I/O, Direct memory Access 8.4. Priority Interrupt: Polling, Daisy-Chaining, Parallel Priority Interrupt 8.5. Direct Memory Access, Input-Output Processor, DMA vs IOP
• Understand why a memory hierarchy is necessary to reduce the effective memory latency. • Appreciate that most data on the memory bus is cache refill traffic • Describe techniques of mapping data stored in RAM to the data in cache memory	**Unit IX: Memory Organization (4)** 9.1 Memory Hierarchy, Main Memory, RAM and ROM Chips, Memory address Map, Memory Connection to CPU, Auxiliary Memory (magnetic Disk, Magnetic Tape) 9.1 Associative Memory: Hardware Organization, Match Logic, Read Operation, Write Operation 9.1 Cache Memory: Locality of Reference, Hit & Miss Ratio, Mapping (Direct, Associative, Set Associative), Write Policies(Write-Back, Write-Through)
• Understand how performance can be increased by incorporating multiple processors on a single chip. • Appreciate the need for cache coherency in multiprocessor systems	**Unit X: Multiprocessors (3)** 10.1 Overview, Loosely Coupled & Tightly Coupled multiprocessors, Interconnection Structures 10.1 Interprocessor Arbitration (Serial , Parallel and Dynamic), Interprocessor Communications and Synchronization **10.1** Cache Coherence, Solution to cache Coherence Problem

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Viva-voce</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Report and Presentation on any topic</td><td>50%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Presentation</td><td>25%</td></tr>
<tr><td></td><td>Attendance</td><td>20%</td><td>Viva</td><td>25%</td></tr>
<tr><td></td><td>Internal Exams</td><td>50%</td><td></td><td></td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation:

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Evaluation (Viva):**
   After completing the end semester theoretical examination, viva examination will be held. External examiner will evaluate report/presentation & take viva exam and will do above mentioned evaluation. Students should make a small report by relating any of the studied topics in the subject to some application areas/examples. Reports can be made in groups. There will be an internal examiner to assist the external examiner. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Prescribed Text

- *M. Morris Mano*, "Computer System Architecture", Prentice-Hall of India, Pvt. Ltd., Third edition, 2007

References

- *William Stallings*, "Computer Organization and Architecture", Prentice-Hall of India, Pvt. Ltd., Seventh edition, 2005.
- *Vincent P. Heuring and Harry F. Jordan*, "Computer System Design and Architecture", Prentice-Hall of India, Pvt. Ltd., Second edition, 2003.

Course Title: Discrete Structures **Credit: 3**
Course No: CSIT.212 **Number of period per week: 3+3**
Nature of the Course: Theory + Tutorial **Total hours: 45+45**
Year: Second, Semester: Third
Level: B. Sc. CSIT

1. Course Introduction

After completing this course, the target student will gain knowledge in discrete mathematics. It helps the target student in gaining fundamental and conceptual clarity in the area of set theory, logic, reasoning, counting, probability, and graph theory.

2. Objectives

At the end of this course the students should be able to:

- Describe basic discrete structures such as sets, functions and relations
- Express and proof verbal arguments using propositional and predicate logic
- Select the best proof strategy for the given problem
- Demonstrate counting principles and apply them to solve problems
- Model problems using graph theory and identify their solutions

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Explain with examples the basic terminology of functions, relations, and sets. • Perform the operations associated with sets, functions, and relations. • Relate practical examples to the appropriate set, function, or relation model.	**Unit I: Functions Sets and Relations (4)** 1.1. Sets: Venn Diagrams, Complements, Cartesian Products, Power Sets, Cardinality and Countability, Computer Representation of Sets 1.2. Functions: Surjections, Injections, Bijections, Inverses, Composition, Growth of Functions 1.3. Relations: Reflexivity, Symmetry, Transitivity, Asymmetry, Equivalence Relations, Representing Relations using Matrices and Diagraphs, Equivalence Classes, Partitions, Partial and Total Ordering
• Apply formal methods of symbolic propositional and predicate logic. • Describe how formal tools of symbolic logic are used to model real-life situations. • Describe the importance and limitations of predicate logic.	**Unit II: Basics of Logic (10)** 2.1. Propositional logic, Logical connectives, Truth tables, Normal forms (conjunctive and disjunctive), Validity 2.2. Conditional statements, inverse, converse, and contrapositive, Translating English sentences, logical equivalences, inference rules, proof of equivalence 2.3. Predicate logic, Universal and existential quantification, Nested quantifiers, Logical equivalences, Translating english sentences, proof of logical equivalences, Limitations of predicate logic

• Outline the basic structure of and give examples of each proof technique. • Relate the ideas of mathematical induction to recursion. • Identify the difference between mathematical and strong induction.	**Unit III: Proof Techniques (6)** 3.1. Proof Strategies: Direct Proofs, Proof By Counterexample, Proof By Contradiction 3.2. Mathematical Induction, Strong Induction And Well Ordering 3.3. Recursive Mathematical Definitions, Structural Induction, Recursive Algorithms 3.4. Program Correctness
• Compute permutations and combinations of a set. • Solve a variety of basic recurrence equations. • Analyze a problem to create relevant recurrence equations or to identify important counting questions.	**Unit IV: Basics Of Counting (8)** 4.1. Sum And Product Rule, Inclusion-Exclusion Principle, Pigeon-hole Principle, and Applications of Pigeon-hole Principle. 4.2. Permutations and Combinations, Binomial Coefficients, Pascal's Identity and Triangle, Generalized Permutation and Combinations, Generating Permutation and Combinations. 4.3. Recurrence Relations, Modeling with Recurrence Relations, Solving Linear Recurrence Relations (Proof of theorems is not Required)
• Calculate probabilities of events and expectations of random. • Differentiate between dependent and independent events. • Apply the binomial theorem to independent events and Bayes' theorem to dependent events.	**Unit V: Discrete Probability (6)** 5.1. Finite probability space, probability measure, events, overview of non-discrete probability theory 5.2. Conditional probability, independence, Bayes' theorem, Applications of Bays Theorem 5.3. Integer random variables, expectation, variance, and Chebyshev bounds, Law of large numbers
• Illustrate by example the basic terminology of graph theory, and some of the properties and special cases of each. • Demonstrate different traversal methods for trees and graphs. • Model problems in computer science using graphs and trees.	**Unit VI: Graphs and Trees (6)** 6.1. Types of Graphs, Basic Terminologies, Special Types of Graphs and their Applications, Graph Representation, Graph Isomorphism. 6.2. Connectivity, Paths, Connectedness, Euler and Hamiltonian Paths and circuits, Travelling Salesman Problem, Planner Graphs, Shortest path problems, Graph Coloring and Applications 6.3. Trees, Properties and Applications of Trees, Decision Trees, infix/prefix/postfix Notations, Tree Traversal, Spanning Trees, Minimum Spanning Trees.
• Use network flows in optimization problems.	**Unit VII: Network Flows (5)** 7.1. Concept of network flows, proof of Maxflow and Mincut theorem, verification of the algorithms by examples.

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Viva-voce**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Report on any topic	50%	20
(Details are given in the separate table at the end)		Quizzes	10%		Presentation	25%	
		Attendance	20%		Viva	25%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation:

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Evaluation (Viva):**
   After completing the end semester theoretical examination, viva examination will be held. External examiner will evaluate report/presentation, take viva exam and will do above mentioned evaluation. Students should make a small report by relating any of the studied topics in the subject to some application areas/examples. Reports can be made in groups. There will be an internal examiner to assist the external examiner. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Prescribed Text

- *Kenneth H. Rosen,* Discrete Mathematics & it's Applications to Computer Science, WCB/McGraw Hill.
- *Joe L. Mott, Abrahan Kandel and Theodore P. Baker,* Discrete Mathematics for Computer Scientists and Mathematicians, Prentice-Hall of India.

Reference

- *G. Chartand, B.R. Oller Mann,* Applied and Algorithmic Graph Theory, McGraw Hill.
- *G. Birkhoff, T.C. Bartee,* Modern Applied Algebra, CBS Publishers.

Course Title: Introduction to Management **Credit: 3**
Course No: CSIT.213 **Number of period per week: 3+3**
Nature of the Course: Theory+Tutorial **Total hours: 45+45**
Year: Second, Semester: Third
Level: B.Sc. CSIT

1. Course Introduction

The course familiarizes students with the fundamentals of management so that they can understand, analyze and practice basic concepts, processes, functions as well as skills of management along with the role, challenges and opportunities of management for successful operations and performance of organizations.

2. Objectives

At the end of this course the students should be able to:

- Understand the basic concepts and principles of management such as basic roles, skills and functions of management
- Identify the historical development, theories and contemporary trends and development in management
- Analyze how environmental factors shape organizations
- Discuss organizational goals, planning system, organizational structure, staffing and conflict resolution
- Examine the essence of effective leader and change agent
- Conceptualize the approaches of decision making, leadership, motivation, control and team work

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the difference between managers and operatives • Differentiate between efficiency and effectiveness • Describe four primary process of management • Summarize the essential roles performed by managers • Discuss whether the manager's job is generic • Discuss the general skills necessary for becoming a successful manager • Decribe how the evolution of	**Unit I: Managers and Management(10 hrs)** • Introduction to Management: Definition, Characteristics, process, function and importance of management, • Characteristic of an organization and its types • Manager: concept, roles and competencies; changing role of managers • Historical roots of contemporary management practices: classical, behavioural, quantitative and contemporary approach, comparative analysis. • Social responsibility and managerial ethics

management theories reflect the changing needs of organizations • Define social responsibility and ethics	
• Define planning and identify the benefits of planning • Identify the potential drawbacks of planning • Outline the steps in the strategic management process • Explain SWOT analysis • Describe the steps in the decision making process. • Explain the limits to rationality • Define heuristics and explain how they affect the decision making process • Identify four decision making styles • Identify several decision-making aids and techniques such as pay off matrics,decision trees, breakeven analysis, ratio analysis, linear programming, queuing theory and economic order quantity.	**Unit II: Foundation of Planning and managerial decision making(8 hrs)** • Organizational goals, purpose and functions • Planning as a managerial function: concept, importance, planning and performance • Strategic planning,Situational analysis, criticism of planning. • Decision making: concept, the decision making process,types and condition of decision making, • Rational decision making: bounded rationality, heuristics,escalation of commitment • Decision making styles • Quantitative decision making aids
• Identify and define the six elements of organization structure. • Describe the advantages and disadvantages of work specialization. • Contrast authority and power • Identify the five different ways by which management can departmentalize • Contrast mechanistic and organic organizations • Contrast divisional and functional structures	**Unit III: Organizing function of management(6 hrs)** • Organizing: concept, nature, importance, principles and approaches to organizing • Nature and types of organizational design • Departmentalization: advantages and types of departmentalization • Concept of Authority, Power and Responsibility • Types of organizational structures: traditional and contemporary structures • Emerging concepts in organizing
• Describe the human resource management process • Differentiate between job description and job specification • Contrast recruitment and	**Unit IV: Staffing and Human Resource Management(6 hrs)** • Staffing: Concept, objectives, importance and components of staffing • Employment planning

downsizing options • Describe selection techniques • Identify various training methods • Explain the various techniques managers can use in evaluating employee performance.	• Recruitment and selection • Orientation, training and development • Performance management, compensation and benefits • Current Issues in Human Resource Management
• Define communication and explain why it is important to managers • Describe the communication process. • List techniques for overcoming communication barriers • Describe effectiveness in supervision • Describe the contingency factors influencing delegation • Explain trait theories of leadership and identify the leadership styles	**Unit V: Managerial processes for effective performance(9 hrs)** • Managerial communication: concept and functions of communication • Interpersonal communication: methods, making effective interpersonal communication • Organizational communication: types, direction and networks • Supervision: concepts, importance, types, processes and methods; effectiveness in supervision • Delegation: concept, principles and techniques • Leadership: concept and importance; leadership styles
• Describe approaches of control • Explain why control is important • Identify the contingency factors in the control process • Explain how controls can be dysfunctional	**Unit VI: Foundations of Control(6hrs)** • Control: concept and importance • The control process, • Tools for measuring organizational performance • Contemporary issues in control.

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**
End semester examination	60	Assignments	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Mid-Term & Pre-board exam	50%	
		Group work	10%	
Total External	60	Total Internal	100%	40

External evaluation

End semester examination

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	8	6	6×8 = 48	40%	24
Group C: Long answer type question	3	2	2×16 =32	40%	24
			100	100%	60

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term & Pre-board examination: These are written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Term Paper writing
- Case study
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Prescribed Text

- *Robbins, S.P.,DeCenzo,A.D., Bhattacharya,S. &Agrawal*, M(2009). Fundamental of Management(6th ed.) New Delhi: Printice Hall.

References

- *Griffin, R. W. Management* New Delhi: AITBS Publishers and Distributors
- *Paudel,S.R., Pradhan, G.M., & Bhandari, K.P. Principles of Management.* Kathmandu: Asmita Publication

Course Title: Object Oriented Programming with C++ **Credit: 3**
Course No: CSIT.214 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Second, Semester: Third
Level: B. Sc. CSIT

1. Course Introduction

This course describes basic features of C++ that are different from C programming language. It also covers principles of object oriented programming like polymorphism, class, object, encapsulation, inheritance etc. Besides this, the course describes features like exception handling, templates and File handling using C++.

2. Objectives

At the end of this course the students should be able to:

- Differentiate structured programming from object oriented programming.
- Understood principles of object oriented programming
- Write programs using OOP principles
- Use concepts like exception handling and generics in programming
- Apply C++ in solving scientific problems and simulation

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand programming language paradigms and History. • Use cin and cout objects along with insertion and extraction operators. • Enable to manage memory dynamically by using New and Delete operators. • Describe reference variables, Scope resolution operator, and Enumerations.	**Unit I: C++ Basics(4)** 1.1. Programming Language Paradigms: Unstructured Programming, Procedural Programming, Modular, Programming, Object Oriented Programming. History of C++. 1.2. Input and Output in C++, Manipulators, Reference variable, Comments, Type Conversion. 1.3. put() and get() Functions, getline() Function. 1.4. New and Delete Operators, Scope Resolution Operators, Enumerations.
• Understand difference between Functions, Macros, and Inline Functions • Use concept of default arguments and method overloading • Enable to pass arguments and	**Unit II: Functions (4)** 2.1. Drawbacks of Functions, Macros, Macro vs Functions, Inline Functions, Macros vs Inline Functions. 2.2. Default Arguments, Overloaded Functions: With Different Number of Arguments, with Different Type of Arguments. 2.3. Passing Arguments to Functions: Pass by Value, Pass

get output from function in different ways.	by Reference, Pass by Pointer 2.4. Returning from Functions: Returning by Value, Return by Reference, Return by Pointer. 2.5. Constant Arguments
• Understand class, object, encapsulation and data hiding. • Explain memory allocation strategy data members and member functions. • Use arrays of objects, pointer objects, and object as argument. • Understand the concept of friend function, friend class and this pointer • Apply the concept of construction and destructors in writing programs.	**Unit III: Class and Objects(10)** 3.1. C++ Structures vs C Structures, Class and Objects, Defining Member Functions, Memory Allocation for Objects and methods. 3.2. Array of Objects, Pointer Objects, Access Specifiers, Passing Objects as Arguments, Returning Objects. 3.3. Static Data Members, Static Methods, Nested Class. 3.4. Friend Functions, Friend Class, This Pointer 3.5. Constructors, Types of Constructors, Constructor Overloading, Copy Initialization, Destructors
• Understand importance and need of operator overloading. • Enable to overload different operators. • Enable to write programs that converts data of one type into another type. • Use nameless temporary objects.	**Unit IV:** Operator Overloading **(7)** 4.1. Introduction, Operators that cannot be overloaded, Rules for Operator Overloading. 4.2. Overloading Unary Operators: Pre-increment operator, Post-increment operator, Negation Operator. 4.3. Overloading Binary Operators: Plus/Minus Operator, Comparison Operators, String Concatenations, Overloading using friend Functions. 4.4. Nameless Temporary Objects 4.5. Type Conversion: Basic to Object, Object to basic, Object to Object.
• Describe need and importance of inheritance • Use inheritance in writing programs • Understand and program different forms of inheritance. • Understand ambiguities in inheritance and handle them. • Use containership and differentiate it from inheritance.	**Unit V: Inheritance & Aggregation (6)** 5.1. Introduction, Benefits, Forms of Inheritance, Protected Access Specifier. 5.2. Public, private, and Protected Derivation. 5.3. Constructor and Inheritance, Destructor and Inheritance 5.4. Method Overriding, Ambiguities in Inheritence: Multiple Inheritance, Multipath Inheritance, Virtual Base Class. 5.5. Containership, Inheritance vs Containership.
• Differentiate static and dynamic polymorphism • Enable to program dynamic polymorphism • Understand importance of pure virtual functions and abstract classes.	**Unit VI: Dynamic Polymorphism(4)** 6.1. Static vs Dynamic Polymorphism, Pointers to base Classes, Virtual Functions 6.2. Implementing Dynamic Polymorphism, Pure Virtual Functions. Abstract Classes 6.3. Virtual Destructors

• Understand exceptions and differentiate it from errors. • Enable to catch and handle exception in programs. • Program own exceptions	**Unit VII: Exception Handling (3)** 7.1. Exception vs Error, Exception Handling mechanism. 7.2. Throw Statement, Try and Catch Statements, Multiple Catch Statements, Catching All Exceptions. 7.3. Nested try-catch, User Defined Exception
• Describe importance of generic programming • Use function and class templates • Understand template specialization and program it..	**Unit VIII: Generic Programming (3)** 8.1. Introduction and Concept, Function Templates, Class Templates. 8.2. Template Specialization. Rules for Using templates.
• Understand concept of streams. • Enable to read/write text and binary files • Use random file access in file handling	**Unit IX: Input/output with Files (4)** 9.1. Streams, Opening and Closing Files, Reading and Writing Text Files. 9.2. Detecting End of File, Reading and Writing Binary Files, Random File Access.

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above

mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Laboratory Work

Student should write programs, prepare lab sheet for each of the topics discussed in classes. Minimum 3 lab hour per week in required. Nature of programming problem can be decided by instructor. Lab sheet of around 50 programming problems is recommended.

Prescribed Text

- *Object-Oriented Programming in C++*: Robert Lafore, Sams Publishing, 4th edition, 2002

Reference

- *C++ Programming with Object Oriented Approach*, Arjun Singh Saud, KEC Publication, Kathmandu, First Edition 2012.
- *C++ How To Program*, Paul J. Ditel & Dr. Harvey M. Ditel, Prentice Hall, 9th Edition, 2013

Course Title: Operating Systems **Credit: 3**

Course No: CSIT.215 **Number of period per week: 3+3**

Nature of the Course: Theory + Lab **Total hours: 45+45**

Year: Second, Semester: Third

Level: B. Sc. CSIT

1. Course Introduction

This course demonstrates basic features of operating system components. It describes process management, deadlocks and process synchronization, memory management techniques, File system implementation, and I/O device management principles. It also includes case study on Linux operating system so that students can compare principles studied in the course with their real implementation.

2. Objectives

At the end of this course the students should be able to:

- Describe need and role of operating system.
- Understood OS components such a scheduler, memory manager, file system handlers and I/O device managers.
- Analyze and criticize techniques used in OS components
- Demonstrate and simulate algorithms used in OS components
- Identify algorithms and techniques used in different components of Linux

3. Specific Objectives and Contents

Specific Objectives	Contents
• Explain Evolution of operating system generation wise • Understand system calls and operating modes of OS • Describe OS structures and open source operating systems	**Unit I: Overview (4)** 1.1. Definition, Two views of operating system, Evolution of operating system, Types of OS. 1.2. System Call, Handling System Calls, System Programs, Types of System Call 1.3. Operating System Structure, The Shell, Open Source Operating Systems
• Differentiate program, process, and threads • Understand process states, process control blocks and thread table • Understand and Simulate inter-process communication IPC and mutual exclusion.	**Unit II: Process Management (10)** 2.1. Process vs Program, Multiprogramming, Process Model, Process States, Process Control Block. 2.2. Threads, Thread vs Process, User Space Threads, Kernel Space Threads. 2.3. Inter Process Communication, Race Condition, Critical Section 2.4. Implementing Mutual Exclusion: Mutual Exclusion

• Trace and simulate process scheduling algorithms and compare them • Describe and simulate classical IPC problems	with Busy Waiting (Disabling Interrupts, Lock Variables, Strict Alteration, Peterson's Solution, Test and Set Lock), Sleep and Wakeup, Semaphore, Monitors, Message Passing, Classical IPC problems (Producer Consumer, Sleeping Barber, Dining Philosopher Problem) 2.5. Process Scheduling: Goals, Batch System Scheduling (First-Come First-Served, Shortest Job First, Shortest Remaining Time Next), Interactive System Scheduling (Round-Robin Scheduling, Priority Scheduling, Multiple Queues), Evaluating Scheduling Algorithms, Overview of Real Time System Scheduling.
• Characterize and simulate deadlock occurrence. • Understand deadlock prevention and avoidance techniques • Enable to apply deadlock detection and recovery techniques.	**Unit III: Process Deadlocks (6)** 3.1. Introduction, Deadlock Characterization, Preemptable and Nonpreemptable Resources, Resource – Allocation Graph, Conditions for Deadlock 3.2. Handling Deadlocks: Ostrich Algorithm, Deadlock prevention, Deadlock Avoidance (Safe and Unsafe States, Bankers Algorithm for Single and Multiple Resource Instances) , Deadlock Detection (For Single and Multiple Resource Instances), Recovery From Deadlock (Through Preemption and Rollback)
• Analyze and understand impact of multiprogramming in resource utilization • Describe memory management and allocation techniques • Understand virtual memory, paging and segmentation. • Demonstrate and simulate page replacement algorithms	**Unit IV: Memory Management (8)** 4.1. Introduction, Monoprogramming vs Multi-programming, Modelling Multiprogramming, Multiprogramming with fixed and variable partitions, Relocation and Protection. 4.2. Memory management (Bitmaps & Linked-list), Memory Allocation Strategies 4.3. Virtual memory: Paging, Page Table, Page Table Structure, Handling Page Faults, TLB's 4.4. Page Replacement Algorithms: FIFO, Second Chance, LRU, Optimal, LFU, Clock, WS-Clock, Concept of Locality of Reference, Belady's Anomaly 4.5. Segmentation: Why Segmentation?, Drawbacks, Segmentation with Paging(MULTICS)
• Describe file and directory concept • Understand and simulate file and directory implementation strategies. • Exemplify disk free space management techniques	**Unit V: File Management (6)** 5.1. File Overview: File Naming, File Structurte, File Types, File Access, File Attributes, File Operations, Single Level, two Level and Hierarchical Directory Systems, File System Layout. 5.2. Implementing Files: Contiguous allocation, Linked List Allocation, Linked List Allocation using Table in Memory, Inodes.

	5.3. Directory Operations, Path Names, Directory Implementation, Shared Files 5.4. Free Space Management: Bitmaps, Linked List
• Describe device types and structures. • Understand Interrupts, DMA and IO software • Demonstrate IO handling techniques • Exemplify and simulate disk scheduling algorithms	**Unit VI: Device Management (6)** 6.1. Classification of IO devices, Controllers, Memory Mapped IO, DMA Operation, Interrupts 6.2. Goals of IO Software, Handling IO(Programmed IO, Interrupt Driven IO, IO using DMA), IO Software Layers (Interrupt Handlers, Device Drivers) 6.3. Disk Structure, Disk Scheduling (FCFS, SSTF, SCAN, CSCAN, LOOK, CLOOK), Disk Formatting (Cylinder Skew, Interleaving, Error handling), RAID
• Correlate above knowledge with Linux operating system	**Unit VII: Linux Case Study (5)** 7.1. History, Kernel Modules, Process Management, , Scheduling, Inter-process Communication, Memory Management, File Systems

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weightage</th><th>Marks</th><th>Practical</th><th>Weightage</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
<tr><td></td><td>Attendance</td><td>20%</td><td>Practical Exam</td><td>50%</td></tr>
<tr><td></td><td>Internal Exams</td><td>50%</td><td></td><td></td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Laboratory Work

Student should simulate at least 15 algorithms discussed in class, prepare lab sheet for each of the algorithm simulated in lab. Minimum 3 lab hour per week in required. Algorithms to be simulated can be decided by instructor, but it must cover IPC, process scheduling, Page Replacement, Free Space management, File System, and deadlock.

Prescribed Text

- *Modern Operating Systems:* Andrew S. Tanenbaum, PH1 Publication, Third edition, 2008

Reference

- *Abraham Silberschatz, Peter Baer Galvin and Greg Gagne,* "Operating System Concepts", John Wiley & Sons (ASIA) Pvt. Ltd, Seventh edition, 2005.
- *Harvey M. Deitel, Paul J. Deitel, and David R. Choffnes,* "Operating Systems", Prentice Hall, Third edition, 2003.

Course Title: Statistics and Probability **Credit: 3**
Course No: CSIT.216 **Number of period per week: 3+3**
Nature of the Course: Theory+ Lab **Total hours: 45**
Year: Second
Level: B. Sc. CSIT

1. Course Introduction

This course covers concept of descriptive statistics, probability, probability distributions, inferential statistics and their applications.

2. Objectives

At the end of this course the students should be able to:

- Know basic concepts of descriptive statistics, probability and their distributions, and inferential statistics and their applications in different areas.
- Identify existing pattern of data and their applications.
- Apply statistical tools and techniques in rational ways.
- Analyze the data scientifically and interpret them meaningfully

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define statistics and probability, and state the scope, importance and limitations of statistics. • Explain the relations between statistics and information technology, and develop the concept of commuter software in association with statistics.	**Unit I: Concepts of Statistics and Probability (2 hr)** 1.1. Definition, importance, scope and limitations of statistics 1.2. Role of probability theory in statistics 1.3. Relations of statistics with information technology and e-methods.
• Define scales, attributes, variables and types of data, and also state the meaning of finite and infinite population, and sample, and distinguish between random and non-random sampling, • To organize the data, classify and tabulate them for presentation, and use appropriate diagrams & graphs for data presentation.	**Unit II: Concept of Population, Sample, Data and Variables and their types (3 hrs)** 2.1 Concept of attributes, scales, variables and their types, types of data, finite and infinite population, notation of sample, random and non-random sample. 2.2 Presentation of data- organization, classification and tabulation of data, rules of tabulation (strugs rule), diagrams and graphs. 2.3 Computational problems and examples
• Compute mean, median, mode, harmonic and geometric mean and partition values and interpret the results, and also state the properties • Compute absolute and relative variation, range, quartile deviation, standard deviation, mean deviation and coefficient of variation, Lorenz	**Unit III: Measures of Descriptive Statistics (8 hrs)** 3.1 Measures of locations- mean, median, mode, harmonic and geometric mean, partition values, and their use and properties. 3.2 Measures of dispersion- variation (absolute and relative), range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Lorenz curve and gini-coefficient and

curve, gini-coefficient and also to interpret the result. • Describe the concept and use of skewness and kurtosis (by using partition values, central and raw moments).	their interpretations and use, 3.3 Measures of skewness and kurtosis, and their use. 3.4 Computational problems and examples
• To understand the terminologies of sample space, events, random experiment, trial, mutually exclusive events, equally likely cases, and to test the independence of the random variables. • To explain classical, statistical, axiomatic definitions of probability, basic principles of counting, permutation and combinations and compute them. • State additive, multiplicative, and conditional probability and compute probabilities, and state Bayes theorem and compute probability using Bayes theorem • Understand discrete & continuous random variables and to calculate probability distribution of a random variables • Compute expected values of discrete & continuous random variables	**Unit IV: Basic Probability Theory (5 hrs)** 4.1 Basic terminology in probability- sample space, events, random experiment, trial, mutually exclusive events, equally likely cases, favourable events, independent and dependent events, 4.2 Definition of probability- classical, statistical, subjective and axiomatic definitions, basic principles of counting, permutation and combinations, 4.3 Laws of probability- additive, multiplicative, and conditional probability, Bayes theorem with examples. 4.4 Random variables- discrete and continuous random variables, probability distribution of random variables 4.5 Expectation- expected value of discrete and continuous random variables, and mean and variance of random variable with illustrative examples. 4.6 Computational problems and examples
• To understand the marginal and joint probability distribution functions, mass and density functions, • Compute mean, variance, co-variance and correlation of random variables. • To know the independent & dependent random variables, • To know Bernoulli, binomial and Poisson random variables, and their distributions and moments, and also to compute their probabilities, test the normality of the distributions by using chi-square test. • Fitting binomial and Poisson distributions, • State the normal distribution and its moments, standardization of normally distributed random variable,	**Unit V: Probability Distributions (12hrs)** 5.1 Marginal and joint probability distributions, joint probability distribution of two random variables, marginal and joint probability mass functions and density functions 5.2 Mean, variance, co-variance, and correlation of random variables, independence of random variables 5.3 Discrete probability distributions- Bernoulli and binomial random variable and their distributions and moments. 5.4 Computing binomial probabilities and fitting binomial distribution (relate with chi-square test of the distribution pattern of the frequency). 5.5 Poisson random variable and its distribution and moments, and computing Poisson probabilities, and also fitting of Poisson distribution (relate with chi-square test of the frequency distribution). 5.6 Continuous probability distribution- normal

• To compute the areas under the normal curve, • Explain the negative exponential distribution and its moments, and also compute the probability.	distribution and its moments, standardization of normally distributed random variable, measurement of areas under the normal curve, 5.7 Negative exponential distribution and its moments, 5.8 Present the areas of application of above probability distributions. 5.9 Computational problems and examples
• To understand the definitions of chi-square, t and F random variables and their distributions and use them • Find the joint distribution of mean and sample variance of normal distribution	**Unit VI: Distribution of Chi-square, t and F (2 hrs)** 6.1 Definitions and properties of chi-square, t and F distribution and their random variables and their distributions and their comparisons 6.2 Find the mean and variance of these distribution (Proof is not required). 6.3 Computational problems and examples
• Understand simple random sampling methods and use it • Explain the sampling distribution and standard error and compute standard error and interpret the result • To know the distinction of descriptive and inferential statistics, point and interval estimation, • To understand the criteria of good estimator, maximum likelihood method of estimation • To estimate mean and variance in normal distribution, estimate the proportion in binomial distribution, • Compute the confidence interval of mean in normal distribution. • To know the step of testing of hypothesis, level of significance, types of error and power of the test. • Testing the hypothesis about mean in normal distribution in case of known variance (z-test) and unknown variance (t-test). • To carry out the ANOVA and also compute ANOVA table for one & two way classifications.	**Unit VII: Inferential Statistics (8 hrs)** 7.1 Concept of sampling its types (probability and non probability) with merits and demerits. 7.2 Steps of sample selection, determination of sample size. 7.3 Sampling distributions and standard error in both case (with and without replacement) 7.4 Distinction between descriptive and inferential statistics. 7.5 Concept of point and interval estimation, and criteria of good estimator, 7.6 Maximum likelihood method of estimation, and estimation of mean and variance in normal distribution, 7.7 Estimation of proportion in binomial distribution and confidence interval of mean in normal distribution 7.8 Concept of testing of hypothesis, level of significance, types of errors, power of the test, testing of hypothesis, concerning mean of a normal distribution in case of known variance and unknown variance. 7.9 Concept of analysis of variance (ANOVA), computation of one way and two way analysis of variance. 7.10 Computational problems and examples
• To understand and use correlation and regression in information technology • Compute correlation and regression coefficients and interpret the results,	**Unit VIII: Correlation and Regression (5 hrs.)** 8.1.Simple correlation- scatter diagram, Karl Pearson's correlation coefficient, and its properties, standard error, probable error, significant test of correlation coefficient.

and also state the properties. • Explain the assumptions of model, least-square estimators technique, and test of significance, and to compute the coefficient of determination and interpret the results. Use the analysis of variance in regression.	8.2. Computation of partial and multiple correlations and their consistency (up to three variables) 8.3. Simple linear regression- model and assumptions of simple linear regression, least square estimators of regression coefficients, standard error of estimate, test of significance of regression coefficients, coefficient of determination, and analysis of variance (up to three variables) 8.4. Computational problems and examples

Note: The figures in the parentheses indicate the approximate periods for the respective units. In addition to teaching hours (45), there will be 3 hours for reviews and discussions.

Evaluation System

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments & Lab	10%	40
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Internal exams	50%	
		Group work	10%	
Total External	60	Total Internal	100%	40
Full Marks 60+40 = 100				

External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage	External exam marks
Group A: Multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	7	6	6×8 = 48	40%	24
Group C:Long answer type questions	3	2	2×16 =32	40%	24
			100	100%	60

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Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge and skill of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and discussion
- Group as well as individual work
- Self study and assignments
- Presentation by students
- Term paper writing
- Quizzes and guest lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Prescribed Text

- Sheldon M. Ross. *Introduction to Probability and Statistics for Engineers and Scientists*, 3rd Edition, India, Academic Press, 2005.
- Shrestha, H.B. *Statistics and Probability- Concepts and Techniques*, EKTA Books Publication, Pvt. Ltd., reprint, 2008.

References

- Richard A. Johnson, Miller and Freunds. *Probability and Statistics for Engineers*, 6^{th} Edition, Indian reprint, Pearson Education, 2001.
- Ronald E. Walole, R.H. Myers, S.L. Myers, and K. Ye. *Probability and Statistics for Engineers and Scientists*, 8^{th} Edition, Indian reprint, Pearson Education, 2001.
- Aryal, T.R. *Fundamental Statistics- Concepts and Practices*, Viddharthee Publication, Pvt. Ltd., 2010.
- Martin, A. *Research Methods, Statistics, IT and e-Methods*. Icon Publication Pvt. Ltd, 2004.
- Yamane, T. *Mathematics for Economics*. Prentice-Hall of India Pvt. Ltd, 2000.
- Aryal, T.R. *Biostatistics-For Biology, Medical and Health Sciences*, Pinnacle Publication, Pvt. Ltd., 2011.
- Harry Frank & Steven C. Althoen. *Statistics Concepts and Applications*. Cambridge University Press (Low price edition), 1995.
- Murray R. Spiegel & Larry J. Stephens. *Statistics (Schaum's outlines)*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, India, 2000.
- Kapoor J. N. and H.C. Saxena. *Mathematical Statistics*, S. Chand & Company Ltd., New Delhi, India, 2001.
- Gupta S. C. and Kapoor V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons, 2007.
- Rohatgi V. K. and Ehsanes Saleh, A. K. MD. *An Introduction to Probability and Statistics*, John Wiley & Sons, 2005.
- Hoel, Port and Stone. *Introduction to Probability Theory*, Houghton Mifflin Company Boston, 1971.
- Hogg R.V and Criag, A.T. *Introduction to mathematical statistics, 3^{rd} edition,* Academic Press, USA.
- Sukubhattu, N. P. *Probability Theory and Statistical Methods, 2^{nd} edition,* Asmita Publications, Kathmandu, 2063BS.
- Miller and Fruend. *Modern Elementary Statistics*, Pearson Publication, 2007.
- Shrestha, Ganga. *Fundamental of Statistics*. ASAN Publications, Kathmandu,Nepal, 2006
- Feller, W. *An Introduction to Probability Theory and its Applications*, Vol. 1, Third edition, John Wiley and Sons, Singapore, 2000.
- Hoel, Port and Stone. *Introduction to Probability Theory*, Houghton Mifflin Company Boston, 1971.
- Mayer, P. L. *Introductory Probability and Statistical Applications*, second edition, Oxford and IBH Publishing Co. Pvt Ltd, New Delhi, 1970.
- Spiegel, M.R. *Theory and Problems of Statistics*, McGraw Hill Book Company, Singapore, 1992.

Note-

(i) Theory and practice should go side by side.
(ii) At least Excel and SPSS software should be used for data analysis.
(iii) It is recommended 45 hours for lectures and 15 additional hours for tutorial class for the completion of the course in the semester.
(iv) Home works and assignments covering the lecture materials will be given throughout the semester.

Specific objectives and contents of the practical problems

Specific objectives	**Contents of the practical problems**
• To organize and arrange raw data in appropriate classifications and tabulations for presentation and interpretation and use appropriate diagrams and graphs.	1. Arrange the data using strugs rule and present possible diagrams and graphs
• To compute mean, median, mode, harmonic mean and geometric mean and partition values, range, quartile,, standard deviation, mean deviation and coefficient of variation, Lorenz	2. Compute mean, median, mode, harmonic mean, geometric mean, partition values, range, quartile deviation, mean deviation, standard deviation, and coefficient of variation, Lorenz curve and gini-

curve, gini-coefficient, skewness and kurtosis using real data sets.	coefficient, skewness and kurtosis
• To compute probability distribution table of uni-variate and bi-variate data, and also calculate mean and variance using expectation	3. Develop probability distribution table of uni-variate data and bi-variate data, and compute mean and variance using expectation.
• To calculate marginal and joint probability table and mean, variance, co-variance and correlations, and test of independence of random variables, • To compute mean and variance of binomial and Poisson random variables, to test normality of binomial distribution using chi-square test, and also calculate areas under normal curve.	4. Calculate the marginal and joint probability distributions table and mean, variance, co-variance, and correlations of random variables, and test the independence of random variables, 5. Compute mean & variance of binomial and Poisson random variables; test the normality of binomial distribution using chi-square test, and compute the areas using normal curve.
• To compute sample size, sampling distributions and standard error, interval estimation of mean and proportion • To calculate t and z-test and one way and two analyses using real data sets.	6. Compute the sample size, sampling distributions and standard error with and without replacement, and also to compute interval estimation of mean and proportion 7. Compute t and z-test using real data, and one way and two way analysis of variance using real data sets.
• To compute simple, partial and multiple correlations, probable error, significant test of correlation coefficient using real data sets. • To fit linear regression and compute standard error of estimate, test of significance of regression coefficients, and coefficient of determination using real data sets.	8. Compute simple, partial and multiple correlations and derive probable error, significant test of correlation coefficient. 9. Fit simple linear regression, compute standard error of estimate, test of significance of regression coefficients, and coefficient of determination.

Note:

- Student must perform 3 hours of practical computer lab work every week.
- Students will develop the skills and knowledge on the calculations by using real data sets manual or computer software package.
- At least a problem is to be performed by each and every unit of the section of the above contents. Additional problems may be added subject to availability of time and skills of the students.
- The practical exam will be graded on the basis of the following marking scheme:

In-Semester Evaluation	20 %
Final Exam Written	60 %
Final Exam Oral	20 %

- The problems for practical computation are to be provided by respective teachers.

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Fourth Semester

Syllabus

2074

Mahendranagar, Kanchanpu

Course Title: Applied Statistics **Credit: 3**
Course No: CSIT.221 **Number of period per week: 3+3**
Nature of the Course: Theory+Lab **Total hours: 45+45**
Year: Second
Level: B.Sc.CSIT

1. Course Introduction

This course covers applied statistics for computer and information technology, which makes students able to understand the scope of applied statistics including non-parametric tests, correlation and regression models, sample survey, survey techniques, design of experiment and inferential statistics.

2. Objectives

At the end of this course the students should be able:

- To know the scope and concepts of applied statistics.
- to know basic concepts of non-parametric tests, correlation and regression models, sampling survey, survey techniques, design of experiment and inferential statistics, and their applications.
- to apply statistical tools and techniques in rational ways.
- to interpret statistical inferences meaningfully.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand the meaning, scope, importance and limitations of applied statistics • Explain the relations of applied statistics with information technology and e-methods.	**Unit I: Concepts of Applied Statistics (01 hr)** 1.1. Scope, importance and limitations of applied statistics 1.2. Relations of applied statistics with information technology and e-methods.
• To know population, sample and need of sampling, distinguished between censuses and sample survey, and sampling and non-sampling errors, and to prepare questionnaires to select sample and determine sample size sampling and non-sampling errors. • To know random sample, and to apply simple random sampling with and without replacement, stratified random sampling and systematic sampling, ratio and regression method of estimation under simple and stratified sampling, cluster sampling, multistage sampling, probability proportion to size (pps) sampling, and also to estimate mean and population total and variance.	**Unit II: Sample survey and Sampling Techniques (07 hrs)** 2.1 Concept of population and sample, need of sampling, censuses and sample survey, questionnaire design, sample selection and determination of sample size, sampling and non-sampling errors. 2.2 Definition of a random sample, types of sampling, uses and applications of simple random sampling with and without replacement, stratified random sampling and systematic sampling, ratio and regression method of estimation under simple and stratified sampling, cluster sampling, multistage sampling, probability proportion to size (pps) sampling, estimation mean and population total and variance (proof is not required)

• Compute Karl Pearson's correlation, Spearman rank correlation, Kendal Tau correlation, partial and multiple correlations for real data and interpret them. • To understand OLS, multiple linear regression and their assumptions, and compute coefficient estimation, fitting of first & second degree regression equations, exponential curves, residuals; and to calculate total sum of squares, coefficient of determination and interpret them, test of significance of regression coefficients, coefficient of determination, and analysis of variance (up to three variables). • To fit Cobb-Dauglas production function in real data, and to understand Growth model, Logistic regression model, and Autoregressive model of order one, to understand the heteroscedasticity, multicolinearity and autocorrelation.	**Unit III: Correlation and Regression Models (08 hrs)** 3.1 Concept of simple correlation, Karl Pearson's correlation, Spearman rank correlation, Kendal Tau correlation, partial and multiple correlations. 3.2 Meaning of data modelling, Principles of Ordinary Least Squares (OLS), multiple linear regression, assumptions, coefficient estimation, methods of fitting of first and second degree equations, exponential curves, analysis of residuals, Fisher decomposition of total sum of squares, coefficient of determination and its interpretation. Test of significance of regression coefficients and analysis of variance (only application in real data up to three variables). 3.3 Concepts of Cobb-Dauglas production function, growth model, logistic regression model, Autoregressive model of order one; fitting of Cobb-Dauglas production function, and introduction of heteroscedasticity, multicolinearity and autocorrelation.
• To apply Run test, Sign test, Wilcoxon signed rank test and Kolmogorov-Smirnov test for real data sets. • Use Kolmogorov-Smirnov two sample test, Median test, Mann-Whitney U test, and to test Kruskal-Wallis one way ANOVA. • To measure the association such as Kendall's tau coefficient, Spearman's coefficient, contingency coefficient, coefficient of concordance, Friedman's two way analysis of variance by ranks. • Use chi-square test for independence of attributes and test for goodness of fit to numerical problems.	**Unit IV: Non-parametric test (07 hrs)** 4.1. Needs of applying non-parametric tests, Run test, Sign test, Wilcoxon signed rank test, Kolmogorov-Smirnov test. 4.2. Kolmogorov-Smirnov two sample test, Median test, Mann-Whitney U test, and Kruskal-Wallis one way ANOVA test. 4.3. Measures of association (Kendall's tau coefficient, Spearman's coefficient, contingency coefficient, coefficient of concordance, Friedman's two way analysis of variance by ranks 4.4. Chi-square test for independence of attributes and test for goodness of fit (only numerical problems)
• To know the design of experiments, Analysis of variance, F-statistics, linear model in ANOVA and their applications. • Carryout Analysis of one and two ANOVA with 1 and m observations per cell in fixed effect model. • Compute ANOVA of Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), and also to obtain the missing lot techniques for RBD and LSD for one observation. • Calculate main and interaction effects of 2^2, 2^3 and also analysis table.	**Unit V: Design of Experiments (07 hrs)** 5.1. Need and concepts of design of experiments, Analysis of variance, F-statistics and its applications, linear model in ANOVA. Analysis of one and two ANOVA with 1 and m observations per cell in fixed effect model. 5.2. Fundamental principles of design, Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD), and their analysis, Missing lot techniques for RBD and LSD (one observation missing only). 5.3. Concepts of factorial design, 2^2 and 2^3, and compute main and interaction effects of factorial design.

• To know statistical quality control, and its use, importance and purposes. • Compute $\bar{x}$ and R charts and their constructions, to detect lack of control in $\bar{x}$ and R charts, their limits, uses and interpretations. • Compute p-chart and its limit, use and interpretations. • Compute c-chart and its limit, use and interpretation. • To know the acceptance quality level, consumers and producers risks.	**Unit VI: Statistical Quality Control (07 hrs)** 6.1 Concepts of statistical quality control, its use, importance and purposes, and control charts and control limits. 6.2 Control chart for variables, $\bar{x}$ and R charts, construction of $\bar{x}$ and R charts, detecting lack of control in $\bar{x}$ and R charts, limits, uses and interpretations. 6.3 Control chart for attributes, p-chart, its limit, use and interpretation. 6.4 Control chart for number of defects per unit (c-chart), its limit, use and interpretation. 6.5 Acceptance quality level, and consumers and producers risks.
• To understand point & interval estimation, confidence interval for mean and proportion, relationship of sample size with desired level of error. • To estimate parameters of binomial, Poisson and normal distribution using maximum likelihood estimation. Explain the properties of maximum likelihood estimate. Use method of moments and least squares techniques. • To estimate confidence interval and confidence coefficient, and confidence interval of mean, proportion, variance and difference between means. • To know null and alternative hypothesis, type I and type II errors, level of significance, critical value and critical region, p–value, one and two tail test, steps used in testing of hypothesis. • To test one sample case for mean of normal population, test for proportion, test for difference between two means and two proportions, paired sample t-test, two independent sample tests for variances of normal populations,	**Unit VII: Inferential Statistics (08 hrs)** 7.1. Concepts of Point & interval estimation, confidence interval for mean and proportion, relationship of sample size with desired level of error. 7.2. Estimation of parameters, likelihood function and its properties, maximum likelihood estimation of parameters of binomial, Poisson and normal distribution, properties of maximum likelihood estimate, method of moments and method of least squares techniques. 7.3. Interval estimation, confidence interval and confidence coefficient, method for obtaining confidence limits, confidence interval of mean, proportion, variance and difference between means. 7.4. Hypothesis Testing- Types of statistical hypotheses (null & alternative), type I & type II errors, level of significance, critical value and critical region, concept of p–value and use of p-value in hypothesis testing, one & two tail test, steps used in testing of hypothesis, one sample tests for mean of normal population (for known & unknown variance), test for proportion, test for difference between two means and two proportions, paired sample t-test, two independent sample tests for variances of normal populations.

Evaluation System:

Undergraduate Programs				
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**
End semester examination	60	Assignments	10%	20
(Details are given in the separate table at the end)		Quizzes	10%	
		Attendance	10%	
		Presentation	10%	
		Term papers	10%	
		Mid-Term exam	40%	
		Group work	10%	
Total External	60	Total Internal	100%	20
Full Marks 60+20+20 = 100				

External evaluation

End semester examination: It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

Full Marks: 100, Pass Marks: 50, Time: 3 Hrs

Nature of question	**Total questions to be asked**	**Total questions to be answered**	**Total marks**	**Weightage**	**External exam marks**
Group A: Multiple choice*	20	20	20×1 = 20	20%	12
Group B: Short answer type questions	7 questions	6	6×8 = 48	40%	24
Group C:Long answer type questions	3 questions	2	2×16 =32	40%	24
			100	100%	60

*Scoring scheme will not follow negative marking.

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failing to get such score will be given NOT QUILIFIED (NQ) and the student will not be eligible to appear in the end semester examinations.

Practical examination: Practical examination will be taken at the end of the semester. Students must demonstrate the knowledge and skill of the subject matter.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Term paper: Term paper must be prepared by using computer in a standard format of technical writing and must contain the required number of pages. It should be prepared and submitted individually. The stipulated time for submission of the paper will be seriously taken as one of the major criteria of the evaluation.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and discussion
- Group as well as individual work
- Self study and assignments
- Presentation by students
- Term paper writing
- Quizzes and guest lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

2. Specific Objectives	Contents of the practical problems
• To compute correlation coefficients in different situations and interpret the results. • To have a knowledge of fitting models of the given data also check the Heteroscedasticity, Multicolinearity and Autocorrelation, and interpret the results.	1. For given data, compute simple correlation, Karl Pearson's correlation, Spearman rank correlation, Kendal Tau correlation, partial and multiple correlations of the given data and interpret the results. 2. To fit multiple linear regression for first and second degree equations, exponential curves, and compute total sum of squares, coefficient of determination, test of significance of regression coefficients, analysis of variance up to three variables for given data and interpret the results. 3. To fit the Cobb-Dauglas production function, use the concept of Growth model, Logistic regression model, and Autoregressive model of order one to the given data and also to interpret the results, and check the Heteroscedasticity, Multicolinearity and Autocorrelation.
• To develop skills on preparing questionnaires and selecting appropriate sampling techniques and to compute mean and population total and variance.	4. To constructs the questionnaires for the survey, to determine the sample size in a sample survey, and to select appropriate sampling techniques for survey and estimate mean and population total and variance of a given data for different sampling techniques.
• To develop skills of applying non-parametric tests in different problems and interpret the results.	5. At least one numerical problem is carried out for each of the non-parametric tests (Run test, Sign test, Wilcoxon signed rank test, Kolmogorov-Smirnov test, Kolmogorov-Smirnov two sample test, Median test, Mann-Whitney U test, Kruskal-Wallis one way ANOVA test and Kendall's tau coefficient, Spearman's coefficient, contingency coefficient, coefficient of concordance, Friedman's two way analysis of variance by ranks, and also Chi-square test for independence of attributes and test for goodness of fit.
• Carry out one and two	6. Carry out one and two ANOVA and layout the Completely Randomized Design (CRD), Randomized Block Design (RBD) and Latin Square

ANOVA and layout the CRD, RBD and LSD for given data, and to calculate main and interaction effects of the design 2^2, and 2^3 designs for given data.	Design (LSD) for given data. 7. To estimate main and interaction effects of the design 2^2, 2^3 and to carry out problem related to factorial design for given data.
• To develop skills on statistical quality control related problems and use different charts.	8. To construct $\bar{x}$ and R charts, p-chart and c-chart for given data and interpret the results.
• To develop the skills on inferential statistics related problems and carry out the testing in different data in different situations and interpret them.	9. To calculate point & interval estimation, confidence interval and limits for mean, proportion and variance, and use maximum likelihood, moments and least square techniques to estimate the parameters of the distributions for given data. 10. Carryout one sample tests for mean of normal population (for known and unknown variance), test for proportion, test for difference between two means and two proportions, paired sample t-test, two independent sample tests for variances of normal populations.

Note: There will be practical examination after end-semester examination. An exteran examiner will be there for taking viva exam.

Prescribed Text

- Drpaer, N and H. Smith. *Applied Regression Analysis*, 2nd edution, New York, John Wiley & Sons, 1981.
- Hogg & Tanis, *Probability & Statistical Inference*, 6th edition, First Indian reprint, 2002
- Gujarati, D. *Basic Econometrics*, International Edition, 1995.
- Gibbons, J.D. *Nonparametric Statistical Inference*. International Student edition.
- Siegel, S. *Non-parametric Statistics for the Behavioural Sciences*. McGraw-Hill, New York.
- Hollander & Wolf. *Non-parametric Statistical Methods*. Johns Wiley & Sons, New York.
- Mukhopadhyay p. Theory and Methods of Survey Sampling, prentice Hall of India, New Delhi, 1998.
- Montgomery Douglas C. Design and Analysis of Experiments, 5th edition, John Wiley & Sons Inc., 2001.
- Cochran W.G. Sampling Techniques, 3rd edition, John Wiley and Sons Inc. New York, 1977.
- Kempthorane, O. Design and Analysis of Experiments, Wiley EASTERN, New York.
- Desraj, Pramod Chandhok, SamPle Survey Theory, Narosa Publishing House, 1998.

References

- Aryal, T.R. *Fundamental Statistics- Concepts and Practices*, Viddharthee Publication, Pvt. Ltd., 2010.
- Martin, A. *Research Methods, Statistics, IT and e-Methods*. Icon Publication Pvt. Ltd, 2004.
- Aryal, T.R. *Biostatistics-For Biology, Medical and Health Sciences*, Pinnacle Publication, Pvt. Ltd., 2011.
- Harry Frank & Steven C. Althoen. *Statistics Concepts and Applications*. Cambridge University Press (Low price edition), 1995.
- Murray R. Spiegel & Larry J. Stephens. *Statistics (Schaum's outlines)*, Tata McGraw-Hill Publishing Company Ltd, New Delhi, India, 2000.
- Kapoor J. N. and H.C. Saxena. *Mathematical Statistics*, S. Chand & Company Ltd., New Delhi, India, 2001.

- Gupta S. C. and Kapoor V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand and Sons, 2007.
- Rohatgi V. K. and Ehsanes Saleh, A. K. MD. *An Introduction to Probability and Statistics*, John Wiley & Sons, 2005.
- Miller and Fruend. *Modern Elementary Statistics*, Pearson Publication, 2007.
- Feller, W. *An Introduction to Probability Theory and its Applications*, Vol. 1, Third edition, John Wiley and Sons, Singapore, 2000.
- Mayer, P. L. *Introductory Probability and Statistical Applications*, second edition, Oxford and IBH Publishing Co. Pvt Ltd, New Delhi, 1970.
- Spiegel, M.R. *Theory and Problems of Statistics*, McGraw Hill Book Company, Singapore, 1992.

Note-

(i) Theory and practice should go side by side.
(ii) At least Excel and SPSS software should be used for data analysis.
(iii) It is recommended 45 hours for lectures and 15 additional hours for tutorial class for the completion of the course in the semester.
(iv) Home works and assignments covering the lecture materials will be given throughout the semester.

Course Title: Data Communication and Networks **Credit: 3**

Course No: CSIT.222 **Number of period per week: 3+3**

Nature of the Course: Theory + Lab **Total hours: 45+45**

Year: Second, Semester: Fourth

Level: B. Sc. CSIT

1. Course Introduction

This course provides an in-depth discussion of computer networks. It includes a detailed discussion of the different Network Models. Concepts that have a direct effect on the efficiency of a network (e.g. collision and broadcast domains, topology) are also discussed. Concepts on different network technologies, distributed computation, networking, and communication software, and security issues are also discussed.

2. Objectives

Towards the end of the course, students are expected to / able to:

- Be familiar with the different Network Models.
- Understand different network technologies
- Understand the effects of using different networking topologies
- Be updated with different advanced network technologies that can be used to connect different networks
- Be familiar with various hardware and software that can help protect the network
- Know the advantage of using a network management system

3. Specific Objectives and Contents

Specific Objectives	Contents
• Describe the basic concept of communications and the electronic implementation of communications paradigms. • Identify the characteristics and the analyze the signals properties	**Unit I: Data Communication Fundamentals (3)** 1.1. Data Communication: Components, Network vs Data Communication, Data vs Signal 1.2. Signal: Analog and Digital Signal, Signal Characteristics: Frequency, Amplitude, Phase, Periodic Signal, Square Wave, Signal Propagation 1.3. Network: Network Models, Categories of Network, Networked Data Processing: Centralized Processing, Distributed Processing, Client/Server Processing
• Describe the design issues related to data transfer • Compare and contrast the circuit and packet switching technologies	**Unit II: Data Transmission Mechanisms (8)** 2.1. Communication Modes: Simplex, Half-duplex, Full – duplex 2.2. Transmission Modes: Serial Transmission, Parallel Transmission

• Differentiate virtual circuits from datagram services. • Understand the techniques of converting data into signals	2.3. Synchronization: Asynchronous Transmission, Synchronous Transmission. 2.4. Introduction to Packet Switching: Circuit Switching vs. Packet Switching, Types of Services: Connection Oriented Services (Virtual Circuits) Connectionless Services (Datagram), Structure of a Switch, 2.5. Data Encoding: Analog to Digital (Pulse Code Modulation, Delta Modulation), Analog to Analog (AM, FM, PM), Digital to Digital (Line Coding, Block Coding), Digital to Analog (ASK, FSK, PSK).
• Describe different network topologies with their strength and drawbacks. • Understand data transmission characteristics of transmission media. • Quantify performance of different transmission system. • Explain role and importance of protocol architecture • Understand protocol header and their use	**Unit III: Network Architectures (6)** 3.1. Network Topologies: Bus, Ring. Star, Tree, Mesh, Hybrid 3.2. Transmission Media: Guided Media: Twisted Pair Cable, Coaxial Cable, Unguided Media: Microwave, Radio Wave, Infrared Wave 3.3. Transmission Impairments: Impairements in Guided Media, Impairements in unguided Media. 3.4. Physical Layer Interfaces: RS 232 / EIA 232/ USB 3.5. Network Performance: Bandwidth, Throughput, Latency. 3.6. Protocols: Syntax, Semantics & Timing, Protocol architecture and Importance, OSI Reference. TCP/IP Protocol Suit 3.7. TCP and IP Headers with Field Description
• Describe evolution of internet and protocols used. • Apply and understand different computer addressees. • Understand different IP address classes. • Apply concept of Subnetting in efficient network design. • Differentiate TCP from UDP protocols. • Describe role of different Internet and application layer protocols	**Unit IV: Internet Protocols (10)** 4.1. Introduction: Evolution of Internet, History of the Internet Protocols, Internet Protocol Stack, 4.2. Computer Addresses: IP Address, MAC Address, Ports. 4.3. IP Addressing: Public and Private IP Addresses, Classes of IP Addresses, Subnetting with Numerical Examples. 4.4. Transport Layer protocols TCP (Transmission Control Protocols), UDP (User Datagram Protocols), 4.5. IP Support Protocols: ARP (Address Resolution Protocol), DHCP (Dynamic Host Control Protocol), ICMP (Internet Control Management Protocol) 4.6. Application Layer Protocols: Domain Name System (DNS), Email (SMTP, POP, IMAP), FTP, HTTP, RTP and VoIP 4.7. IP version 6: Need and Concept
• Introduce the ways of achieving transmission efficiency. • Discuss different techniques of multiplexing	**Unit V: Transmission Efficiency (4)** 5.1. Introduction: Concept and Importance, Multiplexing and Data Compression. 5.2. Multiplexing: Frequency Division Multiplexing,

• Understand principles behind data compression.	Wave-Length Division Multiplexing, Synchronous Time Division Multiplexing, Statistical Time Division Multiplexing. 5.3. Data Compression, Lossy and Lossless Compression, Run-Length Encoding.
• Understand need and importance of flow control and error control • Exemplify different flow control techniques • Discuss different error detection techniques and compare them • Explain ARQ based error correction strategies	**Unit VI: Error and Flow Control Techniques (4)** 6.1. Flow Control: Stop and Wait Protocol, Sliding Window Protocol 6.2. Error Detection: Parity Bits, Cyclic Redundancy Check (CRC), Hamming Distance 6.3. Error Correction: Stop-and-Wait ARQ, Go-Back-N ARQ. 6.4. Data Link Control Protocols: HDLC Frame Structure. HDLC Operation
• Discuss different access protocols. • Describe working of different interconnecting devices. • Explain different layers in LAN protocol. • Discuss different variations of Ethernet. • Understand importance and architecture of wireless LANS	**Unit VII: Local area Networks (4)** 7.1. Access Protocols: CSMA/CD, CSMA/CA, Token Passing 7.2. Interconnecting devices: Hubs, L2 /L3 Switch, Bridge, Router and their Working & Comparisons. Repeater, Amplifier 7.3. Layered LAN Protocol, Physical layer, LLC Layer, MAC Layer. 7.4. Ethernet Variants: Standard Ethernet, Fast Ethernet, Gigabit Ethernet, 10Gb Ethernet, Standard Ethernet Physical Layer Implantation 7.5. Wireless LAN: Architecture, Bluetooth architecture
• Discuss different wide area network alternatives. • Describe SONET architecture and layers • Explain frame relay and ATM architecture and layers	**Unit VIII: Wide Area Networks(4)** 8.1. SONET/SDH: Architecture, SONET Layers, SONET Frames, SONET Networks 8.2. Frame Relay: Architecture, Frame Relay Layers, Extended Addresses 8.3. ATM: Design Goals, Problems Architecture, Switching, ATM Layers, Congestion Control
• Exemplify frequency reuse principles in cellular networks • Discuss first second and third generation cellular telephony • Describe use of GEO, MEO and LEO	**Unit IX: Cellular Telephony (2)** 9.1 Frequency Reuse Principle, Transmitting, Receiving, Roaming 9.1 First Generation Second Third Generation, Third Generation 9.1 Satellite Networks: Orbits, Footprints, Three Ctagories of Satellites: GEO, MEO & LEO

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination		Assignments	20%		Practical Report copy	25%	
(Details are given in the separate table at the end)	60	Quizzes	10%	20	Viva	25%	20
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours tivme will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won’t be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Since the class is primarily focused on the theory behind data networks, the purpose of the project is to introduce students to state of the art technology. Students will be asked to select a particular technology that is of interest to you and study the state of the art in that technology area. At the end of the term, you will have to submit a brief written report, and (perhaps) give a 15 minutes oral presentation on that technology. Besides this, there will be lab session that includes cabling, IP configuration, DNS configuration, DHCP configurations etc.

Prescribed Text

- Behrouz A. Frouzen, Data Communications and Networking, McGraw-Hill, Fourth Edition, 2007

Reference

- William Stalling, Data and Computer Communications, Prentice Hall Publications, Tenth Edition, 2013
- Andrew S. Tanenbaum & David J. Wetherall, Computer Networks, Prentice Hall, Fifth Edition, 2010

Course Title: Database Management Systems **Credit: 3**
Course No: CSIT.223 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Second, Semester: Fourth
Level: B. Sc. CSIT

1. Course Introduction

The purpose of this course is to introduce the fundamental concepts of database management, including aspects of data models, database languages, and database design. At the end of this course, a student will be able to understand and apply the fundamental concepts required for the use and design of database management systems.

2. Objectives

Through this course, students shall

- become proficient at modelling databases at conceptual and logical levels of design,
- be able to develop database schemas with principled design that enforce data integrity,
- become knowledgeable in the creation, altering, and manipulation of tables, indexes, and views using relational algebra and SQL,
- become proficient at casting queries in SQL,
- and at writing database application programs with an understanding of transaction management, concurrency control, and crash recovery.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Identify data management approaches and their values. • Define terms related to database management systems. • Understand benefits of database management systems. • Describe different data models and their usefulness. • Understand the concept of data abstraction and data independence. • Explain database systems structure and database users.	**Unit I: Database System Introduction(5)** 1.1. Basic Terminologies: Data vs Information, Data Hierarchy, Database, Database Management System, Database System, Relational Database Management Systems. 1.2. Data Management Approaches: File Management Systems, Database Management Systems, Limitations, Advantages, and Applications. 1.3. Database Schema and Instance, Data Abstraction (views of Data), Data Independence, Database Languages, Database Users and Administrator, Transaction Management. 1.4. Data Models: Hierarchical, Network, Entity Relationship, Relational, and object oriented data model 1.5. Database System Structure, Database Application

	Architecture, Classification of DBMSs
• Explain use and importance of ER model. • Describe components of ER diagrams. • Use ER diagrams to design databases. • Learn concepts used in EER modeling • Explain concept behind Relational model. • Learn conversion of ER diagrams into Relational model.	**Unit II: Entity Relationship Data Modeling (5)** 2.1. ER Model and ER Diagrams, Components of ER Model, Types of Attributes. 2.2. Degree of Relationship, Constraints on ER Model (Mapping Cardinalities and Participation Constraints), Keys and Types of Keys, Weak Entity Sets. 2.3. Extended ER Modelling: Subclass/Superclass Relationship, Specialization and Generalization, Constraints on Specialization/Generalization Aggregation, Hierarchies, Lattices, Shared Subclasses, Categories. 2.4. Relational Model: Introduction, Structure of Relational Databases, Schema Diagram, Mapping ER Model to Relational Database.
• Understand why relational algebra? • Use basic operations of relational algebra. • Discuss and use additional relational algebra operations and extended relational algebra operations. • Understand and use database modification through relational algebra. • Apply the concept behind NULL values and three-valued logic. • Know basic concepts of Relational Calculus and QBE.	**Unit III: Relational Algebra and Relational Calculus (8)** 3.1. Introduction of Relational Algebra (RA), Fundamental Operation of RA: Select, Project, Set Union, Set Difference, Cartesian Product and Rename Operations. 3.2. Additional Relational Algebra Operations: Set Intersection, Natural Join, Division and Assignment Operation. 3.3. Extended Relational Algebra Operations: Generalized Projection, Outer Join and Aggregate Functions 3.4. Database Modification: Insert, Delete and Update Operation 3.5. Null Values, Advantages and Limitations of Relational Algebra 3.6. Relational Calculus: Introduction and Expressive Power of Relational and Domain Calculus, Sample Queries Using Relational and Domain Calculus. 3.7. Introduction to Query by Example (QBE) and Sample Queries.
• Explain structure of SQL queries. • Use SELECT, FROM and WHERE clauses efficiently. • Understand concept behind join operations. • Discuss and Use aggregate functions and subqueries. • Apply database modification statements. • Explain and use DDL statements.	**Unit IV: Structured Query Language (8)** 4.1. Introduction: Basic Structure of SQL Query, SELECT, FROM and WHERE clause, Using Multiple Relations 4.2. Strings and Pattern Matching, Ordering the Display of Tuples, Join Operations: Join Types and Join Conditions. 4.3. Nested Queries: Set membership Test, Set Comparison and Test for Empty Relations. 4.4. Aggregate Functions, Group by Clause and Having Clause 4.5. Database Modifications: Insert, Delete and Update Operations

• Understand concept behind views and use them.	4.6. Data Definition Language: Domain Types in SQL, Create, Alter and Drop statements 4.7. View and Modification of Views, Embedded and Dynamic SQL
• Understand importance of integrity constraints. • List and discuss different types of integrity constraints. • Use Integrity constraints for maintaining for achieving correctness of data. • Compare and contrast between assertions and triggers	**Unit V: Integrity Constraints (3)** 5.1. Concept and Importance of Integrity Constraints, Data Integrity. 5.2. Domain Constraints: Not Null Constraints, Unique Constraints, Primary key Constraints, Check Constraints. 5.3. Referential Integrity: Using Referential Integrity, Cascading Actions 5.4. Assertions and Triggers: Creating and Deleting Assertions, Creating and Deleting Triggers, Assertions vs Triggers.
• Exemplify database modification anomalies. • Explain why normalization is needed? • Understand and exemplify functional dependencies. • Discuss and exemplify conversion of unnormalized relations into normalized forms.	**Unit VI: Relational Database Design (4)** 6.1. Introduction, Database Modification Anomalies, Functional Dependencies (FDs), Types of FD's, FD Inference Rules. 6.2. Closure of Set of FD's, Closure of Set of Attributes, Covers. 6.3. Normalization: Purpose and Concept of Normalization, Forms of Normalization: 1-NF, 2-NF, 3-NF, BCN 6.4. Lossless Decomposition
• Differentiate between authentication and authorization. • Apply the concept in database management systems. • Understand concept behind roles and apply it.	**Unit VII: Authentication and Authorization (2)** 7.1. Authentication vs, Authorization, Classification of DB Security, Levels of DB Security. 7.2. Types of Authorization, Creating Users, Granting and Revoking Authorizations in SQL, CASCADE and RESTRICT 7.3. Concept of Roles, Authorization using Roles.
• Understand the concept behind indexing. • Demonstrate different types of indices. • Compare and contrast between dense and sparse indices. • Understand indexing evaluation factors	**Unit VIII: Indexing (2)** 8.1. Concept of Indexing, Index File vs Data File, Index key Structure 8.2. Types of Indices: Ordered vs Unordered Indices, Primary vs Secondary Indices. 8.3. Primary Indices: Dense and Sparse Indices with their Strengths and Drawbacks, Indexing Evaluation.
• Understand the concept of transaction and schedules • Discuss and exemplify serial and serializable schedules. • Understand the problems behind concurrent execution of	**Unit IX: Transaction and Recovery (6)** 9.1. Transaction Processing: Desirable Properties of Transactions, Concurrent Executions, Schedules and Recoverability, Testing for Serializability. 9.2. Concurrency Control: Overview of Concurrency Control, Locking Techniques, Lock-Based Protocols,

transactions • Describe and exemplify concurrency control techniques • Discuss need of recovery in database management systems. • Explain different database recovery techniques.	Timestamp-Based Protocols, Commit Protocols, Granularity of Data Items, Time Stamp Ordering Multi Version Concurrency Control. 9.3. Database Recovery: Failure Classification, The Storage Hierarchy, Transaction Model, Log-Based Recovery Techniques, Buffer Management, Checkpoints, Shadow Paging, Failure with Loss of Non-volatile Storage.

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
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			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes

- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should design ER diagrams of organization or particular subsystem with the organization. Tools like Visio or any other should be used for drawing ER diagrams. Those ER diagrams should be converted into relational model and create database schema by using DDL. Finally populate the relations with some data and write some queries that cover all features of DML discussed in class. Creating views and indices for the database should also be appreciated. For laboratory work students can use DBMS systems like Oracle, Mysql, SQL server etc. But MS access should not accepted as Laboratory work platform.

Prescribed Text

- Silberschatz, H.F. Korth, and S. Sudarshan, Database System Concepts, 6th Edition, McGraw Hill, 2010

Reference

- Raghu Ramakrishnan, and Johannes Gehrke, Database Management Systems, 3rd Edition ,McGraw-Hill, 2007
- Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 6th Edition, Pearson Addison Wesley; 2010.

Course Title: Numerical Methods **Credit: 3**
Course No: CSIT.224 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Second, Semester: Fourth
Level: B. Sc. CSIT

1. Course Introduction

This course introduces students to a variety of numerical methods and then applies these methods to solve a broad range of scientific problems. These problems include examples from physics as well as several other disciplines, including chemistry, mathematics, economics, and finance. Numerical techniques for solving problems expressed in terms of matrix, differential and integral equations will be developed.

2. Objectives

After completing this course the students should be able to:

- Understand and estimate errors due to round-off and truncation; understand error propagation and numerical instability.
- Use bracketing and non-bracketing techniques to find approximate roots of non-linear equations, and analyze the errors.
- Perform data analysis using interpolation, extrapolation, and curve-fitting, including quantification of the degree of fit.
- Solve linear systems of equations using direct and iterative methods.
- Calculate approximate derivatives and finite integrals.
- Apply numerical techniques to solve ordinary differential equations.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Review the mathematical concepts needed to study numerical methods. • Define and Exemplify Errors in Numerical Computation. • Understand Error Propagation and FP Representation.	**Unit I: Mathematical Review and Errors (2)** 1.1. Mathematical Review: Taylors Series, Mean Value Theorem, Asymptotic Notations 1.2. Errors in Numerical Computation: True Error, Relative Error, Approximate Error, Relative Approximate Error, Sources of Error: (Round off Error, Truncation Error) 1.3. Error Propagation, Floating Point Representation
• Understand Nonlinear Equations and their Solution Approaches • Exemplify solution of different iterative methods • Write algorithms and program the iterative methods.	**Unit II: Solution of Nonlinear Equations (8)** 2.1. Nonlinear Equations Solution Approaches: Direct Analytical Method, Graphical Method, Trial & Error Method, Iterative Methods 2.2. Iterative Methods: Bisection Method, False Position Method, Newton-Raphson method, Secant Method, Fixed Point Iteration Method and Proof of their

• Prove and understand convergence rate of iterative methods • Understand and program Horner's method and Remainder Theorem.	Convergences 2.3. Synthetic Division, Remainder Theorem, Horners Method for Polynomial Evaluation, Finding Multiple Roots
• Understand use and applications of interpolation. • Derive and apply different regression and interpolation techniques to solve problems • Design algorithms and program interpolation and regression methods. • Discuss Regression vs interpolation.	**Unit III: Interpolation and Regression (8)** 3.1. Interpolation vs Extrapolation, Lagrange Interpolation, Newton's Divided Difference Interpolation 3.2. Interpolation with Equally Spaced Data: Newton's Forward Difference Interpolation, Newton's Backward Difference Interpolation 3.3. Spline Interpolation: What is Spline? Natural Cubic Splines. 3.4. Regression vs Interpolation, Least Square Methods, Linear Regression. 3.5. Non-Linear Regression: Polynomial Regression, Exponential Regression
• Understand system of linear equations their representation and applications. • Discuss direct methods vs iterative methods • Derive formulae for direct and iterative methods to solve system of equations. • Design algorithms and program the solution of direct and iterative methods • Apply power method to calculate largest eigenvalue and eigenvector.	**Unit IV: Solving Systems of Linear Equations (8)** 4.1. System of equations, Matrix Representation, Existence of Solution 4.2. Direct Methods for Solving System of Equations: Basic Gauss Elimination Method, Gauss-Elimination with Partial Pivoting, Gauss Jordan method, Matrix Inversion 4.3. Matrix Factorization: LU Decomposition, Doolittle LU Decomposition, Cholesky's Method 4.4. Iterative Methods for Solving System of Equations: Jacobi Iteration Method, Gauss-Seidal Method 4.5. Ill-Conditioning, Eigenvalues and eigenvectors, Power Method
• Explain use and applications of derivatives. • Derive and apply formulae to calculate derivative of continuous and discrete functions. • Devise the algorithm and program them for calculating differentiation of discrete and continuous functions.	**Unit V: Numerical Differentiation (5)** 6.1. Numerical Differentiation: Introduction, Real Applications 6.2. Differentiating Continuous Functions: Forward Difference Formula, Backward Difference Formula, Central Difference Formula 6.3. Differentiating Discrete Functions: Derivatives using Newton's Divided Difference Formula, Derivatives using Newton's Forward Difference Formula, Derivatives using Newton's Forward Difference Formula.
• Explain use and applications of integration.	**Unit VI: Numerical Integration (5)** 6.4. Numerical Integration: Introduction, Definite Integral

• Derive and apply formulae to calculate values of definite integrals. • Design and implement algorithm for calculating values of definite integrals.	Applications 6.5. Newton Cotes Integration Formulae, A General Quadrature Formula For Equally Spaced Arguments 6.6. Trapezoidal Rule, Composite(Multi-segment) Trapezoidal Rule, Simpsons 1/3 Rule, Composite(Multi-segment) Simpsons 1/3 Rule, Simpsons 3/8 Rule, Composite(Multi-segment) Simpsons 3/8 Rule.
• Understand basics of ODE’s and their solutions. • Apply derived formulae to solve ODE’s or system of ODE’s • Design and implement the algorithms for solving initial value problems and boundary value problems.	**Unit VII: Solving Ordinary Differential Equations (6)** 7.1. Introduction: ODE vs PDE, Order, Degree and Solution of Differential Equations, Initial Value Problems and Boundary Value Problems. 7.2. Solving Initial Value Problems: Picards Method, Eulers Method, Heun’s Method, Forth Order RK Method, 7.3. Solving System of ODE’s and Higher Order ODE’s by using any Existing Method. 7.4. Solving Boundary Value Problems: Shooting Method, Finite Difference Method.
• Understand basics of PDE’s and their categorization. • Solve Laplace and Parabolic equations using finite difference method.	**Unit VIII: Solving Partial Differential Equations (3)** 8.1. Partial Differential Equations: Introduction, Categorization of PDE’s: Elliptic, Parabolic and Hyperbolic PDE’s. 8.2. Deriving Difference Equations, Solving Laplace Equation, Solving Poison’s Equation.

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weightage</th><th>Marks</th><th>Practical</th><th>Weightage</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
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<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
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Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

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Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

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Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs, prepare lab sheet for each of the topics discussed in classes. Minimum 3 lab hour per week in required. Nature of programming problem can be decided by instructor. Lab sheet of around 35 programming problems is recommended.

Prescribed Text

- C.F. Gerald and P.O. Wheatley, "*Applied Numerical Analysis*", 4th Edition, Addison Wesley Publishing Company, New York.
- W.H. Press, B.P. Flannery et.al., "*Numerical Recipes in C*", 1st Edition, Cambridge Press, 1988.

References

- **S.S. Shastry,** "Introductory Methods of Numerical Analysis" Fifth Edition, PHI Leraning Pvt Limited, 2012.
- **Arjun Singh Saud, Bhupendra Singh Saud,** "Numerical methods with Practical Approach", First Edition, kriti Books and Publishers Pvt Limited, 2014

Course Title: System Analysis and Design **Credit: 3**
Course No: CSIT.225 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Second, Semester: Fourth
Level: B. Sc. CSIT

1. Course Introduction

The course is a blend of understanding of system analysis & design with its practical applications. This course includes understanding of various elements of system analysis and design with emphasis on the application of information technology issues as a business tool. The course covers components of system analysis and design techniques, data modeling, logical process modeling, and object oriented modeling techniques.

2. Objectives

The objective of the course is to

- enable the students to explore opportunity and potential impact of using various strategies for developing information systems, including development, maintenance, and delivery of products and services in commercial markets.
- define various systems analysis and design concepts and terminologies
- describe the stages of the system development life cycle model,
- describe different methodologies and state-of-the-art developments in system analysis and design techniques and methods
- apply process and data modelling techniques
- to introduce the maintenance and support approaches

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand system and its components • Explore about types of information system • Understand building blocks of information system	**Unit I: Introduction to System (4 Hrs)** 1.1. Fundamentals of System Analysis and Design: System, Information System, System analysis and design and its importance 1.2. Types of Information Systems: Management Information System, Transaction Processing System, Decision Support System, Executive Information System, Expert System 1.3. The players or stakeholders of a system, System Analyst, Issues associated with system analyst. 1.4. Information System Building Blocks: Data, Process and Interface, Views of different stakeholders on the

	building blocks of a system
• Understand System Development Lifecycle • Get the knowledge about steps in SDLC • Understand the various development routes • Understand the details of case tools	**Unit II: Information System Development (5 Hrs)** 2.1. Process of System Development, Capability Maturity Model (CMM) Level 2.2. System Life Cycle Vs. Development, Underlying Principles for System Development, System Development Lifecycle (SDLC): Planning and Selection, Analysis, Design, Implementation and Operation, Cross Life Cycle Activities 2.3. Alternate Approaches to Development: Rapid Application Development, Agile Methodology, Commercial Off The Shelf Route (COTS), Maintenance and Reengineering Routes 2.4. Automated Tools and Technology: CASE Tools, Application Development Environments
• Understand the basics of project management • Create schedules of systems project using PERT and GANTT Chart	**Unit III: Managing Information System Project (4)** 3.1. Project Management, Causes of Failed Projects, Project Management Life Cycle: scoping, planning, estimating, scheduling, organizing, directing, controlling, and closing, 3.2. Representing and Scheduling Project Plans using GANTT Chart and PERT Chart, Calculating Expected Time Durations Using PERT Chart, Critical Path Analysis using PERT Chart
• Perform feasibility analysis of system from various dimensions • Understand about details of cost-benefit analysis	**Unit IV: Feasibility Analysis (4 Hrs)** 4.1. Feasibility Analysis: A creeping commitment approach, Four Test of feasibility: Schedule, Technical, Operational, Economic 4.2. Cost-benefit Analysis Techniques: payback analysis, return on investment, break-even analysis, net present value 4.3. Feasibility Analysis of Candidate system: Candidate System Matrix, Feasibility Analysis Matrix
• Understand importance of requirement discovery and analysis • Collect functional non-functional requirements of real world system • Understand various fact finding	**Unit V: Determining System Requirement (5 Hrs)** 5.1. Requirement Discovery, System Requirements: Functional and non-functional requirements 5.2. The Process of Requirement Discovery: Problem Discovery and Analysis, Requirements Discovery, Documenting and Analyzing Requirements, Requirements Management 5.3. Traditional Methods for determining requirements: interview, questionnaire, sampling, survey, Modern

techniques	Methods for determining requirements: Joint Application Design, Using Prototypes for Requirement determination, 5.4. Documenting requirements using Use Case List
• Understand logical data model • Design ERD for real world applications • Construct entities, relationships • Understand basics of data normalization	**Unit VI: Data Modeling (7 Hrs)** 6.1. Data Modeling and Analysis, Introduction to Entity Relationship Modelling, Conceptual Data Modeling using Entity Relationship Diagram (ERD), Crow's-foot Notation of ER Diagram, 6.2. Relationships: Unary, Binary and N-ary, Cardinalities in Relationships, Identifying Relationship, Non-Identifying Relationship, Associative Entity and Non-specific Relationships, Examples of ERD 6.3. The Process of Logical Data Modelling: Context Data Model, Key-based Data Model, Fully Attributed data model 6.4. Data Analysis: 1NF, 2NF and 3NF, Mapping Data Requirements to Locations
• Understand process model • Design DFD for real world applications • Construct DFD at different levels • Understand modeling of process logic	**Unit VII: Process Modeling (6 Hrs)** 7.1. Process Modelling, Data Flow Diagram (DFD), System concepts for process modelling, Components of DFD, Data Flow Diagramming Rules, The Process of Logical Process Modeling 7.2. Decomposition of DFD: Context dataflow diagram, Functional Decomposition Diagram, Level-1 DFD, Level-2 DFD, Level-n DFD, Guidelines for Drawing DFD 7.3. Logic Modeling: Structured English & Decision Tables
• Understand steps of construction and implementation of a system • Understand concepts of system maintenance and support	**Unit VIII: System Implementation and Operation (4 Hrs)** 8.1 System Construction and Implementation: The Construction Phase, The Implementation Phase, Testing: Unit, System and Regression Testing 8.2 System Operation and Support: Systems Development, Operation, and Support Functions 8.3 Program/ System Maintenance, System recovery, System Enhancement
• Understand Object Oriented Approach for building system • Design different UML diagrams for real world	**Unit IX: Object Oriented Analysis and Design (6 Hrs)** 9.1 Object Oriented Development Life Cycle, Unified Modelling Language 9.2 UML Diagrams: Use-Case Diagram, Class Diagram, Object Diagram, Interaction Diagrams: Sequence and

applications • Understand about Object Oriented Analysis and Design	Collaboration Diagram, State Diagram, Activity Diagram, Component Diagram, Deployment Diagram 9.3 Object Oriented Analysis: Requirement Analysis using Use Case Model, Conceptual Modeling 9.4 Object Oriented Design: Defining Interaction Diagrams, Defining Design Class Diagrams

Evaluation System

Undergraduate Programs							
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Laboratory Work

Student should practice analysis and design of real world applications. Students are recommended to use different CASE tools as a part of lab work. The choice of CASE Tools can range from MS-Visio, MS-Project manager, Rational Rose so as to provide practical exposure for realizing system design issues. Students should design data and process models for real world application using the data and process modeling tools like ER Diagrams, DFD, UML Diagrams. Additionally, students should practice Gantt Charts, PERT Charts using the appropriate CASE Tools. The lab work should be practiced for minimum of 3 lab hours per week.

It is highly recommended that a project work including analysis and design of real world application should be practiced. A group of four or five students can work together. The project should be documented in a proper report structure in such a way that it will reflect the applications of the theories taught in the course.

Prescribed Texts

1. Jeffrey L. Whitten, Lonnie Bentley, **System Analysis and Design methods,** 7^{th} Edition, Mc-Graw Hill

2. Joseph S. Valacich, Joey F. George, Jefferey A. Hoffer, **Essentials of System Analysis and Design**, 5^{th} Edition, Pearson Education.

References

1. Jeffrey L. Whitten, Lonnie Bentley, **System analysis and design methods**, 5^{th} Edition, Mc-Graw Hill

2. Jefferey A. Hoffer, Joey F. George, Joseph S. Valacich, **Modern Systems Analysis and Design**, 7^{th} Edition, Pearson Education

3. Gary B. Shelly, Harry J. Rosenblatt, **System Analysis and Design**, 9th Edition, Shelly Cashman Series

4. Alan Dennis, Barbara Haley Wixom, Roberta M. Roth **System Analysis and Design**, 4th Edition, Wiley Publication

5. V. Rajaraman, **Analysis and Design of Information System**, 2nd Edition, Prentice Hall

TOC Course Title: Theory of Computation **Credit: 3**
Course No: CSIT.226 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Second, Semester: Fourth
Level: B. Sc. CSIT

1. Course Introduction

This course presents a study of Finite State Machines and their languages. It covers the details of finite state automata, regular expressions, context free grammars. More, the course includes design of the Push-down automata and Turing Machines. The course also includes basics of undecidabilty and intractability.

2. Objectives

The main objective of the course is to introduce concepts of the models of computation and formal language approach to computation. The general objectives are to,

- introduce concepts in automata theory and theory of computation
- design different finite state machines
- design grammars and recognizers for different formal languages
- identify different formal language classes and their relationships
- determine the decidability and intractability of computational problems

3. Specific Objectives and Contents

Specific Objectives	Contents
• Revision of mathematical foundations for computation. • Understand the basic notations of symbols and their closures • Understand basic operations on strings and to know about language	**Unit I: Basic Foundations (3 Hrs)** 1.1. Review of Set Theory, Logic, Functions, Proofs 2.1. Automata, Computability and Complexity: Complexity Theory, Computability Theory, Automata Theory 1.2. Basic concepts of Automata Theory: Alphabets, Power of Alphabet, Kleen Closure Alphabet, Positive Closure of Alphabet, Strings, Empty String, Suffix, Prefix and Substring of a string, Concatenation of strings, Languages, Empty Language, Membership in Language.
• Understand basics of automata theory • Design DFA, NFA and ε-NFA for various languages.	**Unit II: Introduction to Finite Automata (8 Hrs)** 2.2. Introduction to Finite Automata, Introduction of Finite State Machine 2.3. Deterministic Finite Automata (DFA), Notations for DFA, Language of DFA, Extended Transition Function

• Reduce NFA to DFA and ε - NFA to NFA & DFA in different ways • Understand the Moore and Mealy Machines	of DFA 2.4. Non-Deterministic Finite Automaton (NFA), Notations for NFA, Language of NFA, Extended Transition Function of NFA 2.5. Equivalence of DFA and NFA, Subset-Construction Method for reduction of NFA to DFA, Theorems for equivalence of Language accepted by DFA and NFA 2.6. Finite Automaton with Epsilon Transition (ε - NFA), Notations for ε - NFA, Epsilon Closure of a State, Extended Transition Function of ε – NFA, Removing Epsilon Transition using the concept of Epsilon Closure, Equivalence of NFA and ε –NFA, Equivalence of DFA and ε – NFA 2.7. Finite State Machines with output: Moore machine and Mealy Machines
• Understand concepts of Regular Expressions • Write regular expressions for regular languages over various alphabet set • Construct regular expressions from finite state machines and vice versa • Understand use of pumping lemma for proving regular languages • Minimize Finite State Machine	**Unit III: Regular Expressions (6)** 3.1. Regular Expressions, Regular Operators, Regular Languages and their applications, Algebraic Rules for Regular Expressions, 3.2. Equivalence of Regular Expression and Finite Automata, Reduction of Regular Expression to ε – NFA, Conversion of DFA to Regular Expression, 3.3. Properties of Regular Languages, Pumping Lemma, Application of Pumping Lemma, Closure Properties of Regular Languages over (Union, Intersection , Complement) 3.4. Minimization of Finite State Machines: Table Filling Algorithm
• Understand structure and components of grammars. • Design CFG for various languages • Simplify the CFG • Understand and use different normal forms of CFG • Understand concepts of Chomsky Hierarchy, Context Sensitive Grammars, Unrestricted Grammars • Understand use of pumping lemma for proving context free languages.	**Unit IV: Context Free Grammar (9)** 4.1. Introduction to Context Free Grammar (CFG), Components of CFG, Use of CFG, Context Free Language (CFL) 4.2. Types of derivations: Bottomup and Topdown approach, Leftmost and Rightmost, Language of a grammar 4.3. Parse tree and its construction, Ambiguous grammar, Use of parse tree to show ambiguity in grammar 4.4. Regular Grammars: Right Linear and Left Linear, Equivalence of regular grammar and finite automata 4.5. Simplification of CFG: Removal of Useless symbols, Nullable Symbols, and Unit Productions, Chomsky Normal Form (CNF), Greibach Normal Form (GNF), Backus-Naur Form (BNF) 4.6. Context Sensitive Grammar, Chomsky Hierarchy 4.7. Pumping Lemma for CFL, Application of Pumping

	Lemma, Closure Properties of CFL
• Understand basics of PDA • Design PDA with empty stack or final state for various CFG • Understand difference between Deterministic and Non-deterministic PDA • Reduce CFG to PDA and vice-versa	**Unit V: Push Down Automata (7 Hrs)** 5.1. Introduction to Push Down Automata (PDA), Representation of PDA, Operations of PDA, Move of a PDA, Instantaneous Description for PDA, 5.2. Deterministic PDA, Non Deterministic PDA, Acceptance of strings by PDA, Language of PDA, 5.3. Construction of PDA by Final State , Construction of PDA by Empty Stack, Conversion of PDA by Final State to PDA accepting by Empty Stack and vice-versa, 5.4. Conversion of CFG to PDA, Conversion of PDA to CFG
• Understand basics of Turing Machine and its relationship to computers • Design and trace Turing Machine for various languages • Explore the use of Turing Machine in different roles • Encode a general Turing Machine using Universal Turing Machine and encoding Technique	**Unit VI: Turing Machines (10 Hrs)** 6.1. Introduction to Turing Machines (TM), Notations of Turing Machine, Language of a Turing Machine, Instantaneous Description for Turing Machine, Acceptance of a string by a Turing Machines 6.2. Turing Machine as a Language Recognizer, Turing Machine as a Computing Function, Turing Machine with Storage in its State, Turing Machine as a enumerator of stings of a language, Turing Machine as Subroutine 6.3. Turing Machine with Multiple Tracks, Turing Machine with Multiple Tapes, Equivalence of Multitape-TM and Multitrack-TM, Non-Deterministic Turing Machines, Restricted Turing Machines: With Semi-infinite Tape, Multistack Machines, Counter Machines 6.4. Curch Turing Thesis, Universal Turing Machine, Turing Machine and Computers, 6.5. Encoding of Turing Machine, Enumerating Binary Strings, Codes of Turing Machine, Universal Turing Machine for encoding of Turing Machine
• Understand computational complexity and it is classes • Understand concepts of Np-Complete Problems • Explore a family of undecidable problems	**Unit VII: Undecidability and Intractability (5 Hrs)** 7.1. Computational Complexity, Time and Space complexity of A Turing Machine, Intractability 7.2. Complexity Classes, Problem and its types: Absract, Decision, Optimization 7.3. Reducibility, Turing Reducible, Circuit Satisfiability, Cooks Theorem, 7.4. Undecidability, Undecidable Problems: Post's Correspondence Problem, Halting Problem and its proof, Undecidable Problem about Turing Machines

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
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<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for most of the units in the syllabus. Majorly, students should practice design and implementation of Finite State Machines viz. DFA, NFA, PDA, and Turing Machine. Students are highly recommended to construct Tokenizers/

Lexers over/for some language. Students are advised to use regex, Perl, C++, Java for using regular expressions. However, nature of programming can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, **Introduction to Automata Theory, Languages, and Computation,** 3rd Edition, Pearson - Addison-Wesley.

References

1. Harry R. Lewis and Christos H. Papadimitriou, **Elements of the Theory of Computation**, 2nd Edition, Prentice Hall.

2. Michael Sipser, **Introduction to the Theory of Computation,** 3rd Edition, Thomson Course Technology

3. Efim Kinber, Carl Smith, **Theory of Computing: A Gentle introduction,** Prentice- Hall.

4. John Martin, **Introduction to Languages and the Theory of Computation,** 3rd Edition, Tata McGraw Hill.

5. Kenneth H. Rosen, **Discrete Mathematics and its Applications to Computers Science,** WCB/Mc-Graw Hill.

FAR WESTERN UNIVERSITY

Faculty of Science & Technology Bachelor of Science in Computer Science & Information Technology

(B.Sc. CSIT)

Fifth Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Design and Analysis of Algorithms

Course Title: Design and Analysis of Algorithms **Credit: 3**
Course No: CSIT.311 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

This course introduces basic elements of the design and analysis of computer algorithms. Topics include asymptotic notations and analysis, divide and conquer strategy, greedy methods, dynamic programming, basic graph algorithms, NP-completeness, and approximation algorithms. For each topic, beside in-depth coverage, one or more representative problems and their algorithms shall be discussed.

2. Objectives

Upon completion of this course, students will be able to do the following:

- Analyze the asymptotic performance of algorithms.
- Demonstrate a familiarity with major algorithms and data structures.
- Apply important algorithmic design paradigms and methods of analysis.
- Solve simple to moderately difficult algorithmic problems arising in applications.
- Be able to demonstrate the hardness of simple NP-complete problems

3. Specific Objectives and Contents

Specific Objectives	Contents
• Introduce time and space complexity. • Exemplify complexity of some simple algorithms • Discuss asymptotic notations used in algorithm analysis • Understand and solve recurrence relations	**Unit I: Foundation of Algorithm Analysis (4)** 1.1. Algorithm Analysis Introduction: Algorithm and its properties, RAM model, Time and Space Complexity, detailed analysis of factorial algorithm. 1.2. Asymptotic Notations: Big-O, Big-Ω and Big-Ө Notations their Geometrical Interpretation and Examples. 1.3. Recurrences: Recursive Algorithms and Recurrence Relations, Solving Recurrences (Recursion Tree Method, Substitution Method, Application of Masters Theorem)
• Analyze complexity of iterative algorithms. • Understand analysis of single loops, multiple loops and	**Unit II: Iterative Algorithms (4)** 2.1. Basic Algorithms: Algorithm for GCD, Fibonacci Number and analysis of their time and space complexity

nested loops	2.2. Searching Algorithms: Sequential Search and its analysis 2.3. Sorting Algorithms: Bubble, Selection, and Insertion Sort and their Analysis
• Understand components of divide and conquer strategy • Able to write recurrence relations for divide and conquer algorithms • Solve recurrence relations and find time complexity of divide and conquer algorithms • Understand notion of order statistics and solve this problem	**Unit III: Divide and Conquer Algorithms (10)** 3.1. Searching Algorithms: Binary Search, Min-Max Finding their Analysis 3.2. Sorting Algorithms: Merge Sort and Analysis, Quick Sort and Analysis (Best Case, Worst Case and Average Case), Heap Sort (Heapify, Build Heap and Heap Sort Algorithms and their Analysis), Randomized Quick sort and its Analysis 3.3. Order Statistics: Selection in Expected Linear Time, Selection in Worst Case Linear Time and their Analysis.
• Understand notions of optimization problems and optimal solutions. • Explain concepts behind greedy algorithms • Develop the capability of designing and analyzing greedy algorithms • Discuss message compression and Huffman coding	**Unit IV: Greedy Algorithms (4)** 4.1. Optimization Problems and Optimal Solution, Introduction of Greedy Algorithms, Elements of Greedy Strategy. 4.2. Greedy Algorithms: Fractional Knapsack, Job sequencing with Deadlines, Task Scheduling Algorithms able to designd their Time Complexity. 4.3. Huffman Coding: Purpose of Huffman Coding, Prefix Codes, Huffman Coding Algorithm and its Analysis
• Compare greedy strategy, DP strategy, and divide and conquer strategy • Identify problem that are solvable by DP strategy • Develop the capability of designing and analyzing DP algorithms • Compare DP and Memoization	**Unit V: Dynamic Programming (6)** 6.1. Greedy Algorithms vs Dynamic Programming, Recursion vs Dynamic Programming, Elements of DP Strategy 6.2. DP Algorithms: Matrix Chain Multiplication, String Editing, Zero-One Knapsack Problem, Travelling Salesman Problem and their Analysis. 6.3. Memoization Strategy, Dynamic Programming vs Memoization
• Able to provide different representations of graphs and compare them. • Understand graph traversal techniques, develop their algorithms and analyze them • Develop algorithms for generating MST and shortest paths and analyze them	**Unit VI: Graph Algorithms (8)** 6.4. Graph Representation: Adjacency List, Incidence Matrix and their Efficiency Comparison 6.5. Graph Traversal: Breadth First Search, Depth First Search and their Analysis. 6.6. Spanning Trees: Definition of MST, Kruskals Algorithm, Prims Algorithm and their Analysis 6.7. Shortest Path Algorithms: Bellman Ford, Dijkstra, Floyd Warshwall Algorithms and their Analysis.
• Understand concepts and applications of number theory.	**Unit VII: Number Theoretic Algorithms (4)** 7.1. Number Theoretic Notations, GCD, Euclid’s and

• Trace different number theoretic algorithms and analyze them. • Understand and solve the problem of primility testing	Extended Euclid's Algorithms and their Analysis. 7.2. Definition of x modulo n, Solving Modular Linear Equations, Chinese Remainder Theorem 7.3. Primility Testing: Miller-Rabin Randomized Primility Test
• Able to classify problems among different classes. • Understand the concept of problem reduction and polynomial & super polynomial time complexity. • Develop capability of providing proof of NP-completeness • Explain concepts behind approximation algorithms and use them to solve NP complete problems.	**Unit VIII: NP Completeness (5)** 8.1. Tractable and Intractable Problems, Concept of Polynomial Time and Super Polynomial Time Complexity 8.2. Complexity Classes: P, NP, NP-Hard and NP-Complete. NP Complete Problems 8.3. NP Completeness and Reducibility, Cooks Theorem, Proofs of NP Completeness (CNF-SAT, Vertex Cover and Subset Sum) 8.4. Approximation Algorithms: Concept, Vertex Cover Problem, Subset Sum Problem

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above

mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion

- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Laboratory Work

Student should write programs, prepare lab sheet for each of the topics discussed in classes. Minimum 3 lab hour per week in required. In laboratory students should perform empirical analysis of different searching and sorting algorithms. Besides this students should implement greedy algorithms, DP algorithms and graph algorithms. Lab sheet of around 15 moderately large programming problems is recommended.

Prescribed Text

- Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "*Introduction to algorithms*", Third Edition.. The MIT Press, 2009.

References

- **Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekiaran**, "*Computer Algorithms*", Second Edition, Silicon Press, 2007.
- **Kleinberg, Jon, and Eva Tardos, "** *Algorithm Design* **",** Addison-Wesley**,** First Edition, 2005

Artificial Intelligence

Course Title: Artificial Intelligence **Credit: 3**
Course No: CSIT.312 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

The course introduces the ideas and techniques underlying the principles and design of artificial intelligent systems. The course covers the basics and applications of AI, including: design of intelligent agents, problem solving, searching, knowledge representation systems, probabilistic reasoning, neural networks, machine learning and natural language processing.

2. Objectives

The main objective of the course is to introduce concepts of Artificial Intelligence. The general objectives are to,

- learn about computer systems that exhibit intelligent behavior
- design intelligent agents
- identify AI problems and solve the problems
- design knowledge representation and expert systems
- design neural networks for solving problems
- identify different machine learning paradigms

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understands basics of artificial intelligence, its history • Understand different fields influencing study of AI • Understand the application areas of AI	**Unit I: Introduction (3 Hrs)** 1.1. Artificial Intelligence (AI), AI Perspectives: acting and thinking humanly, acting and thinking rationally 1.2. History of AI 1.3. Foundations of AI 1.4. Applications of AI
• Understand components of intelligent agents • Design intelligent agents for various problems • Explore different environment	**Unit II: Intelligent Agents (4 Hrs)** 2.1. Introduction of agents, Structure of Intelligent agent, Properties of Intelligent Agents 2.2. Configuration of Agents, PEAS description of Agents 2.3. Types of Agents: Simple Reflexive, Model Based, Goal Based, Utility Based. 2.4. Environment Types: Deterministic, Stochastic, Static,

types where an intelligent agent can work	Dynamic, Observable, Semi-observable, Single Agent, Multi Agent
• Design state space representation for real world problems • Identify problems that can be expressed in terms of search problems or logic problems, and translate them into the appropriate form, and know how they could be addressed using an algorithmic approach. • Understand different heuristic and blind search techniques.	**Unit III: Problem Solving by Searching (9 Hrs)** 3.1. Definition, Problem as a state space search, Problem formulation, Well-defined problems, 3.2. Solving Problems by Searching, Search Strategies, Performance evaluation of search techniques 3.3. Uninformed Search: Depth First Search, Breadth First Search, Depth Limited Search, Iterative Deepening Search, Bidirectional Search 3.4. Informed Search: Greedy Best first search, A* search, Hill Climbing, Simulated Annealing 3.5. Game playing, Adversarial search techniques, Mini-max Search, Alpha-Beta Pruning. 3.6. Constraint Satisfaction Problemss and Search
• Understand and design knowledge representations using different knowledge representation techniques • Represent Knowledge using object based approaches • Construct Propositional Logic (PL) Systems and understand inference techniques in PL. • Construct statements in Predicate Logic and understand inference techniques in Predicate Logic Reasoning • Understand and analyze uncertain knowledge systems and their representations using Probabilistic Reasoning • Explore the fundamental idea of fuzzy sets and logic	**Unit IV: Knowledge Representation (14 Hrs)** 4.1. Definition and importance of Knowledge, Issues in Knowledge Representation, Knowledge Representation Systems, Properties of Knowledge Representation Systems. 4.2. Types of Knowledge Representation Systems, Structured Knowledge Representation Systems: Semantic Nets, Frames, Conceptual Dependencies and Scripts 4.3. Unstructured Knowledge Representation Systems: Rule Based Systems, Propositional Logic, Predicate Logic 4.4. Propositional Logic(PL): Syntax, Semantics, Formal logic-connectives, truth tables, tautology, validity, well-formed-formula, Inference using Resolution, Backward Chaining and Forward Chaining 4.5. Predicate Logic: FOPL, Syntax, Semantics, Quantification, Inference with FOPL: By converting into PL (Existential and universal instantiation), Unification and lifting, Inference using resolution 4.6. Uncertain Knowledge, Knowledge Representation in Uncertain Domain, Statistical Reasoning using Probability, Bayes' Rule and its use, Bayesian/Causal/Belief networks, Reasoning in belief networks 4.7. Fuzzy Logic
• Understand the basic theory	**Unit V: Machine Learning (5 Hrs)**

underlying the machine learning. • Understand a range of machine learning algorithms along with their strengths and weaknesses	5.1. Introduction to Machine Learning , Concepts of Learning, Importance of Machine Learning 5.2. Learning From Examples, Explanation Based Learning, Learning by Analogy, Learning by Simulating Evolution (Genetic Algorithm)
• Understand neural computing as an alternative knowledge acquisition/representation paradigms, • Explain its basic principles and their relationship to neurobiological models • Describe a range of neural computing techniques and their application areas. • Understand the neural network learning paradigms	**Unit VI: Learning with Neural Networks (5 Hrs)** 6.1. Introduction, Biological Neural Networks Vs. Artificial Neural Networks (ANN), Mathematical Model of ANN, Types of ANN: Feed-forward, Recurrent, Single Layered, Multi-Layered, Application of Artificial Neural Networks 6.2. Learning by Training ANN, Supervised vs. Unsupervised Learning, Hebbian Learning, Perceptron Learning, Back-propagation
• Explore and Build Components of Expert System • Understand basics of NLP and Machine Vision.	**Unit VII: Applications of AI (5 Hrs)** 7.1. Expert Systems, Development of Expert Systems 7.2. Natural Language Processing: Natural Language Understanding and Natural Language Generation, Steps of Natural Language Processing 7.3. Machine Vision Concepts

Evaluation System

Undergraduate Programs							
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External evaluation

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Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for most of the units in the syllabus. Majorly, students should practice design and implementation intelligent agents and expert systems. Students are advised to implement various search techniques for solving problems, as well as Neural Networks, Genetic Algorithms for solving practical problems of AI. Students are advised to use LISP, PROLOG, JAVA. However, nature of programming can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. **Stuart Russel and Peter Norvig**, *Artificial Intelligence A Modern Approach*, Pearson

References

2. **George F. Luger**, *Artificial Intelligence: Structures and Strategies for Complex Problem Solving*, Benjamin/Cummings Publication
3. **E. Rich, K. Knight, Shivashankar B. Nair**, *Artificial Intelligence*, Tata McGraw Hill.
4. **D. W. Patterson**, *Artificial Intelligence and Expert Systems*, Prentice Hall.
5. **P. H. Winston**, *Artificial Intelligence*, Addison Wesley.

Compiler Design

Course Title: Compiler Design **Credit: 3**
Course No: CSIT.313 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

This course is designed to develop acquaintance with fundamental concepts of compiler design. The course starts with the basic concepts and also includes different phases of compilers like lexical analysis, syntax analysis, syntax-directed translation, type checking etc. in detail.

2. Objectives

On completion of this course, students will be able to

- develop their knowledge in compiler design
- develop lexical analyzers, parsers, and small compilers using different tools
- develop lexical analyzers, parsers, and small compilers by using general purpose programming languages.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Identify phases of compiler design • Perform analysis of simple program statements • Demonstrate the concepts of symbol-table manager and error handler • Recognize different tools used in compiler design	**Unit One: Introduction [3 Hr.]** 1.1. Compilers, Analysis of the Source Program, Phases of a Compiler 1.2. Cousins of the Compiler, Compiler Construction Tools
• Exemplify lexical analysis and , input buffering and tokens • Understand role of regular expressions and Finite Automata in specification of tokens • Trace the algorithms used in implementing and optimizing pattern matchers	**Unit Two: Lexical Analysis [8 Hr.]** 2.1. The Role of the Lexical Analyzer, Input Buffering, Specification of Tokens, Recognition of Tokens 2.2. Finite Automata, From Regular Expression to an NFA, Optimization of DFA-Based Pattern Matches
• Understand and write context free grammars • Demonstrate different top down and	**Unit Three: Syntax Analysis [12 Hr.]** 3.1. The Role of Parser, Context Free Grammars, Writing a Grammar

bottom-up parsing techniques • Parse the statements using different variants of LR parsers • Handle ambiguity in context free grammars	3.2. Top-Down Parsing, Bottom-Up Parsing 3.3. Operator-Preceding Parsing, LR Parsers, Using Ambiguous Grammars
• Understand generalization of context free grammars • Construct syntax tree from syntax directed definitions • Exemplify bottom up evaluation of s-attributed definitions and l-attributed definitions • Demonstrate top-down translation and bottom-up evaluations of inherited attributes	**Unit Four: Syntax-Directed Translation [6 Hr.]** 4.1. Syntax-Directed Definition, Construction of Syntax Trees 4.2. Bottom-Up Evaluation of S-Attributed Definitions, L-Attributed Definitions 4.3. Top-Down Translation, Bottom-Up Evaluations of Inherited Attributes
• Understand the rules for assigning type expressions • Specify a type checker for a simple language • Exemplify type conversions and attribute grammar for type checking system	**Unit Five: Type Checking [3 hr.]** 5.1. Type Systems, Specification of a Simple Type Checker 5.2. Type conversions, Attribute Grammar for a Simple Type Checking System
• Understand idea behind intermediate languages • Understand declarations, assignment statements, Boolean expressions, and case statements • Demonstrate the concepts of backpatching and procedure call	**Unit Six: Intermediate Code Generation [4 Hr.]** 6.1. Intermediate Languages, Declarations, Assignments Statements 6.2. Boolean Expressions, Case Statements, Backpatching 6.3. Procedure Calls
• Recognize issues in the design of code generator • Understand target machine, its instruction set, and runtime storage management • Demonstrate basic blocks and flow graphs • Exemplify simple code generator, register allocation and assignment • Understand dag representation of basic blocks and code generation from dag	**Unit Seven: Code Generator [5 Hr.]** 7.1. Issues in the Design of a Code Generator, The Target Machine, Run-Time Storage Management 7.2. Basic Blocks and Flow Graphs, Next Use Information, A Simple Code Generator, Register Allocation and Assignment 7.3. The Dag Representation of Basic Blocks, Generating Code from Dags
• Understand some of the most useful code-improving transformations • Demonstrate Peephole optimization optimize basic blocks	**Unit Eight: Introduction to Code Optimization [4 Hr.]** 8.1. Introduction, The Principal Sources of Optimization

• Exemplify loop optimization	8.2. Peephole Optimization, Optimization of Basic Blocks, Loops in Flow Graphs

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won’t be any provision for re-exam.

Laboratory Work

The laboratory work develops practical knowledge on different concepts of compiler design. Students should be able to develop a project using lexical analyzer generator to specify lexical analyzer, using parser generator to facilitate the construction of the front end of a compiler and using general purpose programming languages like C/C++

Prescribed Text

- Compilers Principles, Techniques, and Tools, Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman; Pearson Education

References

- Compiler Design, Sandeep Saxena, Rajkumar Singh Rathore, S.Chand
- Introduction to Automata Theory, Languages, and Computation, Johne E. Hopcroft, Rajeev Motwani, Jeffrey D. Ulman, Pearson Education

Simulation and Modelling

Course Title: Simulation and Modelling **Credit: 3**
Course No: CSIT.314 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

A simulation is a computer model that mimics the operation of a real or proposed system. Simulation is a commonly-used and practical technique for modeling and analyzing the real world systems in order to make more effective decisions. This course is designed to teach students the processes, tools, and techniques for performing effective simulation analyses. In particular, the course focuses on the basic underlying principles of how simulations work, how to collect and analyze input data, how to build basic simulation models, how to verify and validate simulation models, and how to interpret (and perform statistical analyses of) simulation output.

2. Objectives

After Completing each student should be able:

- to design simulation models.
- to design simulation studies.
- to analyze simulation output.
- to collect and analyze input data.
- to incorporate knowledge from other disciplines in simulation studies.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand Concepts of Simulation and Modeling • Identify Application areas and Importance of Simulation • Investigate Systems, System Types, and Simulation Steps	**Unit I: Basics of Simulation & Modeling (4 Hrs)** 1.1. Definition of Simulation, When is and is not Simulation Appropriate, Advantages and Disadvantages, Application Areas 1.2. System & System Environment, System Components, Discrete and Continuous Systems 1.3. Model of a System, Types of System Models, Discrete Event System Simulation, Steps in Simulation Study
• Exemplify Simulation of Systems	**Unit II: Simulation Examples and Principles (4 hr)** 2.1. Simulation of Queuing System: Single Channel

with hand • Use Even Scheduling to Simulate System Manually • Demonstrate Discrete Event Simulation	Queue & Call Center Problem, Simulation of Inventory System: New Dealers Problem, Order up to Level Inventory System 2.2. Concepts in Discrete Event Simulation, The Event Scheduling/Time Advance Algorithm, World Views, Manual Simulation Using Event Scheduling
• List and Exemplify Software's used in Simulation • Explore and use GPSS is Simulation Systems • Apply the Tool "ARENA" in System Simulation	**Unit III: Simulation Software (6 hr)** 3.1. Categories of Simulation Software, Selection of Simulation Software 3.2. Simulation in GPSS/H, GPSS Building Blocks, Single Server Queue Simulation in GPSS 3.3. Guided Tour Through ARENA, Simple Processing System, Modelling Basic Operations and Inputs, Introduction to Animation
• Explore and Understand Statistical Models Used in Simulation • Exemplify Discrete and Continuous Distributions • Understand Poisson Process and its Applications in Simulation • Understand Empirical Distribution of Discrete and Continuous Systems	**Unit IV: Statistical Models (6 hr)** 4.1. Review of Terminology and Concept, Useful Statistical Models 4.2. Discrete Distributions: Binomial, Geometric & Poisson Distribution, Continuous Distributions: Uniform, Exponential, Gamma, Normal, & Triangular Distribution 4.3. Poisson Process, Properties of Poisson Process, Non-stationary Poisson Process, Empirical Distributions
• Apply Queuing Models in Simulating Continuous Systems • Demonstrate Performance of Queuing Systems • Understand role of Differential Equations in Continuous System Simulation	**Unit V: Continuous System Simulation (5 hr)** 5.1. Characteristics of Queuing Systems, Types of Queues, Queuing Notation 5.2. Long-Run Measures of Performance of Queuing Systems, Markov Models 5.3. Differential and Partial Differential Equations in Simulating Continuous Systems
• Understand Concepts of Random and Pseudo Random Numbers • Implement Specified methods for Generating Random Numbers • Perform Tests for Identifying Degree of Randomness • Exemplify and Implement Random Variate Generation techniques	**Unit VI: Random Numbers (7 hr)** 6.1. Properties of Random Numbers, Generation of Pseudo-random Numbers 6.2. Random Number Generation Techniques: Linear Congruential Method, Combined Linear Congruential Generator, Random Number Streams 6.3. Test for Random Numbers: Frequency Tests, Uniformity Test, Test for Autocorrelation 6.4. Random Variate Generation: Inverses Transform Technique-Exponential, Uniform, Empirical Continuous & Discrete Distributions, Acceptance-Rejection Technique-Poisson Distribution, Non-stationary Poisson Process, Gamma Distribution

• Investigate Distributions of Input Data • Simulating and Fitting the Models with Input Data • Exemplify Multivariate and Time-series Input Methods • Validate Input-Output by Using Confidence Interval Approach • Understand the Concepts of Model Calibration	**Unit VII: Input Modeling, Verification & Validation (8 hr)** 7.1. Data Collection, Identifying Distribution with Data, Parameter Estimations 7.2. Goodness-of-fit Tests: Chi-Square Test, Chi-Square Test with Equal Probabilities, p-values and Best Fits 7.3. Selecting Input Models without Data, Multi-Variate and Time-Series Input Models 7.4. Model Building, Verification, and Validation, Verification of Simulation Models, Calibration and Validation of Models
• Categorize Simulation Types on the Basis of Output Analysis • Understand Performance Measures for Output Analysis • Demonstrate Confidence Interval and Quantile Methods for Analyzing Outputs of Terminating Simulations • Exemplify Methods for Analyzing Outputs of Steady-State Simulations	**Unit VIII: Output Analysis (5 Hrs)** 8.1 Types of Simulation with respect to Output Analysis, Stochastic Nature of Output Data 8.2 Measures of Performance and their Estimation: Point Estimation, Confidence Interval Estimation 8.3 Output Analysis for Terminating Simulations: Confidence Interval with Specified Precision, Quantiles 8.4 Output Analysis for Steady-State Simulations: Bias Initialization, Error Estimation & Replication Method

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

   Full Marks: 100, Pass Marks: 45, Time: 3 hr

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weight
Group A: multiple choice	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	60%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should practice laboratory exercises using simulation and modeling packages such as GPSS and ARENA. Besides this, students can also develop their own simulator by using general purpose high level programming language such C, C++ etc. The lab work should be practiced for minimum of 3 lab hours per week. It is highly recommended that a project work of simulation of some real world problem. A group of four or five students can work together. The project should be documented in a proper report structure in such a way that it will reflect the applications of the theories taught in the course.

Prescribed Texts

1. Banks, Carson, Nelson, and Nicol, "*Discrete-Event Simulation*," Fourth Edition, 2005 Prentice Hall
2. W. David Kelton, Randall P. Sadowski and Nancy B. Swets, "*Simulation with Arena*" Fifth Edition, 2010 ,McGraw Hill

References

1. Geoffrey Gorden, "System Simulation", Second Edition, 1978, Prentice Hall of India
2. Thomas J. Schriber, "An Introduction to Simulation Using GPSS/H", 1991, Wiely Edition

Graphics and Visual Computing

Course Title: Graphics and Visual Computing **Credit: 3**
Course No: CSIT.315 **Number of periods per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

This course provides introduction to computer graphics algorithms, software and hardware. Topics include: description of different IO devices used in displaying graphics, algorithms for drawing different output primitives, 2D and 3D transformations, techniques of hidden surface removal, surface rendering methods, and color models.

2. Objectives

Through this course, students shall

- have a knowledge and understanding of the structure of an interactive computer graphics system, and the separation of system components.
- be able to use C and OpenGL for Graphics Programming
- have algorithmic understanding of output primitives and 2D geometrical transformations.
- be able to represent 3D geometrical objects and transform them
- have a knowledge and understanding of techniques of hidden surface removal, surface rendering and color models.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Exemplify application areas of computer graphics • Describe visualization of images and colors in monitors • Explain working of different input devices	**Unit I: Computer Graphics Hardware (5)** 1.1. Introduction, Application Areas of Computer Graphics, Frame Buffer and Display Buffer, Stair Case Effect 1.2. Graphics Devices: Cathode Ray Tube, Raster and Random Scan Displays, CRTs for Color Display, Beam Penetration CRT, The Shadow - Mask CRT, Direct View Storage Tube, 1.3. Input Devices: Keyboards, Mouse, Tablets, The light Pen, Joysticks, Three Dimensional Devices
• Apply C Library functions in drawing graphics • Explain importance of OpenGL in Graphics Programming	**Unit III: Computer Graphics Software (5)** 2.1. C Graphics Basics: Graphics programming, initializing the graphics, C Graphical Functions, Simple Programs using Library Functions.

• Use OpenGL for Graphics programming	2.2. Introduction to OpenGL: Basic OpenGL Syntax, Related Libraries, Header Files, Display-Window Management Using GLUT, A Complete OpenGL Program, Error Handling in OpenGL 2.3. Coordinate Reference Frames, Screen Coordinates Absolute and Relative Coordinate Specifications, Specifying A Two-Dimensional World-Coordinate Reference Frame in OpenGL, OpenGL Point Functions, OpenGL Line Functions, OpenGL Curve Functions
• Explain Line drawing algorithms and Implement them. • Discuss circle and ellipse generating algorithms and implement them. • Demonstrate Filling Algorithms by writing Programs	**Unit III: Output Primitives (6)** 3.1. Line Drawing Algorithms: Line Equation, DDA algorithm, Bresenham's Algorithm, Displaying Polylines 3.2. Circle Drawing Algorithm: Properties of Circle, Mid-point Circle Algorithm 3.3. Ellipse Generating Algorithms: Properties of Ellipse, Mid-point Ellipse Algorithm 3.4. Filing Algorithms: Scan-Line Filling Algorithm, Boundary Filling Algorithm
• Apply transformations such as translation, rotation, scaling, reflection and shear to images. • Use homogeneous coordinate system to represent geometrical transformations • Explain need and process of world to view-port coordinate transformation. • Discuss and exemplify clipping algorithms	**Unit IV: 2D Transformations Clipping & Windowing(8)** 4.1. Transformations: Basic Transformations (Translation. Rotation, Scaling), Other Transformations (Reflection, Shear), Matrix Representations and Homogeneous Coordinates 4.2. Composite Transformations: Translation, Rotation, Scaling General Pivot-point Rotation, General Fixed-point Scaling, Affine Transformation 4.3. 2D Viewing: Viewing Pipeline, Viewing coordinate Refrence Frame, Window to Viewport Coordinate Transformation 4.4. Cliping: Point Cliping, Line Cliping (Cohen-Sutherland Line Cliping and Liang-Barsky Line Cliping), Polygon Cliping (Sutherland-Hodgeman Cliping)
• Able to represent 3D objects using different data structures. • Describe Bezier curves and B-splines used to represent curved surfaces. • Explain 3D transformations and use homogeneous coordinate system to represent it. • Use projection to display 3D objects in 2D display devices.	**Unit V: 3D Concepts & Transformations (8)** 5.1. 3D Object Representations: Polygon Surfaces (polygon Tables, Plane Equations, Polygon Meshes), Bezier Curve and Surfaces, B-Splines. 5.2. 3D Transformations: Basic Transformations (Translation, Scaling, Rotation), Other Transformations (Shear, Reflection), General 3D Rotations, Fixed Point Scaling, Composite Transformations. 5.3. 3D Viewing: Viewing Pipeline, Viewing Coordinates, Transformation from World to Viewing Coordinates, Projections (Parallel Projection, Perspective Projection),
• Understand the concepts behind	**Unit VI: Visible Surface Detection (5)**

visible surface detection and classify the techniques. • Explain image space methods used for visible surface detection. • Describe object space methods and hybrid methods in detecting visible surfaces.	6.1. Classification of Visible-Surface Detection Algorithms: Object Space Methods, Image Space Methods 6.2. Object Space Methods: Blackface Detection, 6.3. Image Space Methods: Depth-Buffer Method, A-Buffer Method, Scan-Line Method, Ray-casting Method 6.4. Hybrid Methods: Depth-Sorting Method, Area Sub-division method, Octree Method
• Discuss different light sources and their applications in surface rendering • Explain illumination models and compare them • Discuss different algorithms used in rendering polygon surfaces	**Unit VII: Surface Rendering Methods (4)** 7.1 Light Sources: Point Source, Distributed Light Source, Diffuse Reflection, Specular Reflection 7.2 Illumination Models: Ambient Light, Diffuse Reflection, Specular Reflection, Phong Specular Reflection, Intensity Attanuation. 7.3 Polygon Rendering Methods: Constant Intensity Shading, Gouraud Shading, Phong Shading, Fast Phong Shading, Ray-Tracing Methods
• Use & explain different models used in generating colors and their applications • Describe conversion between RGB and HSV color model	**Unit VIII: Color Models and Applications (4)** 8.1. Properties of Light, XYZ Color Model and CIE Chromaticity Diagram 8.2. Color Models: RGB Color Model, YIQ Color Model, CMY Color Model, HSV Color Model 8.3. Conversion between HSV and RGB Models, Color Selection and Applications

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester Examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
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<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

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   Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
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			100	100%

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Laboratory Work

Student should write programs, prepare lab sheet for each of the topics discussed in classes. Minimum 3 lab hour per week in required. Students can write programs by using C programming language. It is recommended to use widely used graphics library OpenGL in laboratory. Students can also use C-Builder to implement algorithms studied in class. Lab sheet of around 30 programming problems is recommended.

Prescribed Text

- ***Donald Hearn and M. Pauline Baker,*** *Computer Graphics C Vesrion***,** Second Edition, Pearson Education, 2003.
- ***Donald Hearn and M. Pauline Baker,*** *Computer Graphics with OpenGL***,** Fourth Edition, Prentice Hall, 2010.

References

- ***James D. Foley, Andries van Dam, Steven K. Feiner, and John F. Hughes****, Computer Graphics: Principles and Practice*, Third Edition, Addison-Wesley, 2013
- ***Dave Shreiner, Graham Sellers , John M. Kessenich, Bill M. Licea-Kane****, OpenGL Programming Guide: The Official Guide to Learning OpenGL***,** 8th Edition**,** 2013

Web Technology I

Course Title: Web Technology I **Credit: 3**
Course No: CSIT.316 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab
Year: Third, Semester: Fifth
Level: B. Sc. CSIT

1. Course Introduction

This course presents many of the core technologies that the Web is based upon. These core technologies include: Hypertext Markup Language, Cascading Style Sheets, XML and XML Schemas, and Client-side Programming Using JavaScript. Besides this, it presents basic concepts behind HTTP and Server-side Programming.

2. Objectives

On completion of this course students should be able to:

- describe the components of the Internet and Web technology;
- explain the basics of Internet technology, such as http and the World Wide Web, HTML, XML, and Java Scripts;
- create WWW pages to serve as front-end to client/server, Internet applications;
- effect client-side programming using tools such as JavaScript

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand WWW and internet fundamentals • Explore the concepts of IP addresses and domain names • Explain HTTP and other application layer protocols	**Unit I: Web Fundamentals (4 Hrs)** 1.1. Internet and its services, World Wide Web, URL, Web Server, Web Browser, Web Page, Web Site, Dynamic and Static Pages, ISP, W3C 1.2. IP addresses and Domain Names, Web Hosting and its Types 1.3. HTTP: Overview, Parameters, Messages, Requests, Response, Methods, Status Codes, Header Fields 1.4. Overview of FTP, SMTP, MIME, POP
• Understand HTML elements, tags and attributes • Discuss different HTML tags and their attributes • Apply HTML tags and attributes to design web pages	**Unit II: Hypertext Markup Language (6 hr)** 2.1. HTML Overview, Tags, Elements, Attributes, Structures of HTML Documents 2.2. Basic Tags: Headings, Paragraph, Center, Line Break, Horizontal Line, Non-breaking Spaces, Pre 2.3. Formatting Tags, Phrase Tags, Meta Tag, Comments, Images, Tables, Lists

• Create web pages having different layouts	2.4. Hyperlinks (Text Links, Image Links, Email Links, Download Links), Intra-page Links, Frames, Iframes, Blocks, Background, Color, Fonts, Forms, Embedded Multimedia, Marquees, Header 2.5. HTML Layouts: Using Tables, DIV & Span Tags, HTML Style Sheets, HTML Entities, Events
• Understand XHTML and HTML5 • Differentiate HTML from XHTML • Explain features of HTML5 and XHTML	**Unit III: XHTML & HTML5 (4 hr)** 3.1. XHTML: Overview, Syntax, HTML vs. XHTML, Doctypes, Attributes, Validations, Events 3.2. HTML5: Overview, Features, Syntax, Document Structure, Web Forms 2.0, MathML, Canvas, Audio, Video, Events
• Understand concepts and importance of CSS and Web page designing • Apply different selectors while creating style sheets • Apply different formatting features with CSS • Explain CSS Box model, and dimensions	**Unit IV: Cascading Style Sheets (6 hr)** 4.1. Introduction, Advantages, Syntax, Inserting Style Sheets: Inline, Internal, External 4.2. Selectors: Type Selector, Universal Selector, Descendent Selector, Class Selector, ID Selector, Child Selector, & Attribute Selector, Grouping Selectors 4.3. CSS Colors, Background, Fonts, Text, Images, Links, Tables, Borders, Margins, Lists, Padding, Cursor, Outlines, Dimensions, Scrollbars, CSS Box Model 4.4. CSS Visibility, Positioning, Layers, Pseudo-classes and Pseudo-elements
• Understand role of java script in web page designing • Discuss syntax and features of java script • Apply java script in handling cookies and • Understand DOM tree and its traversal • Handle different events using java script	**Unit V: JavaScript (6 Hrs)** 5.1. Overview, Why Java Script?, Syntax, Variables, Operators, Screen Output and Keyboard Input, Selection Statements, Loops 5.2. Functions, Events, Handling Cookies, Page Redirect, Dialog Boxes 5.3. JavaScript Objects: Number, Boolean, String, Array, Date, Math, RegExp 5.4. Events & Event Handling, DOM, Element Access in JavaScript, DOM Tree Transversal & Modification
• Validate web forms by using java script • Design dynamic pages using java script • Exemplify error handling with java script • Explore the concepts behind jquery	**Unit VI: Advanced JavaScript (6 Hrs)** 6.1. Form Validation & Pattern Matching, Error Handling, Animations, Image Map 6.2. Positioning Elements, Moving Elements, Element Visibility, Changing Colors & Fonts 6.3. Dynamic Content, Stacking Element, Locating Cursor, Reacting to Mouse Click, Dragging and Dropping Element 6.4. Jquery: Overview, Basics, Selectors, Attributes, Traversing, DOM, Events, Interactions
• Understand purpose of XML	**Unit VII: Extensible Markup Language (8 Hrs)**

and XML tags • Discuss XML DOM and XML processing • Describe XML syntax, features and Validations • Create XML documents and DTD • Write XML schema and understand its importance • Explore concepts behind Xpath, and XSLT	7.1. XML Overview and Syntax, XML Documents, XML Tags, Elements and Attributes, Comments, Character Entities, White Spaces, XML Processing, XML CSS, Encoding and Validation 7.2. XML DOM, XML Tree Structure, XML Namespaces, XML Processors 7.3. DTD Overview, Syntax, Components, Entities and Validations 7.4. XML Schema Overview, Syntax, Validation, Simple and Complex Types, String, Date Time, Numeric Types 7.5. Xpath Overview, Expression, Nodes, Absolute and Relative Paths, Axes, Operators, Wildcard, Predicates 7.6. XSLT Overview, Syntax, template, value-of, for-each, sort, if, choose
• Discuss different web services and standards • Explain need and importance of server side scripting • Discuss Ruby and Ruby on Rails • Apply Rails for form processing and database manipulation	**Unit VII: Web Services & Server Side Scripting (5 Hrs)** 7.7. Web Services: Introduction, Characteristics, Components, Standards, Examples 7.8. Server Side Scripting Languages, Overview, Examples, Web Servers 7.9. Introduction of Ruby, Introduction to Rails Framework, Document Request, Sample Form Processing with Rails, Database Connectivity

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**

It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice	20	20	20×1 = 20	60%
Group B: Short answer type questions	8	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to write HTML and CSS scripts by using various tags & different controls and able to design web pages having different layouts. Besides this, students should be able to perform client side validation by using java scripts and should also be able to create XML documents, DTDs, & XML schemas. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. Robert. W. Sebesta, "*Programming the World Wide Web*", Fourth Edition, Pearson Education, 2007.

References

1. Deitel, Deitel, Goldberg, "*Internet & World Wide Web How To Program*", Third Edition, Pearson Education, 2006.
2. Jeffrey C.Jackson, "Web *Technologies--A Computer Science Perspective*", Pearson Education, 2006.
3. Kogent, *HTML5 Black Book: Covers CSS3, Javascript, XML, XHTML, AJAX, PHP and JQuery*, Wiley

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Sixth Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Course Title: Introduction to Cryptography **Credit: 3**
Course No: CSIT.321 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Sixth
Level: B. Sc. CSIT

1. Course Introduction

Cryptography provides important tools for ensuring the privacy, authenticity, and integrity of the increasingly sensitive information involved in modern digital systems. Nowadays, core cryptographic tools, including encryption, message authentication codes, digital signature, key agreement protocols, etc., are used behind millions of daily on-line transactions. This course will unveil some of the magic of cryptography.

2. Objectives

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

→ Understand different cryptographic schemes their goals and limitations
→ Explain how security systems works and how these systems can be attacked by imposters
→ Demonstrate and implement different cryptographic algorithms and protocols
→ Analyze strength of implemented sedulity mechanisms

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand need and importance of cryptography • Discuss security attacks, services and mechanism • Demonstrate classical cipher techniques	**Unit I: Introduction & Classical Encryption (8 hr Hrs)** 1.1. Defining Cryptography and Cryptanalysis, Security Attacks, Security Services, Security Mechanisms 1.2. Virus, Worms, Torjan Horse, Types of Crypto Systems and their comparison, Symmetric cipher model 1.3. Substitution Techniques: Caeser, Monoalphabetic, Playfair, Hill, Polyalphabetic ciphers, one-time pad 1.4. Transposition Techniques, Steganography, Overview of Shannon's Theory, Block ciphers vs Stream Ciphers
• Understand working of symmetric ciphers • Discuss mathematical concepts used in symmetric ciphers • Exemplify different symmetric ciphers and implement them	**Unit II: Modern Symmetric Ciphers (10 hr)** 2.1. Block Cipher Principles, Data Encryption Standards, Strength of DES 2.2. Finite Fields: Groups Rings, Fields, Modular Arithmetic, Euclidean Algorithm, Galois Fields (GF(p) & GF(2^n)), Polynomial Arithmetic 2.3. AES (Advanced Encryption Standards) Cipher, AES Evaluation 2.4. Double DES, Triple DES, Stream Cipher Structure, RC4 Algorithm

• Discuss Number Theory that is useful in asymmetric ciphers • Demonstrate different asymmetric ciphers • Understand different types of attacks on symmetric ciphers • Implement asymmetric cipher techniques	**Unit III: Asymmetric Ciphers (10 hr)** 3.1. Number Theory: Prime Numbers, Fermats Theorem, Euler Theorem, Primility Testing, Chinese Remainder Theorem, Discrete Logarithms 3.2. Public Key Cryptosystems, Applications of Public Key Cryptosystems, Requirements of Public Key Cryptosystems, Public Key Cryptanalysis 3.3. RSA Algorithm, Computational aspects of RSA, Security of RSA 3.4. Distribution of public key, Distribution of secret key by using public key cryptography, Diffie-Helman Key Exchange and Man-in-the-Middle Attack, Elliptic Curve Arithmetic, Elliptic Curve Cryptography, The ElGamal Encryption Algorithm
• Understand hashing and hash value • Demonstrate hashing algorithms to generate hash value • Understand attacks on hash functions	**Unit IV: Hashing (6 hr)** 4.1. Authentication Requirements, Authentication Functions, Message Authentication Codes 4.2. Hash Functions and Birthday Attacks, Security of Hash Functions and MACs, Message Digests (MD5) 4.3. Secure Hash Algorithm (SHA-512), HMAC, Security of HMAC, CMAC
• Understand role and operation of digital signatures • Discuss different authentication protocols • Explain digital signature standard and DS algorithm	**Unit V: Digital Signatures and Authentication (6 Hrs)** 5.1. Digital Signatures: Direct Digital Signatures, Arbitrated Digital Signature 5.2. Authentication Protocols: Mutual Authentication, One-way Authentication 5.3. Digital Signature Standard: The DSS Approach, Digital Signature Algorithm
• Discuss different protocols used in authentication • Demonstrate PGP used in email security • Understand role and working of SSL, TLS and SET • Explain intruders and intrusion detection techniques	**Unit VI: Network Security (6 Hrs)** 6.1. Authentication Applications: Kerberos, Public Key Infrastructure 6.2. Email Security: Pretty Good Privacy (Description, Keys, Key Management) 6.3. IP Security, Web Security, Secure Socket Layer, Transport Layer Security Secure Electronic Transaction, Dual Signature, Payment Processing 6.4. Intruders, Intrusion Detection (Statistical Anaomaly Detection, Rule Based Intruder Detection), Password Protection, Password Selection, Firewalls

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
<tr><td></td><td>Attendance</td><td>20%</td><td>Practical Exam</td><td>50%</td></tr>
<tr><td></td><td>Internal Exams</td><td>50%</td><td></td><td></td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to implement different cryptographic algorithms discussed in class. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- W. Stallings, "Cryptography and Network Security", Pearson Education.

References

- Douglas Stinson, "Cryptography Theory and Practice", 2nd Edition, Chapman & Hall/CRC.
- B. A. Forouzan, "Cryptography & Network Security", Tata Mc Graw Hill.

Course Title: Java Programming I **Credit: 3**
Course No: CSIT.322 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Sixth
Level: B. Sc. CSIT

1. Course Introduction

This course introduces the fundamental programming concepts and techniques in Java. All elements of object-oriented programming are introduced. Topics covered include control structures, classes and objects, dynamic memory allocation, Inheritance and Polymorphism, File Handling, Multithreading, Exception Handling, and Generic Programming.

2. Objectives

Upon completion of this course students should:

- → Understand the basic concepts and principles of object oriented programming.
- → Be able to design, write and test a Java program to implement a working solution to a given problem specification.
- → Be able to deal with exceptions effectively and write multithreaded programs

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand importance of java technology • Setup java environment and get ready for coding • Compile and Execute java programs • Read inputs and Display Outputs	**Unit I: Java Programming Basics (4 Hrs)** 1.1. History of java, Characteristics of java, Architecture of java 1.2. PATH and CLASSPATH Variables, Structure of Java Programs, Compiling & Running Java Programs 1.3. Review of Data Types, Comments, Operators, Variables, Converting between Data Types (Type Casting), Strings, Arrays, Constants 1.4. Command Line Arguments, StringBuffer Class, Reading form Keyboard using Scanner Class, Using Math Class
• Use decision statements in programs • Demonstrate looping statements and program them • Apply jump statements in programs	**Unit II: Control Flow (4 Hrs)** 2.1. Selection Statements: if statements, if....else statements, else if ladders, switch statements 2.2. Looping: While Loop, Do While Loop, For Loop, Enhanced For Loop 2.3. Jump Statements: Break Statement, Continue Statement, Return Statement
Understand class and objects and	**Unit III: Class and Objects (6 Hrs)**

develop programs around it. Use access Specifiers properly to class members Exemplify static data members and methods Understand constructors and use it in programs Pass arguments and return values from methods	3.1. Creating Classes, Defining member variables and methods, Creating Reference Variables, Creating Objects, Using member variables and methods 3.2. Access Specifiers: Public, Protected, Default, and Private 3.3. Static and Non-static members, Constructors, This Keyword, Garbage Collection, Inner Classes, Local Classes 3.4. Passing Parameters, Arrays, Objects to Methods and Constructors, Returning Values, Arrays, Objects from Methods and Constructors
• Write polymorphic programs using overloading and overriding • Understand importance of inheritance and use it in writing programs • Explain concepts of containership and abstract classes	**Unit IV: Inheritance and Polymorphism (6 Hrs)** 4.1. Method Overloading, Constructor Overloading, Creating Subclass, Different Types of Inheritance 4.2. Method Overriding, Dynamic Method Dispatch, Using Constructors and Inheritance, Super Keyword 4.3. Access Specifiers and Inheritance, Final Methods, Final Classes 4.4. Has-a Relationship (Containership), Object Class, Abstract Classes
• Understand interfaces and use it in programs • Differentiate between interfaces and abstract classes. • Demonstrate packages by creating and using it.	**Unit V: Interfaces and Packages(4 Hrs)** 5.1. Defining Interfaces, Interfaces vs. Classes, Extending Interfaces, Implementing Interfaces, Multiple Inheritance by using interfaces, Abstract Classes vs. Interfaces. 5.2. Importance of Packages, Using Packages, Creating Packages
• Read inputs from files and store outputs in files. • Understand and use byte stream classes and character stream classes • Use random access and tokenizer in files	**Unit VI: File and IO Handling (5 Hrs)** 6.1. Concept of IO Streams, File Class, InputStream and OutputStream Class, FileInputStream and FileOutputStream Class, BufferedInputStream and BufferedOutputStream Class 6.2. Reader and Writer Classes, FileReader and FileWriter Class, InputStreamReader and OutputStreamWriter Class, BufferedReader and BufferedWriter Class, 6.3. Random File Access, StreamTokenizer Class, Using PrintWriter Class, Using Scanner Class
• Understand exceptions and its categories • Hand exceptional conditions in programs by using different keywords • Define own exception classes and use them in exception handling	**Unit VII: Exception Handling (5 Hrs)** 7.1. Concept of Exception and Exception Handling, Categories of Exceptions, Hierarchy of Exception Classes 7.2. Using Try....Catch, Multiple Catch Blocks, Finally Keyword 7.3. Using Throws and Throw Keywords, Nested Try....Catch, Creating Exception Classes
• Explain importance of	**Unit VIII: Multithreading (5 Hrs)**

multithreaded programs • Use Runnable interface and Thread class in creating threads • Understand thread life cycle and manage multithreaded programs by using different methods.	8.1. Concept of Thread and Multithreading, Main Thread, Naming a Thread, Pausing a Thread, Thread Life Cycle 8.2. Multithreading by Using Runnable Interface, Multithreading by using Thread Class, Creating multiple threads, Joining Threads, setting Thread Priority, Stopping Threads 8.3. Thread Synchronization, Communication between Threads, Suspending and Resuming Threads
• Understand generics and write generic java programs • Understand collection framework and use collection classes	**Unit IX: Generics and Collection Classes(5 Hrs)** 9.1. Concept of Generics, Generic Methods, Bounded Type Parameters, Generic Classes 9.2. Collections and Collection Framework, Collection Classes (Stack, Linked List, Hash Table), Iterator, Comparator

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner.

Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

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Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments

- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for most of the units in the syllabus. They should practice design and implementation of java programs that demonstrates different concepts discussed is class. However, nature of programming can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- Cay S. Horstmann, Core Java Volume I--Fundamentals Ninth Edition, Prentice Hall, 2012

References

- Hebert Schildt Java: The Complete Reference, McGraw-Hill Education, Ninth Edition, 2014
- Steven Holzner, Java 7 Programming, Black Book, Dreamtech Press, 2013

Course Title: Research Methodology for Computer Science **Credit: 3**

Course No: CSIT.323 **Number of period per week: 3+3**

Nature of the Course: Theory + Tutorial **Total hours: 45+45**

Year: Third, Semester: Sixth

Level: B. Sc. CSIT

1. Course Introduction

This course deals with the knowledge of research methods/techniques/project works in computer science. It covers the details of scientific approach of research, research design and types of research, measurements and scales, and data, sample designs, data analysis and research report presentation. This course also includes for preparing research reports and dissertations/thesis, writing academic paper for publication in the journal, and presentation of the research documents.

2. Objectives

The main objective of the course is to make students familiar with research methodologies/ techniques/project works in Computer Science. After completion of this course, the students will be able to carry out research /project works independently. The general objectives are to:

- introduce scientific approach of research
- familiar research design and different types of research
- introduce measurements and scales including measures of reliability, validity and generalizability.
- collect the data, prepare appropriate sample designs and sample plans and sample size for research.
- make able to write research documents (writing research proposal, grant proposal, thesis/ dissertation, report writing and academic paper writing for publication in the journal).

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• To understand research methodologies/ techniques, project works. • To know the concept and nature of research, its process, objective, planning and formulation of research problems and hypotheses. • To understand the significance, application and characteristics, and generality and specificity of research problems along with the nature of multivariate research problems especially focused on computer science. • To know the concept of reviewing literature of related research work and preparing review notes and references/bibliographies in the research documents.	**Unit I: Scientific Approach of Research (5 Hrs)** **1.1 Basic concept of research:** Concept and nature of research activities, process of scientific investigation, objective of research, planning and formulation of hypotheses, statement of research problems and its significance, applications and characteristics, and generality and specificity of research problems, and multivariate nature of research problems focused on computer science and information technology. **1.2 Literature review**: Purposes of literature review, function and types of literature reviews, format of presenting the literature review, guidelines for conducting literature reviews, references/bibliographies in computer science.
• To understand the concept and meaning of research design, types and dimension of	**Unit II: Research Design (8 Hrs)** 2.1 Concept and meaning of research design, types and

research design, purposes and needs and principles of research design, function of research design and its process. • To develop a research plan, select a good, adequate and scientific research design. • To know the principles of experimental, quasi-experimental, and factorial research design for empirical research. • To know the elements, goals and logics of experimental research design.	dimension of research design, purposes and needs and principles of research design, function of research design and its process. 2.2 Developing a research plan, selecting a study design, criteria of good research design, adequate and inadequate research design, and scientific research design. 2.3 Experimental, quasi-experimental, and factorial research design for empirical research. 2.4 Elements, goals and logic of experimental design.
• To understand the meaning and concept of different types of research, especially scientific research, ex-post-facto research, historical research, experimental and laboratory research, field experimental research, action and participatory action research, evaluation, project and monitoring research, qualitative and quantitative research in computer science	**Unit III: Research Types (6)** 3.1 Basic concept of different types of research, scientific research, ex-post-facto research, historical research, experimental and laboratory research, field experimental research, action and participatory action research, evaluation, project and monitoring research, qualitative and quantitative research.
• To know the meaning of the variables and attributes in research. • To understand the concept of measurement scales, nominal, ordinal, interval and ratio scales, classification of scaling, standard score, σ , T and Percentile scores, sources of error in measurement. • To understand the reliability, validity, and generalizability and the relationship between reliability and validity. • To measure the reliability and validity, and also to estimate the test score.	**Unit IV: Measurements and Scales (8)** 4.1 Variables and attributes, concept of measurement scales, nominal, ordinal, interval and ratio scales, classification of scaling, scaling techniques, standard score, σ , T and Percentile scores, sources of error in measurement. 4.2 Concept of reliability, validity, and generalizability and their measures and tests, estimation of true score of the test, and relationship between reliability and validity.
• To know the sources of data and their collection using different methods. • To prepare sample designs, sample plans and selection of sample size for research, and also to check the validity of the collected data for research. • To organize and manage data and apply appropriate techniques for data analysis and tabulation and presentation of data.	**Unit V: Sample Designs and Data Analysis (6 Hrs)** 5.1 Data sources and data collection methods. 5.2 Sample designs, sample plans, selection of sample and validation of the data. 5.3 Organization and management of data, coding and decoding of data, data analysis techniques, tabulation and presentation of data.
• To understand the basic concept of writing research paper, thesis/dissertation, reports and their formats, typing of research documents and presentations of research. • To know writing research proposal and grant research proposal. • To able how to prepare research report/ project/monitoring/evaluation report. • To know how to prepare thesis/dissertation and academic research paper for publication in the journal.	**Unit VI: Research Writing & Presentation (12 Hrs)** 6.1 Basic concept of writing research paper, thesis/dissertation, reports and their formats. Typing of research documents and presentations of research findings. 6.2 Writing research proposal and grant research proposal. 6.3 Writing research report/project report/ monitoring/evaluation report. 6.4 Writing thesis/dissertation and prepare academic

• Able to prepare sample formats and examples of thesis/dissertation writing, report writing, proposal writing and research paper writing.	research paper for publication in the journal. 6.5 Prepare sample formats and examples of thesis/dissertation writing, report writing, proposal writing and research paper writing as the case study focusing on computer science.

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Report**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Preparation of some research document And presentation	100%	20
(Details are given in the separate table at the end)		Quizzes	10%				
		Attendance	20%				
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	**Total questions to be asked**	**Total questions to be answered**	**Total marks**	**Weightage**
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won’t be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Report

Student needs to choose topic of their interest related to computer science and information technology and needs to prepare sample reports that include all concepts discussed in theory class. Finally presentation should be done in the presence of external examiner

Reference Materials

- Abbas, T. and Charles, T. (2002): Handbook of Mixed Methods in Social and Behavioral Research, Sage Publications .
- and *Procedures for Developing Grounded Theory,* Sage Publication
- Aryal, T.R. (2008): Research Methodology, Paluwa Prakashan Ltd., Kathmandu
- Best J.W and Kahn J. V. (2010). Research in Education, PHI Learning, Pvt. Ltd. New Delhi.
- Cohen L., Manion L and Morrison K. (2010). Research Methods in Education. Routledge, London and New York.
- Cramer, Duncan (2003). Advanced Quantitative Data Anlysis. Open University Press.
- Creswell, J.W. (2002). Research Designs: Qualitative, Quantitative and Mixed Method Approach.
- Donna, M. and Pauline, E.G. (2008): The Handbook of Social Research Ethics, Sage Publications
- Dowdy Shirley and Wearden Stanley, Chilko Daniel. (2004).Statistics for Research.New Jersy: John Willey& Sons Publication.
- Drapper, N. and Smith, H. (1968): Applied Regression Analysis, John Wiley and Sons
- John, F. (2008): Applied Regression Analysis and Generalized Linear Models, Sage Publication Inc.
- Kerlinger, F.N. (1983): *Foundations of Behavioural Research*, Surjeet Publication, India
- Kish, L. (1965): *Survey Sampling*, John Wiley and Sons
- Kothari C. R. (2011): Research Methodology: Methods and Techniques, New Age International Publication, New Delhi.
- Moser, C and Kaltan, G. (1979): *Survey Methods in Social Investigations*, Heinman Education Books, UK
- Mujis, Daniel. (2004). Doing Quantitative Research in Education with SPSS.London.Thousand Oaks.New Delhi: Sage Publications.
- Pranee, L.R. and Douglas, E. (1999): *Qualitative Research Methods: A Health Focus*, Oxford University Press
- *Procedures for Developing Grounded Theory,* Sage Publication.Richardson, J. (2002): Handbook of Qualitative Research Methods for Psychology and the Social Sciences, Blackwell Publishing Co.
- Scot, Davi, and Usher, Robin (2011). Researching Education: Data Methods and Theory in Educational Enquiry.London:New Work: Continnum International Publishing Group
- Singh, Kultar. (2007). Quantitative Social Research Methods. Los Angelos, London.New Delhi. Singapore. Sage Publications
- Strauss, A. and Corbin, C. (1998): Basics of Qualitative Research: Techniques

Course Title: Software Engineering **Credit: 3**
Course No: CSIT.324 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Sixth
Level: B. Sc. CSIT

1. Course Introduction

This course is aimed to understanding of the software engineering discipline and its application to the development of software.It cover the software concept, different software process models, software requirements engineering process, systems analysis and design as a problem-solving activity, design architecture, configuration management and software quality assurance to software development process.

2. Objectives

After completion of Software Engineering course, Students will be able to:

- Understands the systematic, discipline and quantifiable approach of software development process and phases.
- Demonstrate problem solving, critical thinking and analytical skills in building and maintaining quality software systems in the most cost effective manner.
- Demonstrate leadership and creativity in software industries with proficient in oral and written communication, and effective in teamwork with the highest levels of ethical standards and social responsibilities.
- Engage in lifelong learning, advance their knowledge, and have skills and ability to pursue graduate studies and do research in software engineering and related interdisciplinary areas.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define software, characters and categories • Explore changing nature of software • Define software engineering, practices and myths	**Unit I: Software and Software Engineering (4 Hrs.)** 1.1. Definition, characteristics and application domain of software 1.2. Changing Nature of Software 1.3. Definition of software engineering and software process 1.4. Software engineering practices 1.5. Software Development Myths 1.6. Software Process Structure
• Analyze the modern software development process • Compare the classical and evolutionary software development model • Apply the Agile process in software development	**Unit II: Software Development Process Model(5 Hrs.)** 2.1. Waterfall Model 2.2. Prototype Model 2.3. Rapid Application Development Model 2.4. Spiral Model 2.5. Agile Process: Extreme Programming, Scrum 2.6. Aspect Oriented Software Development Model

• Create the function and non-functional requirement of software. • Understands the document structure of software requirement. • Identify the requirement engineering process in real development process.	**Unit III: Requirements Engineering (5)** 3.1. Functional and non-functional requirements 3.2. The software requirements document 3.3. Requirements specification 3.4. Requirements engineering processes 3.5. Requirements elicitation and analysis 3.6. Requirements validation 3.7. Requirements management
• Identify the software modeling concept • Describe the model driven software engineering • Explain the architecture design and pattern • Understands the mobile and web development architecture	**Unit IV:System Modeling and Architecture Design (7 Hrs.)** 4.1. Context models 4.2. Interaction models 4.3. Structural models 4.4. Behavioural models 4.5. Model-drivenengineering 4.6. Architectural design decisions 4.7. Architectural views 4.8. Architectural patterns 4.9. Application architectures 4.10. Web Application Design 4.11. Mobile Application Design
• Understand object oriented design principle • Describe UML • Design and Draw Use Case, Activity, Sequence, Class, Component and Deployment Diagram. • Compare the CASE and i-CASE Tools	**Unit V: Object Oriented Design (7 Hrs.)** 5.1. Object Oriented design principle and process 5.2. Unified Model Language 2.0 5.3. Use Case Diagram 5.4. Activity Diagram 5.5. Sequence Diagram 5.6. Class Diagram 5.7. Component Diagram 5.8. Deployment Diagram 5.9. CASE and I-CASE Tools
• Understand software configuration process • Describe the version management and maintenance process • Describe the software engineering process.	**Unit VI: Configuration Management(4 Hrs.)** 6.1. Software Configuration Management Activities 6.2. Change management 6.3. Version and Release management 6.4. Software Maintenance 6.5. Software Re-Engineering
• Understand elements of SQA • Define the SQA Process and Task • Understands the software reliability and Standards	**Unit VII: Software Quality Assurance (4 Hrs.)** 7.1. Elements of software Quality Assurance 7.2. SQA Process and product characterise 7.3. SQA Task, Goal and Metrics 7.4. Statistical Software Quality Assurance

	7.5. Software Reliability 7.6. ISO 9000 Quality standards
• Understand concepts of software Testing and Approach • Define the process of unit, integration and system Testing • Compare Validation and System Testing • Understands the Mobile and Web Application Testing Approach	**Unit VIII: Software Testing Strategies (5 Hrs.)** 8.1 Strategic Approach of Software Testing 8.2 Black Box and White Box Testing Approach 8.3 Unit and Integration Testing 8.4 Validation and System Testing 8.5 Testing Object Oriented software 8.6 Testing Web Application 8.7 Testing Mobile Application 8.8 Testing Tools
• Understand concept of project and its activities • List the planning activities • Use Risk management and Cost estimation tools	**Unit IX: Software Project Management (4 Hrs.)** 9.1 Project Activities 9.2 Project Planning 9.3 Risk Management 9.4 Cost Estimation

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will beasked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above

mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments

- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should practice software engineering principle for real world applications. Students are recommended to use UML tools as a part of lab work. The choice of CASE Tools can range from MS-Visio, MS-Project manager, Rational Rose so as to provide practical exposure for realizing system design issues. Students should select the development model and apply requirement engineering. Students should use software quality assurance activities and testing techniques for quality product. The lab work and case study should be practiced for minimum of 3 lab hours or case study per week.

It is highly recommended that project proposal, system requirement specification document, design specification, test case are prepared to real world application should be practiced. A group of four or five students can work together.

Prescribed Texts

1. Sommerville, I. (2010). Software engineering. 9th Edition, Wokingham, England: Addison-Wesley Pub. Co.
2. Pressman, R.S (2014)., "Software Engineering – A Practitioner's Approach", 8th Edition, New Delhi, McGraw Hills

References

1. LethbridgeTimothy and LaganiereRobert (2010). Object-oriented Software Engineering: Practical Software Development using UML and Java. New Delhi, McGraw Hills
2. Pankaj Jalote,(2005) "An Integrated Approach to Software Engineering", 3rd Edition,New Delhi, Narosa Publishing House.
3. Pfleeger, S. L., & Atlee, J. M. (2010). Software engineering: theory and practice (4th ed). N.J. Prentice Hall.
4. Schwaber, K., &Beedle, M. (2002). Agile software development with Scrum. Upper Saddle River, NJ: Prentice Hall.

Course Title: Web Technology II **Credit: 3**
Course No: CSIT.325 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Third, Semester: Sixth
Level: B. Sc. CSIT

1. Course Introduction

In addition to creating web sites and enhancing their basic programming skills, students will learn to embed PHP in HTML, to interact with MySQL databases through the PHP engine, accessibility issues, and the basics of (secure) file transfers, file management, and web server configuration.

2. Objectives

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

- Understand of PHP and programming with PHP
- Work by using MySQL with PHP
- Use very simple regular expressions
- Put all of these ideas together to create web sites

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand and explain importance of PHP • Understand basics of PHP syntax and programming • Embed PHP codes into web pages	**Unit I: PHP Fundamentals (7 Hrs)** 1.1. Introduction: What is PHP?, The history of PHP, What does PHP do?, PHP Installation and Configuration. 1.2. Language Basics: Lexical Structures, Variables, Data Types, Expressions and Operators 1.3. Flow Controls: If, switch, while, for, foreach, try...catch, declare, exit, return, go to. 1.4. Including Code, Different styles of Embedding PHP in Web Pages
• Understand and demonstrate functions in PHP • Explain variable scopes, parameters and return values in functions • Handle strings and regular expressions in PHP	**Unit II: Functions Strings (7 hr)** 2.1. Defining Function, Calling Function, Variable Scope, Function Parameters, Returning Values, Variable Functions, Anonymous Functions 2.2. String Constants, Printing Strings, Accessing Characters, Cleaning Strings. 2.3. Encoding and Escaping Strings, Comparing Strings, Manipulating and Searching Strings, Regular Expression
• Demonstrate different types of arrays • Apply arrays in writing PHP	**Unit III: Arrays and Objects (7 hr)** 3.1. Indexed Arrays, Associative Arrays, Accessing Array Elements, Storing Data, Extracting Multiple Values,

programs - Understand Objects and other OOP concepts - Use OOP concepts in writing PHP programs	Multidimensional Arrays. 3.2. Converting between Arrays and Variables, Different Ways of Traversing Arrays, Sorting, Acting on Arrays. 3.3. Creating Objects, Accessing Properties and Methods, Declaring Classes 3.4. Constructors, Destructors, Inheritance, Interfaces, Abstract Classes
- Understand HTTP and Web server basics - Explain GET and POST in form processing - Exemplify file uploading and form validation - Demonstrate sessions and cookies	**Unit IV: Form Processing (6 hr)** 4.1. HTTP Basics, Server Variables, Getting Server Information 4.2. PHP Get & POST, Form Processing, Methods, Form Parameters, Form Validation, File Uploads, Setting Response Headers 4.3. Working with cookies, Setting cookie values, Reading cookie values, Unsetting cookie values, Working with sessions, SSL
- Understand MySQL and RDBMS - Connect PHP with MySQL and retrieve data from it - Demonstrate SQL operations by using PHP - Use complex SQL operations through PHP	**Unit V: Database Connectivity (6 Hrs)** 5.1. Using PHP to access Database, Relational Databases and SQL, PHP Data Objects 5.2. MySQL Object Interface, Retrieving Data for Display, SQLite 5.3. Performing basic database operation (DML) (Insert, Delete, Update, Select), Setting query parameter Executing query, 5.4. Cartesian Product and Join Operations, Prepared Statements
- Creating and drawing images suitable for web pages - Embedding images in web pages - Understand and implement security techniques with web pages.	**Unit VI: Graphics and Security (6 Hrs)** 6.1. Embedding Images, Basic Graphics Concepts, Creating and Drawing Images, Images with Text 6.2. Dynamically Generated Buttons, Scaling Images, Color Handling 6.3. Security: Filter Input, Cross-Site Scripting, Escape Output, Session Fixation, File Upload, File Access
- Understand basics of different frameworks and CMS systems used in PHP programs - Use basic functionalities of Wordpress.	**Unit VII: Framework and CMS(6 Hrs)** 7.1. Frameworks: Introduction of CodeIgniter, Cake PHP 7.2. CMS: Introduction of Wordpress, Joomla, Drupal, Magento 7.3. Wordpress Introduction: Using domain names, Hosting Options, Dashboard, Pages, Directory Permissions, Tags, Settings

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to write PHP scripts by using various concepts discussed in class. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. Kevin Tatore, Peter MacIntyre, Ramus Lerdorf, Programming PHP, O'Reilly Media, Third Edition Edition, 2013

References

1. David Sklar, Learning PHP 5, A Pain-Free Introduction to Building Interactive Web Sites**,** O'Reilly Media,
2. Robin Nixon, "Learning PHP, MySQL & JavaScript: With jQuery, CSS & HTML5",
3. Luke Welling ,PHP and MySQL Web Development, Addison-Wesley Professional O'Reilly Media

Note:- Students and Instructors need to follow web resources for last unit

Course Title: Minor Project I **Credit: 2**
Course No: CSIT.326
Nature of the Course: Project
Year: Third, Semester: Sixth
Level: B. Sc. CSIT

1. Course Introduction

This course will allow students who are taking the ***Web Technology II*** computer science course to expand their programming knowledge and work on significant projects of their choice. Lessons on software development processes, project design & management, and other topics will assist in completing the projects as well as advance their programming skills. There is no set syllabus. Students identify their chosen project area and are allocated a supervisor who is a member of the academic staff, and is responsible for providing support and guidance. Students are responsible for organizing themselves and their work, with advice from their supervisor with whom they should meet on a regular basis, as agreed with the supervisor.

2. Objectives

Upon completion of this course students will be:

→ Experienced and empowered in undertaking significant project work in a self disciplined, organized, and professional manner from conception to documentation.
→ Skilled in analyzing, designing and developing of meaningful and efficient real world application

3. Method of Instruction:

Individual working with support from the project supervisor

4. Tentative Project Report Format

The final report documents the results of the project and should be submitted within 1 week after finishing final examination. Students should use Times New Roman Font and Line spacing 1.5 while formatting their project report. Tentative project report format should be as per following outline:

Front Part

- Cover Page
- Students Declaration
- Supervisors Recommendation
- Letter of Approval
- Acknowledgement
- Abstract
- Table of Contents
- List of Figures

- List of Tables
- List of Abbreviations

Body Part

a. Introduction

First and foremost, you should write about the most interesting or important parts of your project. Devote most space and time to this. For example:

- What design choices did you have along the way, and why did you make the choices you made?
- What was the most difficult part of the project?
- Why was it difficult?
- How did you overcome the difficulties?
- Did you discover anything novel?
- What did you learn?

Set the scene and problem statement/specification. Provide the motivation for reading this report. Introduce the structure of report (what you will cover in which chapters).

b. Background

You should provide enough background to the reader for them to understand what the project is all about. For example:

- What the reader needs to know in order to understand the rest of the report. Examiners like to know that you have done some background research and that you know what else has been done in the field (where relevant). Try to include some references.
- Related work (if you know of any)
- How does this relate to other work in this area?

c. Analysis and Design

- Write how requirements are collected and also write about feasibility analysis of the project.
- If your project involves designing a system, give a good high-level overview of your design. In many projects, the initial design and the final design differ somewhat.
- If the differences are interesting, write about them, and why the changes were made. If your design was not implemented fully, describe which parts you did implement, and which you didn't. If the reason you didn't implement everything is interesting write about it.

d. Implementation and Testing

    - Give description of tools used in implementation and code details (not a complete listing, but descriptions of key parts). Discuss the most important/interesting aspects.
    - Test plan -- how the program/system was verified. Put the actual test results in the Appendix.

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e. **Conclusion, Evaluation and Further Work**
   What have you achieved? Give a critical appraisal (evaluation) of your own work - how could the work be taken further (perhaps by another student next year)?

End Part

- References
- Bibliography
- Appendices

5. Evaluation System

Internal Evaluation:-40%

- Proposal Defence:-10%
  Needs to be evaluated in following basis
    - Concept and Depth of Understanding
    - Proposal document
    - Presentation
    - Viva
- Mid Term Evaluation:-30%
  Students are expected to complete their database design and also start design and implementation of the project. Evaluation should be done following basis
    - Database Design
    - Progress and clarity of concepts
    - Presentation
    - Viva

External Evaluation:-60% (Supervisor:-30%, External Examiner:-30%)

External evaluation should be done in the presence of external examiner and evaluation should be done following basis

- Project Report
- Practical relevance of the project
- Presentation
- Viva

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Seventh Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Course Title: E-Commerce **Credit: 3**
Course No: CSIT.411 **Number of period per week: 3+3**
Nature of the Course: Theory + Case Study **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course includes examining different aspects of conducting business over the internet. The discussion covers different e-business models. Besides this, the course covers several topics including different E-Payment systems, online marketing and advertising systems, and different social, ethical, political issues, and legal scenario.

2. Objectives

Upon completion of this course students should be able to:

→ Demonstrate an awareness of the key components and concepts of e-commerce, and the vital role it plays in modern business practice.
→ Understand the need for payment methods for conducting transaction over the e-commerce transactions.
→ Identify the components that comprise an e-Business strategy and demonstrate understanding of methods for devising such a strategy
→ Understand the importance and relevance of E-Advertising and E-Marketing in the current global and local business scenarios.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define ecommerce, ebusiness and other terminologies • Demonstrate different ebusiness models • Exemplify M-commerce and other emerging business models • Understand the concepts of EDI and its working	**Unit I: Introduction of E-Commerce (6 hr)** 1.1. Definition of Ecommerce, Ecommerce vs Traditional Commerce, Ebusiness, Pure vs Partial Ecommerce 1.2. Why Ecommerce, Basic Terminologies: E-shop, E-mall, E-market etc, Benefits and Limitations of Ecommerce 1.3. Ecommerce Framework, Unique Features of E-Commerce, Types of Ecommerce: B2B, B2C, C2C, C2B 1.4. M-Commerce, E-Commerce vs M-Commerce, Features of M-Commerce, 1.5. Electronic Data Interchange: Defining EDI, EDI vs Email, Benefits of EDI, Limitations of EDI, Working of EDI
	Unit II: E-Commerce Payment Systems (6 hr)

• Identify different traditional and ecommerce payment systems • Describe the working of different e-payment systems • Explain requirements and risks associated with payment system • Demonstrate services provided by payment gateways	2.1. Types of Payment Systems: Cash, Checks, Credit/Debit Cards, Stake Holders of Payment Systems 2.2. E-Commerce Payment Systems: E-cash, E-check, Online Credit Card Payment, Digital Wallet, Smart Card Based Payment Systems, Bit-Coins, Strengths and Drawbacks of each Payment System 2.3. Mobile Payments, Internet Banking, Digital Payment Requirements, Risk and E-Payment Systems, 2.4. Payment Processing, Payment Gateways, Case Study on e-Sewa and PayPal
• Understand the elements of business models and classify different business models. • Demonstrate different B2C business models. • Exemplify major B2B business models. • Identify emerging business models and demonstrate each of them • Discuss impact of ecommerce in organization restructuring	**Unit III: Ecommerce Business Models (6 Hrs)** 3.1. Introduction of E-Commerce Business Models, Key Elements of Business Models, Categorization of E-Commerce Business Models 3.2. Major B2C Business Models: Portal, E-tailer, Content Provider, Transaction Broker, Market Creator, Service Provider, Community Provider. 3.3. Major B2B Business Models: E-distributor, E-procurement, Exchanges, Industry Consortia, Private Industrial Networks 3.4. Emerging E-Commerce Business Models: Consumer-to-Consumer (C2C) Business Models, Peer-to-Peer (P2P) Business Models, M-commerce Business Models 3.5. Impact of Internet and Web in Structurture, Strategy and Process of Organizations, Case Study of some E-Commerce Site
• Indentify different mechanism for discovering behaviors of online consumers • Discuss concepts and importance of marketing • Understand and demonstrate different internet marketing techniques and strategies • Explain B2B and B2C ecommerce marketing and branding strategies	**Unit IV: E-Commerce Marketing and Advertising (6 Hrs)** 4.1. Consumers Online: The Internet Audience, Internet Traffic Pattern, Consumer Behavior Models, Profiles of Online Consumers, The Online Purchasing Decision, A Model of Online Consumer Behavior, Browsers and Buyers, Finding Vendors Online, Why More People Don't Shop Online, Trust, Utility and Opportunism in Online Markets 4.2. Basic Marketing Concepts: Feature Sets, Products, Brands and the Branding Process, Segmenting, Targeting, and Positioning, Brands Rationale, Brands and Price Dispersion on the Internet 4.3. Internet Marketing Technologies: The Revolution in Internet Marketing Technologies, Web Transaction Logs, Cookies and Web Bugs, Developing Profiles,

	CRM Systems 4.4. B2C and B2B E-commerce Marketing and Branding Strategies: Market Entry Strategies, Establishing the Customer Relationship, Customer Retention Net Pricing Strategies, Channel Strategies 4.5. Case Study on Online Marketing
• Describe social marketing tools techniques and measurement • Demonstrate social marketing tools techniques and measurement • Exemplify location-based marketing tools techniques and measurement	**Unit V: Social, Mobile and Local Marketing (6 Hrs)** 5.1. Social Marketing: Social Marketing Players and Process, Facebook Marketing, Marketing Tools and Measurement, Twitter Marketing, Marketing Tools and Measurement 5.2. Mobile Marketing: Mobile marketing Features and Tools, Basic Mobile Device Features, Measuring Mobile marketing Result 5.3. Local Marketing: Local and Location based marketing and their Growth, Location Based Marketing Platforms, Technologies, and Tools, Measuring Result of Location Based Marketing 5.4. Case Study on Social, Mobile and Local Marketing
• Discuss ethical, social and political issues related with ecommerce • Explain different privacy issues and information rights raised due to ecommerce • Understand intellectual property rights and issues • Discuss issues related to governance of internet and ecommerce • Explain copyright act and cyber law of Nepal	**Unit VI: Ethics Laws and E-Commerce (15 Hrs)** 6.1. Understanding Ethical Social and Political Issues: Model for Organizing the Issues, Ethical Issues, Dilemmas, and Principles 6.2. Privacy and Information Rights: Information's Collected at E-Commerce Sites, Privacy Issues in Social networks and Mobiles, Profiling and Behavioural Targeting, Ecommerce Surveillance, Legal Protections, Emerging Privacy Protection Business 6.3. Intellectual Property Rights: Types of Intellectual Property Protection: Copyright, Look & Feel, Fair use Doctrine, Patents, Trademarks, Cyber piracy, Meta-tagging, Key-wording, Lining, Framing 6.4. Governance: Governance of Internet and Ecommerce, Public Government and Law, Taxation, Net Neutrality 6.5. Public Safety and Welfare: Protecting Children, Cigarettes, Gambling and Drugs 6.6. Copy Right Acct of Nepal, Cyber Law of Nepal

Evaluation System

Undergraduate Programs							
External	**Marks**	**Internal**	**Weight**	**Marks**	**Practical**	**Weight**	**Mark**

Evaluation		**Evaluation**	**age**			**age**	
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Case Study

During the semester, all students are required to complete a research term paper/project as a group. The purpose of this project is to study an electronic commerce business in depth in a short period of time. Students need to select an ecommerce site randomly should study details about it such as business model, revenue generation model, payment methods adopted, services provided by the organization, strengths, limitations etc. An in-class presentation and a written report are required.

Prescribed Text

- Kenneth Loudon, Carol Guárico Traver, E-Commerce Prentice Hall; Seventh edition, 2011.

References

- Electronic Commerce 2010, Efraim Turban, Jae K. Lee, David King, Ting Peng Liang, Deborrah Turban. Pearson Education; Sixth edition
- Andrew B. Whinston and Ravi Kalakota, ***"Frontiers of Electronic Commerce",*** Pearson 1996
- P.T. Joseph, ***"E-Commerce A Managerial Perspective",*** PHI publication, Fifth edition, 2015

Course Title: Advanced Java Programming **Credit: 3**
Course No: CSIT.412 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course is a study in Java language techniques beyond the introductory course. Emphasis will include, GUI and event-driven programming, Database Connectivity, Socket Programming, Remote Method Invocation and Servlets and JSP Technology.

2. Objectives

Upon completion of this course students should be able to:

- → Write sample applets and draw graphics by using AWT
- → Use libraries for creating GUIs handling events and accessing databases
- → Develop desktop applications, web applications, and network applications
- → Understand concepts of reusable software components and distributed program development.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand concepts of AWT containers and controls • Use Containers a d controls to create GUI • Demonstrate layout mangers and SetBound method • Apply graphics libraries to create graphics. • Create menus and Menubars using AWT	**Unit I: AWT & Layout Management (10 hr)** 1.1. AWT Basics: AWT class Hierarchy, AWT Containers & Controls, AWT Features 1.2. AWT Containers: Window, Frame, Panel, Dialog, Applets, Creating Frames & Panels, Creating Applets, Applet Life Cycle. 1.3. Layout Managers: Flow Layout, Grid Layout, GridBag Layout, Border Layout, Group Layout, Using SetBound method. 1.4. AWT Controls: TextField, TextArea, Button, Label, Checkbox, Checkbox Group, Choice, List, Canvas, Image 1.5. AWT Menu: Menu Hierarchy, Menu, MenuBar, MenuItem, PopupMenu 1.6. AWT Graphics: Graphics and Graphics2D Class, Drawing Lines, Curves, rectangles, ellipse, Changing Color & Font
• Compare Swing with AWT and understand differences	**Unit II: GUI with Swing (8 hr)** 2.1. Swing Basics: Swing Hierarchy, Swing Fewatures, AWT vs Swing

• Use Swing library to create GUI with different controls and menus • Demonstrate the use of advanced swing components • Demonstrate the use of dialog boxes and internal frames • Understand the use of different component organizers	2.2. Text Input: Text Fields, Password Fields, Text Areas, Scroll Pane, Label and Labelling Components 2.3. Choice Components: Check Boxes, Radio Buttons, Borders, Combo Boxes, Sliders 2.4. Menus: Menu Building, Icons in Menu Items, Check box and Radio Buttons in Menu Items, Pop-up Menus, Keyboard Mnemonics and Accelerators, Enabling and Disabling menu Items, Toolbars, Tooltips 2.5. Dialog Boxes: Option Dialogs, Creating Dialogs, Data Exchange, File Choosers, Color Choosers 2.6. Components Organizers: Split Panes, Tabbed Panes, Desktop Panes and Internal Frames, Cascading and Tiling 2.7. Advance Swing Components: List, Trees, Tables, Progress Bars
• Understand event handling models • Demonstrate the use of listeners and adapters • Write programs to handle different types of events	**Unit III: Event Handling (6 Hrs)** 3.1. Introduction: Standard Event Handling, Using Delegated Class, Using Action Commands, Listener Interfaces, Adapter Classes 3.2. Handling Events: Action Events, Key Events, Focus Events, Window Event, Mouse Event, Item Event
• Understand JDBC architecture and driver types • Explain different steps used in connecting with databases • Demonstrate used of different types of statements • Create programs to executes DDL and DML statement	**Unit IV: Java Database Connectivity (6 Hrs)** 4.1. Design of JDBC: JDBC Architectures, Drivers & Jar Files, Driver Types, Steps for Connecting to JDBC 4.2. Executing SQL Statements: Managing Connections, Statements, Result Set, SQL Exceptions, Populating Database 4.3. Query Execution: Prepared Statements, Reading and Writing LOBs, SQL Escapes, Multiple Results, Scrollable Result Sets, Updateable Result Sets, Row Sets and Cached Row Sets, Transactions
• Understand concepts of ports, IP address, and Protocols • Implement TCP/UDP servers and clients • Perform different operations with URLs	**Unit V: Network Programming (4 Hrs)** 5.1. Networking Basics: Transmission control Protocol (TCP), User Datagram Protocol (UDP), Ports, IP Address Network Classes in JDK 5.2. Working with URLS: Connecting to URLS, Reading Directly from URLS, Inet Address Class 5.3. Sockets: TCP Sockets, UDP Sockets, Serving Multiple Clients, Half Close, Interruptible Sockets, Sending Email
• Practice the creation, modification, and deletion of JAR files	**Unit VI: Java Beans (5 Hrs)** 6.1. Introduction: Creating, Updating and Reading From JAR Files, Java Beans, Advantages of Java Beans,

• Demonstrate the use of bean components • Write programs to create Java Beans	Class vs Beans, BDK and Bean Box 6.2. Java Bean: Creating a Java Bean, Creating a Bean Manifest File, Creating a Bean JAR File, Using a New Bean, Adding Controls to Beans, Giving a Bean Properties, Creating Bound Properties, Giving a Bean Methods, Giving a Bean an Icon
• Understand Servlet basics and its life cycle • Configure web servers and create servlets by using different classes and interfaces • Demonstrate the use of session and cookies • Understand JSP architecture and compare it with servlets • Demonstrate the use of JSP tags by writing sample programs • Under exceptions and exception handling	**Unit VII: Servlets & JSP(5 Hrs)** 7.1. Servlets: Introduction to Servlets, Life cycle of servlets, Java Servlets Development Kit, Creating, Compiling and running servlet, The servlet API (javax.servlet package), Reading the servlet Parameters, Reading Initialization parameter, The javax.servlet.http.Package, Handling HTTP Request and Response (GET / POST Request), Using Cookies, Session Tracking 7.2. Java Server Pages: Advantage of JSP technology (Comparison with ASP / Servlet), JSP Architecture, JSP Access Model, JSP Syntax Basic (Directions, Declarations, Expression, Scriplets, Comments), JSP Implicit Object, Object Scope, Synchronization Issue, Exception Handling, Session Management, Creating and Processing Forms.
• Explain basics of RMI and CORBA • Write, Compile, and Execute sample RMI programs • Understand CORBA and its architecture	**Unit VIII: RMI & CORBA (5 Hrs)** 8.1. Remote Method Invocation: Introduction of RMI, Architecture of RMI, Remote Objects, Creating and Executing RMI Applications 8.2. CORBA: Introduction to CORBA, Architecture of CORBA, Functioning of CORBA Applications, CORBA Service

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weightage**	**Marks**	**Practical**	**Weightage**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20

Full Marks 60+20+20 = 100

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should design at least two Projects. Desktop Application (Address Book, Library system etc), Simple network Application (e.g. Chatting Application) or Simple Web Applications (online banking Application, Online Music Application, etc)

Prescribed Text

- Cay S. Horstmann, Core Java Volume I--Fundamentals Ninth Edition, Prentice Hall, 2012
- Cay Horstmann and Grazy Cornell, Core Java Volume II-Advance Features, Eighth Edition

References

- Hebert Schildt Java: The Complete Reference, McGraw-Hill Education, Ninth Edition, 2014
- Steven Holzner, Java 7 Programming, Black Book, Dreamtech Press, 2013

Course Title: Object Oriented Analysis and Design **Credit: 3**
Course No: CSIT.413 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course starts with object oriented concepts and moves towards the preparation of standard UML diagrams using an UML modeling tool. Besides this the course covers details of object oriented analysis and design process.

2. Objectives

By the end of this course, students will be able

→ To learn the concept of Object Oriented Software Development Process
→ To get acquainted with UML Diagrams
→ To understand Object Oriented Analysis Processes
→ To understand Object Oriented Design Processes

3. Specific Objectives and Contents

Specific Objectives	Contents
• Discuss importance of object orientation • Exemplify objects, classes, inheritance, polymorphism, and aggregation • Explain object attributes, object state, and object identity • Understand object oriented system development process	**Unit I: Overview of Object Oriented System (8 hr Hrs)** 1.1. Orthogonal views of software, Why object orientation, Overview of Unified approach 1.2. Object, Class, Object attribute and state, Object methods and behaviour, Messages 1.3. Encapsulation and Information Hiding, Class Hierarchy, Polymorphism, Object relationships-association, aggregation and composition 1.4. Object Identity, Static and Dynamic Binding, Object Persistence, Meta Classes 1.5. Object Oriented System Development: Object Oriented Analysis, Object Oriented Design, Prototyping, Implementation, Incremental Testing
• Discuss different modeling techniques, methodologies and identify their strengths and drawback • Understand concepts and importance of patterns and	**Unit II: Methodologies, Modeling and UML (10 hr)** 2.1. Object Oriented Methodologies: Rumbaugh Modelling Techniques, Booch methodology, Jacobson Methodologies 2.2. Patterns and its Types, Anti-patterns, Pattern Templates, Frameworks 2.3. UML: Static and dynamic models, Introduction of

framework • Draw different UML diagrams to model some system	UML, Importance of Modelling 2.4. UML Diagrams: Class Diagram, Object Diagram, Use-case Diagram, Interaction Diagrams, Sate-chart diagrams, activity diagram, implementation Diagrams
• Describe object oriented analysis and its difficulties • Understand object oriented analysis process • Perform OOA some real world system to identify actors, use cases, classes, methods and attributes	**Unit III: Object Oriented Analysis (10 hr)** 3.1. Introduction, Analysis Difficulties, OOA Process, Finding actors, Finding Use cases, Naming Use cases, uses and extends association, Case Study for finding use cases and actors 3.2. Object Analysis: Classification theory, Approaches for finding classes: Noun phrase approach, Common class pattern approach, Use case driven approach, CRC approach 3.3. Identifying Relationships: Associations, Super-Sub Class Relationships, Aggregation, Identifying Attributes and Methods, Case Study on Identifying Relationships, Methods and Attributes
• Differentiate OOD from OOA • Understand OOD process, Axioms, and corollaries • Discuss and exemplify object relational mapping • Explain access layer and view layer design process • Perform OOD of some real world system	**Unit IV: Object Oriented Design (12 hr)** 4.1. OOD Process, OOD Axioms and Corollaries, Design patterns, UML Object Constraint Languages, Designing Classes, Define Visibility, Refine Attributes, Designing Methods and Protocols 4.2. Access Layer, Object Relational Databases, Object Relational Mapping, Process for designing access layer classes 4.3. View Layer, Process of designing view layer classes, Macro level process, Micro level process, UI design rules 4.4. Case Study on designing business layer, access layer and view layer classes.
• Discuss and exemplify different types of errors • Explain different test strategies and understand impact of reusability in testing • Exemplify usability testing and test cases.	**Unit V: Software Quality (5 Hrs)** 5.1. Quality Assurance Tests, Testing Strategies, Impact of Object Orientation on Testing, Test Cases, Test Plan, Continuous Testing 5.2. Verification and Validation, Usability Testing, case study on Usability Test Plan and Test Cases

Evaluation System

Undergraduate Programs

External Evaluation	Marks	Internal Evaluation	Weight age	Marks	Practical	Weight age	Mark
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won’t be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should use some case tools to draw UML diagrams discussed the course. Besides this student should perform analysis and design of some small scale some real world system and needs to make report.

Prescribed Text

- Ali Bahrami, Object Oriented Systems Development using the Unified Modeling Language, McGraw Hill, Reprint 2009.

References

- Grady Booch, James Rumbaugh, Ivar Jacobson, *"The Unified Modeling Language User Guide"*, 2nd Edition, Pearson Education, 2007.
- Bernd Oestereich, Developing Software with UML, Object-Oriented Analysis and Design in Practice, Addison-Wesley, 2000.

Course Title: Minor Project II **Credit: 3**
Course No: CSIT.414
Nature of the Course: Project
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course will allow students who are taking the ***Advanced Java Programming*** course to expand their programming knowledge and work on significant projects of their choice. Lessons on software development processes, project design & management, and other topics will assist in completing the projects as well as advance their programming skills. There is no set syllabus. Students identify their chosen project area and are allocated a supervisor who is a member of the academic staff, and is responsible for providing support and guidance. Students are responsible for organizing themselves and their work, with advice from their supervisor with whom they should meet on a regular basis, as agreed with the supervisor.

2. Objectives

Upon completion of this course students will be:

- → Experienced and empowered in undertaking significant project work in a self disciplined, organized, and professional manner from conception to documentation.
- → Skilled in analyzing, designing and developing of meaningful and efficient real world application

3. Method of Instruction:

Individual working with support from the project supervisor

4. Tentative Project Report Format

The final report documents the results of the project and should be submitted within 1 week after finishing final examination. Students should use Times New Roman Font and Line spacing 1.5 while formatting their project report. Tentative project report format should be as per following outline:

Front Part

- Cover Page
- Students Declaration
- Supervisors Recommendation
- Letter of Approval
- Acknowledgement
- Abstract
- Table of Contents
- List of Figures

- List of Tables
- List of Abbreviations

Body Part

a. Introduction

First and foremost, you should write about the most interesting or important parts of your project. Devote most space and time to this. For example:

- What design choices did you have along the way, and why did you make the choices you made?
- What was the most difficult part of the project?
- Why was it difficult?
- How did you overcome the difficulties?
- Did you discover anything novel?
- What did you learn?

Set the scene and problem statement/specification. Provide the motivation for reading this report. Introduce the structure of report (what you will cover in which chapters).

b. Background

You should provide enough background to the reader for them to understand what the project is all about. For example:

- What the reader needs to know in order to understand the rest of the report. Examiners like to know that you have done some background research and that you know what else has been done in the field (where relevant). Try to include some references.
- Related work (if you know of any)
- How does this relate to other work in this area?

c. Analysis and Design

- Write how requirements are collected and also write about feasibility analysis of the project.
- If your project involves designing a system, give a good high-level overview of your design. In many projects, the initial design and the final design differ somewhat.
- If the differences are interesting, write about them, and why the changes were made. If your design was not implemented fully, describe which parts you did implement, and which you didn't. If the reason you didn't implement everything is interesting write about it.

d. Implementation and Testing

- Give description of tools used in implementation and code details (not a complete listing, but descriptions of key parts). Discuss the most important/interesting aspects.

- Test plan -- how the program/system was verified. Put the actual test results in the Appendix.

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e. Conclusion, Evaluation and Further Work

What have you achieved? Give a critical appraisal (evaluation) of your own work - how could the work be taken further (perhaps by another student next year)?

End Part

- References
- Bibliography
- Appendices

Note-Referencing and Citation should follow IEEE style.

5. Evaluation System

Internal Evaluation:-40%

- Proposal Defence:-10%
  Needs to be evaluated in following basis
  - Concept and Depth of Understanding
  - Proposal document
  - Presentation
  - Viva
- Mid Term Evaluation:-30%
  Students are expected to complete their database design and also start design and implementation of the project. Evaluation should be done following basis
  - Database Design
  - Progress and clarity of concepts
  - Presentation
  - Viva

External Evaluation: - 60% (Supervisor:-30%, External Examiner:-30%)

External evaluation should be done in the presence of external examiner and evaluation should be done following basis

- Project Report
- Practical relevance of the project
- Presentation
- Viva

Course Title: Net Centric Computing **Credit: 3**

Course No: CSIT.415.1 **Number of period per week: 3+3**

Nature of the Course: Theory + Lab **Total hours: 45+45**

Year: Fourth, Semester: Seventh

Level: B. Sc. CSIT

1. Course Introduction

This course is an introduction to ASP.Net Web Development using the C# programming language. Students will utilize ASP.NET to deliver dynamic content to a Web Application. Topics include Web Forms, User Controls, Server Controls, and Database Integration

2. Objectives

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

- → Explain the role of the Microsoft .NET Framework to ASP.NET
- → Add server controls to an ASP.NET Web Form and Enhance functionality of ASP.NET server controls.
- → Utilize validation controls to validate user input in an ASP.NET Web Form.
- → Use Microsoft ADO.NET to access data in an ASP.NET Web application.
- → Store application and session data using a variety of methods and Configure and deploy an ASP.NET Web application.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Explain ASP.net and .net framework • Discuss web servers used to execute ASP.net scripts	**Unit I: ASP.net Overview (4 Hrs)** 1.1. Asp.Net Introduction, How Asp.Net Works, Different Languages used in Asp.Net. 1.2. Common Language Runtime (CLR), .NET Framework, Features of ASP.net 1.3. Web Server, Web servers for ASP.net, Introduction of IIS and Visual Studio 1.4. Review of HTML, CSS and Java Script, ASP.net vs PHP
• Discuss syntax and semantics of C# programming language • Practice basic features like loops, selections, arrays, string etc in writing C# programs • Use object oriented features in writing C# programs • Demonstrate use of features like exception handling file handling in C#	**Unit II: C# Programming Basics (8 hr)** 2.1 C# Structural Elements: Looping and Conditional Constructs, Primitive types ,operators and expressions 2.1 C# Object Based Elements: Class, Object, Message, State, Constructor, Garbage Collector, Static and Instance Members 2.1 Object Composition: Arrays, Strings, Structures, Enumerations, Operator Overloading. 2.1 Object Oriented Elements: Interface, Inheritance, Polymorphism, Abstract Classes 2.1 Exception Handling: The try-catch construct, throw,

	finally 2.1 Input/Output: Console I/O, File I/O, Network I/O
• Discuss different types of control available in ASP.net • Demonstrate the use of labeling and input controls • Use image controls to create better user interfaces • Create forms by using different controls	**Unit III: ASP.net Standard Controls (8 hr)** 3.1. Basics of ASP.net Controls: HTML Server Controls, Web Server Controls, Validation Controls 3.2. Displaying Information: Label Controls, Literal Controls, Bulleted List 3.3. Input Control: Textbox controls, RadioButton and RadioButtonList Controls, CheckBox and CheckBoxList Controls, Button controls, LinkButton Control, ImageButton Control, Using Hyperlink Control, DropDownList, ListBox 3.4. Displaying Images: Image Control, Image Map Control, Using Panel Control, Using Hyperlink Control
• Discuss the use of validation controls • Use validation controls to validate forms • Create regular expressions to use them into Regular Expression Validator	**Unit IV: Validation and Rich Controls (8 hr)** 4.1. Validation Controls: Required Field Validator Control, Regular Expression Validator Control, Compare Field Validator Control, Range Validator Control, Validation Summary Control, Custom Validator Control 4.2. Rich Controls: Accepting File Uploads, Saving files to file system, Calendar Control, Displaying advertisements, Displaying Different Page view, Displaying a Tabbed Page View, Wizard Control
• Connect ASP.net programs to databases • Demonstrate the execution of SQL statements embedded in ASP.net programs • Display data retrieved from database by using various controls	**Unit V: Database Access and Display (8 Hrs)** 5.1. Database Access: Creating database Connections, Connecting to MSSQL Server and MS Access, Data Set & Data Table Features, Using inline SQL Statements, Using Stored Procedures, Executing select commands, SQL Transaction 5.2. Displaying Data: Using Grid View Control, Repeater Control, Data List Control, Details View Control, Form View Control
• Demonstrate the use of master pages in web page designing • Discuss concepts of page and state management • Exemplify the uses of navigation controls • Write programs to upload,	**Unit VI: Advanced ASP.net Features (9 Hrs)** 6.1. Designing Websites with master pages: Creating master pages, Creating default contents, Nesting master pages, Registering master pages in web configuration 6.2. Page & State Management, Overview of Events in Page 6.3. Using Navigation Controls: Understanding Site Maps, Using the Sitemap Path Control, Formatting

download files and send emails • Demonstrate the use of XML, web services and AJAX	the Sitemap Path Control, Using the Menu Control, Using Tree View Control 6.4. XML and Web Services and AJAX: Overview of XML, Creating /Reading/Deleting XML Files, Web Services, About Ajax, Setting up and implementing Ajax 6.5. FTP and Emails: Understanding FTP, Setting up FTP Server, Uploading and downloading FTP contents, Designing email panel, Sending Email, Sending auto emails, Deploying application on Web Server

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to write scripts ASP.net programs by using various concepts discussed in class. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- Bill Evjen, Scott Hanselman, Devin Rader, Professional ASP.NET 4 in C# and VB, Wrox, First Edition, 2010

References

- Imar Spaanjaars, Beginning ASP.NET 4.5 in C# and VB, Wrox, 2012,
- Matthew MacDonald, Beginning ASP.NET 4.5 in C#, Apress, 2012

Course Title: Database Administration **Credit: 3**
Course No: CSIT.415.2 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course introduces the database administration techniques in Oracle. Most of the DBA's tasks are covered. Topics covered include principles of DBA Roles, Oracle Database Architecture and storage management, Database backup, restoration and recovery, connectivity and user management for database security, Tuning of database and overall DB administration which could be useful for administrator in the future.

2. Objectives

Upon completion of this course students should:

- → Understand the basic role, task and responsibilities of Database Administrator.
- → Understand the Oracle database architecture and how its components work and interact with one another
- → Be able to install and configure an Oracle Database.
- → Be able to administer the Oracle Database, create and manage storage structures and Create and manage the users.
- → Be able to perform backup and recovery, tuning the oracle database for the better performance.
- → Be able to create database objects like tables, views, indexes etc. and able to write PL/SQL Procedures

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the different roles and responsibilities of DBA at different environment • Understand the Oracle database architecture and how its components work and interact with one another. • Understand the Oracle Automatic Storage Management • Understand the Oracle Client Application and its use • Use of oracle tools like SQL PLUS, OEM	**Unit I: Introduction (6 Hrs)** 1.1. Responsibilities and Role of Database Administrator 1.2. Oracle Database Architecture Overview 1.3. Process Architecture 1.4. Memory structures 1.5. Logical and physical storage structures 1.6. Oracle ASM 1.7. Oracle Database version 1.8. SQL*PLUS Overview 1.9. Oracle Enterprise Manager 1.10. iSQL*PLUS
• Install and configure an Oracle Database • Understand the startup and	**Unit II: Creating and Managing Oracle Database (4 Hrs)** 2.1. Create and Delete a Database 2.2. Password Management 2.3. Start and stop the Oracle database and components

shutdown options • Understand the basic database installation parameters and dynamic performance views	2.4. Modify database installation parameters 2.5. Describe the stages of database startup 2.6. Describe database shutdown options 2.7. View the alert log 2.8. Access dynamic performance views
• Creating tables, views, profiles, Sequences, Synonyms, Indexes • Use of PL/SQL Blocks, procedure, functions • Use of database links for accessing the remote database	**Unit III: Understanding Oracle Logical Database Structures(6 Hrs)** 3.1. Creating and managing tables, views, constraints 3.2. Use of DML operations on tables 3.3. Creating index 3.4. Creating users and schema 3.5. creating sequences, synonyms 3.6. Use of PL/SQL Blocks, functions, procedures, packages 3.7. External File Accesses, Database links and remote databases
• Create and manage storage structures • Understand how table data is stored and the storage structure of Oracle Database. • Creating Table spaces, data files and Space Management in Table spaces • Understand the importance of multiplexing • Understand the importance of database archiving • Understand the Concept of Oracle Managed Files	**Unit IV: Managing Database Storage Structures (6 Hrs)** 4.1. Storage Structures 4.2. Tablespace and Datafile management 4.3. Multiplexing Control files, Redo log files and Archive redo logs 4.4. Configure database in Archive log mode 4.5. Manage FRA(Flash Recovery Area) 4.6. Maintaining and monitoring redo log files, Archive logs 4.7. Oracle Managed Files (OMF)
• Create and administer user accounts • Understand importance of roles and apply it to users • Understand the concepts of system and object privileges • Understand the use of Virtual Private database concept on securing the database • Use of database auditing	**Unit V: Administering User Security (5 Hrs)** 5.1. Managing Database User Accounts 5.2. Predefined Administrative Accounts 5.3. Creating Roles and assigning Role 5.4. Predefined Roles 5.5. Implementing Profiles 5.6. managing privileges 5.7. Database Security and Auditing 5.8. Virtual Private Database
• Understand the Oracle Networking and database connectivity • Setting Up Networking Configuration Files • Managing the Oracle Listener • Understand the shared server and dedicated server environment	**Unit VI: Configuring the Oracle Network Environment(3 Hrs)** 6.1. How Oracle Networking works 6.2. create and configure the Listener 6.3. Enable Oracle Restart to monitor the listener 6.4. Use tnsping to test Oracle Net connectivity 6.5. Configure and editing the tnsnames.ora and listener.ora

	files using Oracle NET Manager 6.6. Identify when to use shared servers and when to use dedicated servers 6.7. The Oracle Client
• Perform basic backup and recovery of a database • Understand the concept of physical backup and logical backup • Understand cold backup and hot backup • Learn the recovery process in case of failure • Use of flashback technique to recover the database • Understanding the use of oracle data pump tool for export and import of database	**Unit VII: Backup and Recovery concept (6 Hrs)** 7.1. Backup Overview 7.2. Oracle Secure Backup 7.3. User-Managed Backup 7.4. Logical Backup, Physical Backup, Offline Backups, Online Backups 7.5. Data Pump Export and Import 7.6. SQL Loader 7.7. Types of Database Failure 7.8. Oracle Recovery Process 7.9. Understanding Instance Recovery 7.10. Flashback Techniques and Recovery 7.11. Database Corruption Detection
• Understand the RMAN environment and difference between RMAN and Traditional backup methods • Explain the RMAN backup and recovery concepts • Understand the power of RMAN	**Unit VIII: Recovery Manager (RMAN) (4 Hrs)** 8.1. RMAN Features and Configuring RMAN Backup Settings 8.2. RMAN vs. Traditional Backup Methods 8.3. Overview of RMAN Commands and Options 8.4. Backup Operations (Full Database Backups, tablespace, datafile,, control file and spfile backup, Archived Redo Logs, Incremental Backup) 8.5. Performing Recovery with RMAN
• Understand the concept of tuning • Learn the use of dynamic performance views to monitor the performance • Use of different tools like ADDM, SQL Tuning Advisor for the performance optimization • Understand the use of memory component for the best performance	**Unit IX: Performance Tuning (5 Hrs)** 9.1. Brief overview of Tuning methodology, general tuning concepts 9.2. Performance Monitoring 9.3. Managing Memory Components 9.4. Enabling Automatic Memory Management (AMM) 9.5. Automatic Shared Memory Advisor 9.6. Dynamic Performance Statistics 9.7. ADDM (Automatic Database Diagnostic Monitor) 9.8. SQL Tuning Advisor 9.9. Automatic Workload Repository (AWR)

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination		Assignments	20%		Practical Report copy	25%	
(Details are given in the separate table at the end)	60	Quizzes	10%	20	Viva	25%	20

		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should prepare lab sheet for most of the units in the syllabus. They should practice design database and implementation of database administration activities that demonstrates different concepts discussed is class. However, nature of lab work can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- Sam R. Alapati, Expert Oracle Database 11g Administration, Apress

References

- Bob Bryla, Kevin Loney, Oracle Database 11g DBA Handbook, Oracle Press
- Introduction to Database Administration, by O'reilly
- C.J. Date, Database Systems, Addison Wesley, 2000

Course Title: System Administration **Credit: 3**
Course No: CSIT.415.3 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

The course introduces the ideas and techniques underlying the principles and designs of system administration. The course concentrates on the popular Linux operating system, and covers topics ranging from initial installation of Linux to day-to-day administrative tasks such as management of user accounts and disk space, and even imparting the trouble-shooting skills future system administrators will need to cope with unexpected behavior. The course is featured with working with kernels as well as securing and monitoring the Linux system.

2. Objectives

The main objective of the course is to introduce concepts of System Administration. The general objectives are to,

- learn about system administration
- use different tools and techniques for system administration
- identify and access file system, storage and network management services
- learn about the system kernels, security essentials and system monitoring

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand basics of Linux environment • Understand different installations • Understand the startup services	**Unit I: Introduction (6 Hrs)** 1.1. Linux workstation installation, Linux server installation, Post-install system configuration, 1.2. Scripting installation of custom setups using kickstart, Linux boot process, 1.3. SysV init concepts and configuration, 1.4. Managing startup of system daemons, 1.5. Controlling startup of services in xinetd / inetd
• Understand components user management • Explore authentication approach • Use root account commands	**Unit II: User Management (4 Hrs)** 2.1. Creation, modification, and deletion of users and groups, 2.2. Creating group directories 2.3. Password aging under Linux, 2.4. The Linux login process and login authentication,

	2.5. Regulating access to the root account via su and sudo
• Understand the file system • Create files, set file attributes • Understand using ACL over files • Understand disk management and backups	**Unit III: File System and Storage (4 Hrs)** 3.1. Path Names: Absolute and Relative Paths, 3.2. File Types, File Attributes, Access Control Lists 3.3. Creation, modification, and deletion of partitions and file systems, 3.4. Management of RAID devices under Linux, 3.5. Disk space regulation using quotas, 3.6. Backing up and restoring Linux filesystems,
• Understand job scheduling and process management • Understand and analyze system logs • Explore the fundamental ideas of network configurations • Understand network issues	**Unit IV: Process and Network Service Management (12 Hrs)** 4.1. Scheduling jobs using cron, anacron, and at, 4.2. Management of processes running on the system, Usage of process accounting and implementation of process limits, 4.3. Configuration and analysis of system logs, 4.4. System performance analysis, 4.5. Configuring network interfaces, Setup of DNS and DHCP clients, 4.6. Diagnosing network setup issues, Configuring NFS clients 4.7. Basic installation and configuration of common network services: telnet and SSH servers file sharing via NFS, SMB, HTTP, FTP, and TFTP e-mail services via SMTP, POP, and IMAP ISC DHCP services
• Understand the basic concepts of kernels • Understand Linux Troubleshooting	**Unit V: Working with Kernels (9 Hrs)** 5.1. Configuration of optimized Linux kernels, Compiling and installing custom Linux kernels, 5.2. Using third-party patches with Linux kernels, Updating userland to support new kernels, 5.3. Concepts for troubleshooting Linux, Analysis of system logs to identify problems, 5.4. Use of systems-level debugging aids in troubleshooting, Usage of the Linux rescue environment
• Understand security in Linux • Understand configuring the file security, authentication and firewalls	**Unit VI: Security (5 Hrs)** 6.1. Securing freshly installed Linux systems, 6.2. Protecting files and the file system, 6.3. User authentication, 6.4. Keeping Linux systems up-to-date, Configuration of Linux firewalls
• Explore system monitoring and	**Unit VII: Managing System Resources (5 Hrs)**

management of CPU, Memory, Disk and Network	7.1. Monitoring and Controlling Processes 7.2. Managing CPU Resources 7.3. Managing Memory 7.4. Monitoring Disk Space Usages 7.5. Managing Network Performances

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should have practical session for configuring and using above mentioned topics in Linux However, nature of Linux Platform can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. **Æleen Frisch**, *Essential System Administration*, O'Reilly

References

2. Fedora System Administrator's Guide
3. Red Hat Enterprise Linux System Administrator's Guide
4. **Evi Nemeth, Garth Snyder, Trent R. Hein**, *Linux Administration Handbook*, Addison-Wesley Professional
5. **Evi Nemeth, Garth Snyder, Trent R. Hein , Ben Whaley** *Unix and Linux System Administration Handbook*, Prentice Halls
6. **Ronald McCarty,** *Ubuntu Linux System Administration*

Course Title: Digital Image Processing **Credit: 3**
Course No: CSIT.415.4 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

The course will cover techniques and tools for digital image processing, and finally also introduce image analysis techniques in the form of image segmentation. The course is primarily meant to develop on-hand experience in applying these tools to process these images. The students would be encouraged to develop the image processing tools from scratch, rather than using any image processing library functions.

2. Objectives

Upon completion of this course students should be able to:

- → Develop an overview of the field of image processing.
- → Understand the fundamental algorithms and how to implement them.
- → Prepare to read the current image processing research literature.
- → Gain experience in applying image processing algorithms to real problems.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Discuss basics of image lightning and bright model • Describe geometry, projection, filtering, sampling and quantization	**Unit I: Introduction (4 hr)** 1.1. Light, Brightness adaption and discrimination, Pixels, coordinate conventions, Imaging 1.2. Geometry, Perspective Projection, Spatial Domain Filtering, sampling and quantization.
• Demonstrate the use or different filters • Exemplify intensity transformation and its application • Apply FFT in processing digital images • Discuss concept of time domain and frequency domain	**Unit II: Image Filtering (10 hr)** 2.1. Intensity transformations, contrast stretching, histogram equalization, Correlation and convolution Smoothing filters, sharpening filters, gradient and Laplacian 2.2. Hotelling Transform, Fourier Transforms and properties, FFT (Decimation in Frequency and Decimation in Time Techniques), Convolution, Correlation, 2-D sampling, Discrete Cosine Transform, Frequency domain filtering.
• Discuss need and importance of image restoration • Demonstrate different restoration	**Unit III: Image Restoration (6 Hrs)** 3.1. Basic Framework, Interactive Restoration, Image deformation and geometric transformations, image morphing, Restoration techniques

techniques with example • Explain technique of noise characterization and apply filters to remove noise • Exemplify estimation of degradation function	3.2. Noise characterization, Noise restoration filters, Adaptive filters, Linear, Position invariant degradations, Estimation of Degradation functions, Restoration from projections.
• Understand redundancies and its use in image compression • Discuss Shannon's theorem and its implication • Exemplify different types of coding techniques • Demonstrate the use of Thresholding • Discuss the concepts of refinement, transforms, and encoding	**Unit IV: Image Compression (13 Hrs)** 4.1. Encoder-Decoder model, Types of redundancies, Lossy and Lossless compression, Entropy of an information source, Shannon's 1st Theorem 4.2. Huffman Coding, Arithmetic Coding, Golomb Coding, LZW coding, Transform Coding 4.3. Sub-image size selection, blocking artifacts, DCT implementation using FFT 4.4. Run length coding, FAX compression (CCITT Group-3 and Group-4), Symbol-based coding, JBIG-2, Bit-plane encoding, Bit-allocation, Zonal Coding, Threshold Coding, JPEG, Lossless predictive coding, Lossy predictive coding, Motion Compensation 4.5. Expansion of functions, Multi-resolution analysis, Scaling functions, MRA refinement equation, Wavelet series expansion, Discrete Wavelet Transform (DWT), Continuous Wavelet Transform, Fast Wavelet Transform, 2-D wavelet Transform, JPEG-2000 encoding, Digital Image Watermarking
• Understand morphological features of images • Demonstrate boundary detection and holes filing techniques • Explain image processing by using different morphological features	**Unit V: Image Processing (6 Hrs)** 5.1. Basics, SE, Erosion, Dilation, Opening, Closing, Hit-or-Miss Transform, Boundary Detection, Hole filling 5.2. Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.
• Explain need and importance of image segmentation • Exemplify identification of boundaries and edges • Demonstrate image segmentation with suitable example	**Unit VI: Image Segmentation (6 Hrs)** 6.1. Boundary detection based techniques, Point, line detection, Edge detection, Edge linking, local processing, regional processing, Hough transform 6.2. Thresholding, Iterative Thresholding, Otsu's method, Moving averages, Multivariable Thresholding, 6.3. Region based segmentation, Watershed algorithm, Use of motion in segmentation

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should implement different algorithms discussed in class by using programming language of interest and prepare to make a lab sheet. At least 15 algorithms needs to be implemented.

Prescribed Text

- Digital Image Processing, 3rd Edition, by Rafael C Gonzalez and Richard E Woods. Publisher: Pearson Education.

References

- N. Efford, Digital Image Processing, Addison Wesley 2000
- M Sonka, V Hlavac and R Boyle, Image Processing, Analysis and Machine Vision, PWS 1999
- W K Pratt, Digital Image Processing, John Wiley and Sons, 1991

Course Title: Data Warehousing and Data Mining **Credit: 3**
Course No: CSIT.416.1 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

Data warehousing and data mining are two major areas of exploration for knowledge discovery in databases. As more data is collected by businesses and scientific institutions alike, knowledge exploration techniques are needed to gain useful business intelligence. Data mining is for relatively unstructured data for which more sophisticated techniques are needed. The course aims to cover powerful data mining techniques including clustering, association rules, and classification.

2. Objectives

Upon completion of the course, the student should:

→ Be able to define and critically analyze data warehouse and mining approaches
→ Understand the technology of data warehousing.
→ Understand data mining concepts and techniques.
→ Be able to develop applications of higher order database systems.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Discuss data mining and KDD and their relationships • Describe data warehouse concepts and needs • Explain functionalities and applications of data mining • Demonstrate data pre-processing steps	**Unit I: Introduction (6 hr)** 1.1. Data Mining Definition, KDD vs.Data Mining, KDD Process, Architecture of Data Mining Systems 1.2. Data Warehouse, Framework of Data Warehouse, Data Mining Functionalities, Classification of Data Mining Systems, Interestingness of Patterns 1.3. Integrating Data Mining with Data Warehouses and Databases, Data Mining Task Primitives, Data Mining Issues and Applications 1.4. Importance of Data Pre-processing, Data Summarization, Data Cleaning, Data Integration and Transformation, Data Reduction, Data Discretization and Concept Hierarchy Generation
• Understand differences between OLAP and OLTP • Describe multidimensional data	**Unit II: Data Warehouse and OLAP (10 hr)** 2.1. Overview of Data Warehouse, Features of Data Warehouse, Operational Database Systems vs Data Warehouse, Need of Separate Data Warehouse 2.2. Multidimensional Data Model and Data Cube,

and their representation using cube • Demonstrate the different schema used for data warehouse representation • Apply DMQL to create data warehouse schema • Demonstrate different OLAP operations • Understand data cube computation and materialization	Schema for Multidimensional Data-Star Schema, Snowflake Schema, Fact Constellation Schema 2.3. DMQL introduction and Syntax, Defining Multidimensional schema by using DMQL, Measures and Its Categories, Using DMQL for finding Measures 2.4. Concept Hierarchies, OLAP Operations- Roll-up, Drill-down, Slicing, Dicing, Pivoting 2.5. Data Warehouse Architecture, Data Warehouse Models, Data Warehouse Backend Tools and Utilities, Metadata, Types of OLAP Servers 2.6. Data Cube Computation, Data Cube Computation , Finding number of Cuboids, Data Cube Materialization, OLAP Query Processing, Data Warehouse Usage 2.7. Cube Materialization- Full Cube, Iceberg Cube, Closed Cube, Shell Cube, Optimization of Cube Computation
• Understand need and importance of association mining • Demonstrate the use of Apriori and FP-Growth algorithms in finding frequent item sets • Use above mentioned algorithms to generate association rules	**Unit III: Association Mining (8 Hrs)** 3.1. Frequent Item Sets, Closed Item Sets, Association Rules, Support & Confidence 3.2. Finding Frequent Item Sets by using Apriori Algorithm, Mining Association Rules from Frequent Items, Improving Efficiency of Apriori Algorithm 3.3. Finding Frequent Item Sets by using FP-Growth Algorithm, Generating Association Rules
• Understand need and importance of classification and prediction • Apply classification algorithms to find class labels • Apply prediction algorithms to make predictions	**Unit IV: Classification and Prediction (8 Hrs)** 4.1. Defining Classification and Prediction, Comparison of Classification and Prediction 4.2. Classification by Decision Trees, Naive Bays Classification, Rule Based Classification, Support Vector Machines 4.3. Prediction-Linear and Non-linear Regression, Accuracy and Error Measures, Evaluating Accuracy of Classifiers and Predictors, Ensemble Methods
• Explain different measures of distances • Understand difference between classification and clustering • Categorize different clustering	**Unit V: Cluster Analysis (8 Hrs)** 5.1. Defining Cluster Analysis, Distance Measures, Types of Data in Cluster Analysis, Categorization of Clustering 5.2. Partition Based Clustering: K-Means Algorithm, K-Medoid Algorithm 5.3. Hierarchical Clustering: Agglomerative Clustering, Divisive Clustering

algorithms • Apply clustering algorithms to divide data into number of groups	5.4. Density Based Methods: DBSCAN Clustering, OPTICS Clustering 5.5. Clustering High Dimensional Data (CLIQUE), Outlier Analysis (Statistical Distribution-Based Outlier Detection
• Explain use of data mining techniques in different areas	**Unit VI: Advanced Data Mining Concepts (5 Hrs)** 6.1. Mining Data Streams, Graph Mining, Social Network Analysis, Multi-relational Data Mining 6.2. Text Mining, Web Mining, Object Mining, Spatial Data Mining, Multimedia Data Mining

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should design data warehouse by using SQL Server or any other tool and then practice different OLAP operations and DMQL queries on it. Besides this students need to implement different association mining, classification and clustering algorithms.

Prescribed Text

- Data Mining Concepts and Techniques, Morgan Kaufmann J. Han, M. Kamber Second Edition

References

- Data Warehousing in the Real Worlds, Sam Anahory and Dennis Murray, Pearson Edition Asia.
- Data Mining Techniques – Arun K. Pajari, University Press.

Course Title: Geographical Information System **Credit: 3**
Course No: CSIT.416.2 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course is designed to develop acquaintance with fundamental concepts of geographical information system. The course starts with the basic concepts and also includes geographic information and spatial data types, data management, referencing and positioning, data entry and preparation, data analysis, visualization, and opens GIS.

2. Objectives

On completion of this course, students will be able to develop knowledge in GIS and different related concepts to develop and use GIS.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Know about history, definition, scope and different application areas of GIS • Understand about GISystems, GIScience and applications • Gain knowledge about spatial data and geoinformation • Know about models of GIS, Maps, GIS databases, Spatial databases and Spatial analysis	**Unit I: Introduction [4 Hrs.]** 1.1. History, Definition, Scope, and Applications 1.2. GISystems, GIScience, and GIS applications 1.3. Spatial Data and Geoinformation 1.4. Models and Modeling; Maps; Databases; Spatial Databases and Spatial Analysis
• Understand about models and real world representations • Know about geographic phenomena • Understand computer representations of GIS • Understand to organize and manage spatial data • Know about temporal dimension	**Unit II: Geographic Information and Spatial Data Types [6 Hrs.]** 2.1. Models and Representations of the Real World 2.2. Geographic Phenomena 2.3. Computer Representations of Geographic Information 2.4. Organizing and Managing Spatial Data 2.5. the Temporal Dimension
• Identify different hardware and software trends for GIS • Know about GIS for data management and processing data • Know different stages of spatial data	**Unit III: Data Management and Processing Systems [7 Hrs.]** 3.1. Hardware and Software Trends 3.2. Geographic Information Systems 3.3. Stages of Spatial Data Handling 3.4. Database Management Systems

handling • Understand about database management systems for GIS • Study about GIS and spatial data	3.5. GIS and Spatial Database
• Develop knowledge on spatial referencing • Develop knowledge on satellite based positioning	**Unit IV: Spatial Referencing and Positioning [6 Hrs.]** 4.1. Spatial Referencing 4.2. Satellite-based Positioning
• Know about spatial data input • Understand about data quality • Know about data preparation • Know about point data transformation	**Unit V: Data Entry and Preparation [6 Hrs.]** 5.1. Spatial Data Input 5.2. Data Quality 5.3. Data Preparation 5.4. Point Data Transformation
• Know about classification of analytical GIS capabilities • Understand about retrieval, classification and measurement in spatial data analysis • Know about overlay functions • Know about neighborhood functions	**Unit VI: Spatial Data Analysis [6 Hrs.]** 6.1. Classification of Analytical GIS Capabilities 6.2. Retrieval, Classification and Measurement 6.3. Overlay Functions 6.4. Neighborhood Functions
• Know to visualize GIS and maps • Know about the visualization process • Develop knowledge on visualization strategies	**Unit VII: Data Visualization [7 Hrs.]** 7.1. GIS and Maps 7.2. the Visualization Process 7.3. Visualization Strategies
• Know about open concepts in GIS • Know to use open source software for data analysis	**Unit VIII: Open GIS [3 Hrs.]** 8.1. Introduction of Open Concept in GIS 8.2. Open Source Software for Spatial Data Analysis

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Laboratory Work

Students should be able to use any GIS software to store, retrieve, manage, display, and analyze geographic and spatial data.

Prescribed Text:

1. Principles of Geographic Information Systems (GIS): an Introductory Textbook, O. Huisman, and R.A. De By, ITC Educational Textbook Series (2009)

References:

1. Principles of Geographical Information Systems, Third Edition, Peter A. Burrough, Rachael A. McDonnell, and Christopher D. Lloyd
2. An Introduction to Geographical Information Systems, Ian Heywood, Sarah Cornelius, and Steve Carver, Pearson

Course Title: Management Information Systems **Credit: 3**
Course No: CSIT.416.3 **Number of period per week: 3+3**
Nature of the Course: Theory + Case Study **Total hours: 45+45**
Year: Fourth Semester: Seventh
Level: B.Sc. CSIT

1. Course Introduction

This course introduces information systems that are used for organizational decision making & problem solving. It discusses the significant managerial aspects of treating information as an organizational resource and its increasing impact on today's organization. Besides this, it will include topic of ethical, social and political issues of IS, securing information systems, enhancing decision making, and project management.

2. Objectives

By the end of this course, it is expected the student will be able to

- Highlight information systems and their effectiveness in organization success
- Understand types of MIS applications in organisations
- To provide concepts of new ethical issues, security threats, information system development process
- Analyze the business issues, processes, and techniques associated with organizational information systems;
- Select and design MIS systems appropriate to meet management requirements.
- Critically evaluate MIS contributions to the strategic management of organisations
- Identify project management tools, techniques and risks

3. Specific Objectives and Contents

Specific Objectives	**Contents**
- Differentiate between data, information, information systems, and information technology - Understand trends in MIS and Challenges & opportunities due to globalization - Discuss how MIS can transform businesses	**Unit I: Information Systems in Global Business (6)** 1.1. Role of Information Systems in Business, How Information Systems are Transforming Business 1.2. New in MIS, Globalization Challenges and Opportunities, Emerging Digital Firm. 1.3. Data vs Information, Information System, Information technology, Dimensions of IS, Contemporary approaches to IS 1.4. MIS Hands-on Project: Sales Trend Analysis by using Database or Excel
- Understand role of information	**Unit II: Business and Information Systems (9)** 2.1. Business Processes, Use of Information Technology to

systems to enhance business process - Explore information systems used in different organizational levels & functional areas - Conceptualize role of enterprise applications and collaboration systems in business firms	Enhance Business Process 2.2. Systems for Different Management Groups: Transaction Processing Systems, Management Information Systems, Decision Support Systems, Executive Support Systems 2.3. Systems for Different Functional Areas: Finance and Accounting Systems, Sales and Marketing Systems, HR Systems, Manufacturing and Production Systems 2.4. Systems for Linking Enterprise: Enterprise Systems, Supply Chain Management Systems, Customer Relationship Systems, Knowledge Management Systems 2.5. MIS Hands-on Project: Analyzing Opportunities by using Excel, Business Case
- Understand Organization and Impact of IS in Organizations - Discuss competitive advantages of using information systems. - Explain Business value chain and impact of internets in competitive advantages	**Unit III: Information Systems & Organizational Strategy(6)** 3.1. Definition of Organization, Features of Organization, Impact of IS on Organization and Business Firms 3.2. Information Systems and Competitive Advantages, Porters Competitive Force Model, Using Information System to Deal with Competitive Forces, Impact of Internet on Competitive Advantages. 3.3. Business Value Chain Model, The Value Web, Synergies, Core Competencies and Network Based Strategies, 3.4. Business Case
- Relate ethical issues with society and politics - Understand nee types of ethical issues raised due to growth of information systems & internet - Describe & exemplify moral dimensions of information age - Identify some ethical dilemmas created due to information systems	**Unit IV: Ethical & Social Issues Related to IS (6)** 4.1. Understanding Social and Ethical Issues: Ethics, Relationship between Ethical, Social and Political Issues, Moral Dimensions of Information Age, Technology trends that raises Ethical Issues 4.2. Ethics in Information Society: Responsibility, Accountability & Liability, Ethical Analysis, Some Real World Ethical Dilemmas 4.3. MIS Hands-on Project: Analyzing Privacy and other Ethical Issues by Analyzing Data, Business Case
- Describe the reasons behind vulnerabilities of information systems - Understand business value of security & control - Identify & explain different tools used for protecting organizational information	**Unit V: Securing Information Systems (6)** 5.1. Why Systems are Vulnerable, Internet Vulnerabilities, Wireless Security Challenges, Malicious Software, Hackers and Computer Crime, Software Vulnerabilities 5.2. Business value of Security and Control, Legal and Regulatory Requirements for Electronic Record Management, Electronic Evidence and Computer Forensic. 5.3. Information System Control, Risk assessment, Security Policy, Disaster Recovery and Business Continuity Planning, Role of Auditing 5.4. Access Control, Firewalls, Intrusion Detection Systems, Antivirus Software, Securing wireless Networks, Encryption and PKI, Ensuring System Availability

<table>
<tr><td></td><td>5.5. MIS Hands-on Project: Analysing Security Vulnerabilities by using Spreadsheets and Web Tools, Business Case</td></tr>
<tr><td>- Understand different types of decisions and decision making process
- Demonstrate the role of DSS, MIS and ESS is Decision making
- Discuss importance of GDSS and ESS in firms</td><td>Unit VI: Enhancing Decision Making (6)
6.1. Decision Making and Information Systems: Business Value of Improved Decision Making, Types of Decisions, Decision Making Process, Managers and Decision Making
6.2. Systems for Decision Support: Management Information Systems, Decision Support Systems, Executive Support Systems, Web Based Customer Decision Support Systems, Group Decision Support Systems
6.3. ESS and Balanced Scoreboard Framework, Role of ESS in the Firm, Business value of ESS
6.4. MIS Hands-on Project: Improving Decision Making by using Pivot Tables and Analyzing Sales Data, Business Case</td></tr>
<tr><td>- Understand value of project management and its objectives
- Identify different factors to be considered and analyzed in selecting projects
- Demonstrate and analyze value of in formations systems for business
- Explain different project management risks and their management</td><td>Unit VII: Managing Projects (6)
7.1. Importance of Project management: Runway Projects, System Failures, Project Management Objectives
7.2. Selecting projects: Management Structure for IS Projects, Linking Projects to Business Plan, Critical Success Factors, Portfolio Analysis, Scoring Models
7.3. Establishing Business Value of IS: IS Cost and Benefits, Real Options Pricing Models, Limitations of Financial Models
7.4. Managing project Risks: Dimensions Project Risks, Change Management and Concept of Implementation, Controlling Risk Factors, Project Management Tools
7.5. Business case</td></tr>
</table>

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
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<tr><td></td><td>Internal</td><td>50%</td><td></td><td></td></tr>
</table>

		Exams					
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
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2. **External Practical Evaluation:**
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Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

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Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

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Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Field Visit/Case Study

First, each student will join a group. The student or student group (at most 4 students) needs to finish a written case study report (2000 – 3000 words) on the effectiveness and limitations of some existing information system. The Field Visit/Case study report must reflect your understanding on basic concepts taught in the course and capability of using them to analyze practical cases. The case study should be outlined tentatively as follows:

a) Abstract
b) Introduction and purpose of Information System
c) Categorization of the IS
d) Infrastructures required for the IS
   - Hardware Infrastructure
   - Software Infrastructure
   - Network Infrastructure
e) Data Sources and Data Analysis required for the IS
f) Effectiveness of the IS and its Assistance to Management
g) Conclusion, Limitations of the IS and Recommendations for Enhancements

Prescribed Text

- *Laudon, K. C. & Laudon, J. P.,* Management Information Systems, 12th Edition Pearson, 2013
- *James A. O'Brien*, *George Marakas*, Management Information Systems, 7th Edition McGraw-Hill Companies, 2006
- *R. Kelly Rainer*, *Efraim Turban*, *Richard E. Potter*, Introduction to Information Systems: Supporting and Transforming Business, Wiley, 1st Edition, 2006

Course Title: Neural Network **Credit: 3**
Course : CSIT.416.4 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Seventh
Level: B. Sc. CSIT

1. Course Introduction

This course introduces the fundamental concepts of neural networks and essentials of artificial neural networks with single layer and Multilayer Networks. The course covers the basics and applications of neural networks, including design of neural network, learning processes, perceptron model, radial basis function and neuro-fuzzy systems.

2. Objectives

The main objective of the course is to introduce concepts of artificial neural networks. The general objectives are to:

- introduce the neural networks as means for computational learning
- present the basic neural network architectures
- give design methodologies for artificial neural networks
- introduce learning theories used in neural networks
- demonstrate neural network applications on real-world tasks.
- explore use of fuzzy system in neural networks

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand Biological Neural Network • Understand analogy between biological neural network and artificial network • Explore real world applications of neural networks	**Unit I: Introduction (6 Hrs)** 1.1. Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological Neuron Model, Artificial Neuron Models, Artificial Network Networks (ANN) 1.2. History of neural network research, characteristics of neural networks, Applications of ANN
• Understand mathematical foundations of neural network • Explore different neuron models • Understand different neural network architectures	**Unit II: Basics of Artificial Neural Networks (8 Hrs)** 2.1. Artificial Neuron Model and its Mathematical model 2.2. Activation Function, Types of Neuron Activation Function: Linear, Threshold, Sigmoid, Tangent 2.3. Models of neuron Mc Culloch –Pitts model, Perceptron, Adaline model, Madaline Model

	2.4. ANN Architectures: Single-layer, Multilayer Feed Forward, Recurrent 2.5. Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic)
• Understand the learning strategies • Explore different learning approaches	**Unit III: Learning Process (7 Hrs)** 3.1.Learning, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application 3.2.Error-Correction Learning, Memory-Based Learning, Hebbian Learning, Competitive Learning, Boltzman Learning
• Understand perceptron model • Explore theories and algorithms for perceptron networks • Determine applications of perceptrons	**Unit IV: Single Layer Perceptrons (8 Hrs)** 4.1.Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks 4.2.Least Mean Square Algorithm 4.3.Perceptron Convergence theorem, Limitations of the Perceptron Model, Applications
• Understand feed forward and feedback networks • Construct multilayer neural networks • Explore the Hopfield network • Understand and analyze delta rule and back propagation algorithm with its use	**Unit V: Single and Multilayer Feed forward Neural Networks (8 Hrs)** 5.1.Basic Concepts of single layered networks, Hopfield Networks 5.2.Multilayer Feed Forward Networks, Feedback Networks, 5.3.Discrete Hopfield Network 5.4.Gradient Descent, Delta Rule 5.5.Derivation of Back-propagation (BP) Training, Summary of Back-propagation Algorithm, Selection of tuning parameters in Back-propagation
• Understand Radial function networks • Understand regularization theory • Construct Radial Basis Function Networks	**Unit VI: Radial Basis Function Networks (5 Hrs)** 6.1. Pattern separability and Interpolation 6.2. Regularization Theory 6.3. Regularization and Radial Basis Function (RBF) Networks 6.4. RBF network design and training 6.5. Approximation properties of RBF
• Understand basics of fuzzy systems and fuzzy neural Networks	**Unit VII: Fuzzy Neural Networks (3 Hrs)** 7.1. Neuro-fuzzy systems 7.2. Background of fuzzy sets and logic, Design of fuzzy systems 7.3. Design of fuzzy neural networks, applications of neuro-fuzzy systems

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
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<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
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Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

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Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should have practical session for constructing artificial neural networks. The students should simulate different programs constructing neural networks for solving real world problems. The environments can be decided by the instructor, however it is highly recommended to use MATLAB, Java. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. **S. Haykin**, *Neural Networks – A Comprehensive Foundation*, Prentice Hall

References

1. **C. M. Bishop**, *Neural Networks* for *Pattern Recognition*, Clarendon Press Oxford
2. **B.Yegnanarayana**, *Artificial Neural Networks*, Prentice Hall of India
3. **Satish Kumar**, *Neural Networks – A Classroom Approach*, Tata McGraw-Hill
4. **Robert J. Schalkoff**, *Artificial Neural Networks*, McGraw-Hill International Editions
5. **Jeff Heaton ,** *Introduction to Neural Networks for Java*, Heaton Research
6. **S N Sivanandam, S. Sumathi**, *Introduction to Neural Networks Using MATLAB* , Tata McGraw-Hill

FAR WESTERN UNIVERSITY

Faculty of Science & Technology

Bachelor of Science in Computer Science & Information Technology (B.Sc. CSIT)

Eighth Semester

Syllabus

2074

Mahendranagar, Kanchanpur

Course Title: Parallel Computing **Credit: 3**
Course No: CSIT.421 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

In a parallel computation, multiple processors work together to solve a given problem. While parallel machines provide enormous raw computational power, it is often not easy to make effective use of all this power. This course will describe different techniques used to solve the problems, in order to develop efficient parallel algorithms for a variety of problems. We will also pay much attention to practical aspects of implementing parallel code that actually yields good performance on real parallel machines.

2. Objectives

At the end of this course, you should be able to accomplish the objectives given below.

- Describe different parallel architectures; inter-connect networks, programming models, and algorithms for common operations such as matrix-vector multiplication.
- Given a problem, develop an efficient parallel algorithm to solve it and analyze its time complexity as a function of the problem size and number of processors.
- Given a parallel algorithm, implement it using MPI, OpenMP, pthreads, or a combination of MPI and OpenMP.
- Given a parallel code, analyze its performance, determine computational bottlenecks, and optimize the performance of the code.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• To understand basics of parallel programming. • To explain Flynn's classification and parallel algorithm cdesign model • To design elementary parallel algorithms.	**Unit I: Parallel Programming (5)** 1.1. Introduction to parallel programming, data parallelism, functional parallelism, pipelining 1.2. Flynn's taxonomy, parallel algorithm design – task/channel model , Foster's design methodology 1.3. case studies: boundary value problem, finding the, maximum – Speedup and efficiency,

	Amdahl's law, Gustafson Barsis's Law, Karp-Flatt Metric, Isoefficiency metric
• To explain message passing programming model. • To understand MPI interface and use common methods provided by it • To handle timing issues in MPI programs. • To write simple programs using MPI.	**Unit II: Message Passing Programming (10)** 2.1. The message-passing model, the message-passing interface, MPI standard, basic concepts of MPI: MPI_Init, MPI_Comm_size, MPI_Comm_rank, MPI_Send, MPI_Recv, MPI_Finalize, 2.2. Timing the MPI programs: MPI_Wtime, MPI_Wtick, collective, communication: MPI_Reduce, MPI_Barrier, MPI_Bcast, MPI_Gather, MPI_Scatter 2.3. case studies: the sieve of Eratosthenes, Floyd's algorithm, Matrix-vector multiplication
• To understand shared memory model of parallel programming and OpenMP standard. • To explain loops, critical section, function, etc in parallel programming • To write simple programs by using shared memory paradigm.	**Unit III: Shared Memory Programming (10)** 3.1. Shared-memory model, OpenMP standard, parallel for loops, parallel for pragma, private variables, critical sections 3.2. Reductions, parallel loop optimizations, general, data parallelism, functional parallelism 3.3. Case studies: the sieve of Eratosthenes, Floyd's algorithm, matrix-vector multiplication, distributed shared-memory programming, DSM primitives
• To understand basic principles of parallel algorithms • To understand principles of Monte Carlo method in algorithm design • To design parallel algorithms in specified topics.	**Unit IV: Parallel Algorithms I (10)** 4.1. Monte Carlo methods, parallel random number generators, random number distributions 4.2. Case studies: Matrix multiplication, row-wise block-stripped algorithm, Cannon's algorithm, solving linear systems, back substitution, Gaussian elimination, iterative methods, conjugate gradient method
• To design parallel algorithm for sorting data • To design searching and FFT parallel algorithms	**Unit V: Parallel Algorithms II (10)** 5.1. Sorting algorithms: quicksort, parallel quicksort, hyper quicksort, sorting by regular sampling 5.2. Fast fourier transform, combinatorial search, divide and conquer, parallel backtrack search, parallel branch and bound, parallel alpha-beta search.

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

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Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

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Laboratory Work

Students should practice small scale parallel programs, message passing programs, and shared memory programs. Besides this student should implement parallel algorithms discussed in the course.

Prescribed Text

- Michael J. Quinn, “Parallel Programming in C with MPI and OpenMP”, Tata McGraw-Hill Publishing Company Ltd., 2003.

References

- B. Wilkinson and M. Allen, “Parallel Programming – Techniques and applications using networked workstations and parallel computers”, Second Edition, Pearson Education, 2005.
- 2. M. J. Quinn, “Parallel Computing – Theory and Practice”, Second Edition, Tata McGraw-Hill Publishing Company Ltd., 2002.

Course Title: Internship **Credit: 4**
Course No: CSIT.422
Nature of the Course: Project
Year: Fourth, Semester: Eight
Level: B. Sc. CSIT

1. Course Introduction

Practical experience in a formal work environment is a valuable aspect of a Computer Science or Computer Systems curriculum. The intent of the CS Internship program at Far Western University is to provide students with an opportunity to earn academic credit while gaining work experience at a business, government, or other institutional computer center. Students are employed on a full-time basis typically for a three to five month period. The hours, wages, and benefits associated with the job are determined by the employer prior to hiring the intern. Although tasks assigned to the student usually correspond to the student's educational background, new and exciting challenges may be encountered. Additional formal or informal training may be provided by the employer either on-site or off-site. Computer Science-related tasks, such as, network design and installation, software programming, testing, documentation, and user training would be considered as appropriate job duties for an intern. The student must be working under a mentor or expert that can provide training and guidance to the student.

2. Objectives

Students will be able to do the following:

- → Apply what they have learned in the classroom.
- → Learn concepts in the computing field that are difficult to teach in the classroom, such as user interaction, testing, etc.
- → Experience the business and industrial environment in which a computer professional must learn to function.
- → Grow professionally, emotionally, socially and intellectually.
- → Sharpen their focus on career goals and course selection to reach those goals.
- → Develop writing skills that are necessary in the professional world of computing.

3. Tentative Internship Report Format

The final report documents the results of the project and should be submitted within 1 week after finishing final examination. Students should use Times New Roman Font and Line spacing 1.5 while formatting their project report. Tentative project report format should be as per following outline:

Front Part

- Cover Page
- Students Declaration
- Supervisors Recommendation
- Letter of Approval
- Acknowledgement
- Abstract
- Table of Contents
- List of Figures
- List of Tables
- List of Abbreviations

Body Part

a. **Organization Overview**
   Explain which company you interned with, where the facility was located, what the business of the company is, organization chart etc.
b. **Responsibilities Handled**
   Explain the area you worked in and the main emphasis of your internship, Duration of Internship.
c. **Discussion of Projects**
   Discuss in detail the areas of responsibility you had to deal with during your internship. Although this is an overview of your internship experience, include technical details about the projects you worked on. How many lines of code? What technologies, languages, tools, systems were used? Discuss the significance of your efforts relative to the company's operations.
d. **Summary and Conclusions**
   Summarize your work and learning experience. Explain how the internship either reinforced or changed your career goals. Discuss any new perspectives you obtained because of this experience. Elaborate on the benefits you realized from the internship. Did you face any challenges or difficulties in your assignments? How did you solve these issues? In what ways did you apply what you have learned in your graduate courses to the internship?

End Part

- References
- Bibliography
- Appendices

Note-Referencing and Citation should follow IEEE style.

4. Evaluation System

Internal Evaluation:-40% (by mentor and supervisor)

- **Proposal Defence**:-10%

Needs to be evaluated in following basis

- Organization Selection
- Relevance of students intern area with CS
- Presentation
- Viva

- **Mid Term Evaluation**:-30%

  Students are expected to gained some experience and worked in projects. Evaluation should be done following basis

  - Efforts Made by Students
  - Report
  - Presentation
  - Viva

External Evaluation: - 60% (Supervisor/Mentor:-30%, External Examiner:-30%)

External evaluation should be done in the presence of external examiner and evaluation should be done following basis

- Internship Report
- Depth of Learning and Experience Gained
- Presentation
- Viva

Course Title: Enterprise Java Programming **Credit: 3**
Course No: CSIT.423.1 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

This course is designed to give students a solid knowledge in the architecture and concepts of Java EE Programming, Java web & business application development. To understand the examples, students need a good knowledge of the Java programming language, SQL, and relational database concepts.

2. Objectives

This course will allow the students to understand various Java EE concepts including:

→ Learning Java EE Architecture
→ Java web application development
→ Learning Web Core Technologies: Servlets and JSP
→ Business Component Development
→ Exposure to lots and lots of working examples/applications

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand Java EE multi-tired architecture • Discuss concept of J2EE containers • Discuss provides of different applications and tools used in J2EE	**Unit I Java EE Overview (5 hr)** 1.1 Distributed Multi-tiered Applications: J2EE Components, J2EE Clients, Web Components, Business Components, Enterprise Information System Tier 1.2 J2EE Containers: Container Services, Container Types, Packaging 1.3 Development Roles: J2EE Product Provider, Tool Provider, Application Components Provider, Application Assembler, Application Deployer and Administrator 1.4 Reference Implementation Software: Database Access, J2EE APIs, Simplified System Integration, Tools
• Demonstrate Setting of J2EE environment • Discuss and Exemplify creation, compiling, and packaging of EJB • Demonstrate creation of J2EE	**Unit II: J2EE Environment (8 hr)** 2.1 Setting Up Environment: Example Code, Getting Build Tool, Checking Environment Variables, Starting J2EE Server, Starting the Deploy Tool, Creating J2EE Applications 2.2 Creating Enterprise Bean: Coding the Enterprise Bean, Compiling the Source File, Packaging the Enterprise

application clients • Exemplify creation of Web client. • Discuss JNDI and deployment of J2EE Applications • Demonstrate modification of J2EE Applications	Bean 2.3 Creating the J2EE Application Client: Coding the J2EE Application Client, Compiling the Application Client, Packaging the J2EE Application Client, Specifying the Application Clients Enterprise Bean Reference 2.4 Creating the Web Client: Coding the Web Client, Compiling the Web Client, Packaging the Web Client, Specifying the Web Clients Enterprise Bean Reference 2.5 Specifying the JNDI Names, Deploying the J2EE Application, Running the J2EE Application Client, Running the Web Client 2.6 Modifying the J2EE Application: Modifying the Class File, Adding a File, Modifying the Web Client, Modifying a Deployment Setting
• Understand basic concept and importance of EJB • Discuss different types of EJBs • Demonstrate accessing from clients • Exemplify different types of Beans	**Unit III: Enterprise Java Beans (8 hr)** 3.1. Enterprise Beans: Introduction, Benefits of EJB, when to use EJB 3.2. Types of EJB: Session Bean, Entity Bean, Message-Driven Bean 3.3. Defining Client Access: Local Bean, Remote Bean, Performance and Access, Method Parameters and Access, 3.4. Content of EJB, Naming Conventions of EJB, Life Cycles of EJBs 3.5. Session Bean Examples, Bean Managed Persistence Examples, Container Managed Persistence Examples, Message driven Bean Examples 3.6.
• Discuss terminologies used in EJB query language • Demonstrate full syntax of EJB QL • Understand life cycle, configuration, deployment, execution, and modification of web client.	**Unit IV: EJB Query Language and Web Clients (6 hr)** 4.1. Terminologies, Simplified Syntax, Example Queries (Finder Queries, Select Queries) 4.2. Full Syntax: BNF Symbols, BNF Grammar of EJB QL, Select Clause, From Clause, Where Clause, Path Expression, EJB QL Restrictions 4.3. Web Clients and Components: Web Client Life Cycle, Web Application Archives, Configuring, Deploying, Running, Updating, and Internationalizing Web Clients
• Discuss Servlet concept and life cycle • Demonstrate servlet initialization, request and response • Handle cookies and sessions through servlets	**Unit V: Java Servlet Technology (8 Hrs)** 5.1. Introduction: Definition, Example, Servlet Life Cycle, Sharing Information 5.2. Initializing Servlets, Writing Service methods, Filtering Request and Response, Invoking other web Resources, Accessing web Context, Maintaining Client State, Finalizing the Servlet 5.3. Handling HTTP Request and Response (GET / POST Request), Using Cookies, Session Tracking, Database

	Access using Servlet.
• Understand JSP page and its life cycle • Demonstrate form creation and database processing using JSP • Demonstrate inclusion of applets in JSP pages • Exemplify creation, and retrieval of Bean components and their properties in JSP. • Demonstrate different concepts though examples	**Unit VI: JSP Technology (8 Hrs)** 6.1. Definition and Example of JSP Page, Life Cycle of JSP Page, Initializing and Finalizing JSP Page 6.2. Creating and Processing Forms, Database Access using JSP 6.3. Creating Static and Dynamic Content, Including Content in JSP Page, Transferring Control to another web Component, Including an Applet, and Extending JSP Language. 6.4. Java Beans Component in JSP Pages: Why Bean Component, Creating, Setting, and Retrieving Bean Components Properties 6.5. Custom Tags, JSP Example Pages, Using Tags, Defining Tags, Examples
• Discus concepts of transactions and its types • Discuss J2EE security techniques and tools	**Unit VII: Transaction and Security (4 Hrs)** 6.6. Transactions: Definition Bean managed Transactions, Container Managed Transactions 6.7. Security: Overview, Roles, Web Tire, EJB-Tier, Client-Tier, EIS-Tier Security 6.8. Resource Connections, J2EE Connector Architecture, J2EE SDK Tools

Evaluation System

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- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to Server Side programs by using various concepts discussed in class. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

- Java Server Programming Java EE6 (J2EE 1.6) Black Book, Kogent Learning Solutions Inc, Dreamtech Press, 2010
- J2EE: The Complete Reference, Keogh, Tata-McGraw Hill Eduction, 2002
- Professional Java Server Programming J2EE, Subrhamanyam Allamaraju, Cedric Beust, Marc Wilcox
- Professional J2EE EAI, Matjaz Juric, Ranesh Nagappan, Rick Leander, S Jeelani Basha
- Web Resource: http://www.muskingum.edu/~reichard/J2EE/j2eetutorial/ doc/ J2eeTutorialTOC.html

Course Title: Advanced Database Design **Credit: 3**
Course No: CSIT.423.2 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

Advanced database design is the course that focuses on principles and algorithms of designing database management systems. This course covers concepts of file structures, indexing, query processing and optimization techniques used by database management systems. Besides this, course has given emphasis on techniques of handling transaction, concurrency, and recovery.

2. Objectives

Upon completion of the course, the student can:

- → Understand techniques and algorithm used in DBMS design
- → Demonstrate each techniques and algorithm used in DBMS design.
- → Optimize queries by creating alternative evaluation plans.
- → Develop small scale DBMS.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand access characteristics of disks and performance parameters • Discuss role of buffer manager in performance of DBMS' • Exemplify different file organization used by database management systems	**Unit I: Storage and File Structures (8 hr)** 1.1. Physical Storage Media: Memory Hierarchy, Physical Characteristics of Disks, Performance Measures of Disks, Optimization of Disk Block Access, RAID 1.2. Storage Access, Buffer Manager, Buffer Replacement Policies 1.3. File Organization: Fixed Length Records, Variable Length Records, Organization of Records in Files, Data Dictionary Storage
• Understand need and importance of indices • Discuss different type of indices critically • Explain hashing and its applications critically	**Unit II: Indexing and Hashing (8 hr)** 2.1. Basic Concepts, Types of Indices, Factors for Evaluating Indices, 2.2. Ordered Indices, Primary Indices (Dense and Sparse), Multilevel Indices, Index update, Secondary Indices, Secondary Indices, B+ Tree Index 2.3. Static Hashing, Hash File Organization, Hash Functions, Bucket Overflow handling, Hash Indices, Dynamic Hashing, Index definition in SQL
	Unit III: Query Processing (8 Hrs)

• Understand steps of query processing • Exemplify algorithms used in performing different SQL operations • Discuss and exemplify process of evaluating SQL expressions	3.1. Steps Involved in Query Processing, Measure of Query Cost 3.2. Select Operation: Basic Algorithms, Selection using indices, Selection involving comparisons, Implementation of Complex Selections 3.3. Join Operation: Nested Loop Join, Block Nested Loop Join, Indexed Nested Loop Join 3.4. Other Operations: Duplicate Elimination, Projection Set Operations, Outer Join, Aggregation 3.5. Evaluation of Expressions, Materialized Evaluation, Pipelining Evaluation
• Discuss importance of optimizing queries • Exemplify size estimation of relations and its use in query optimization • Demonstrate transformation rules used in query optimization • Understand and compare cost base and heuristic query optimization	**Unit IV: Query Optimization (8 Hrs)** 4.1. Basic Concepts, Estimating Statistics of Expression Result, Catalog Information 4.2. Selection Size Estimation, Join Size Estimation, Size Estimation of other operations, Estimating Number of Distinct Values 4.3. Transformation of Relational Expressions, Equivalence Rules, Examples of Transformations 4.4. Cost Based Query Optimization, Heuristic Query Optimization, Optimization of Nested Queries
• Understand basic concept of transaction and interleaved processing • Discuss need of serailizable schedules • Exemplify serializability test procedure	**Unit V: Transaction Management (4 Hrs)** 5.1. Basic Concepts, ACID Properties, Transaction States, Concurrent Execution 5.2. Schedules, Types of Schedule on the Basis of Serializability, Testing Conflict Serializability, Types of Schedule on the Basis of Recoverability 5.3. Commit and Rollback
• Understand need of concurrency control • Discuss different protocols used in controlling concurrency and exemplify each of them • Exemplify techniques of handling deadlocks	**Unit VI: Concurrency Control(5 Hrs)** 6.1. Lock Based Protocols, Timestamp Based Protocols, Thomas write Rule 6.2. Validation Based Protocols, Granularity, Multiversion Protocols 6.3. Deadlock Prevention (wound-wait and wait-die), Deadlock Detection, Recovery from Deadlocks
• Discuss need of recovery techniques • Exemplify log based recovery schemes • Explain shadow paging technique of recovery	**Unit VII: Recovery System(4 Hrs)** 6.4. Types of Failures, Recovery Schemes, Log File, Write Ahead Logging 6.5. Log Based Recovery Techniques (undo/redo, no-undo/redo, undo/no-redo), Check pointing, Shadow Paging 6.6. Recovery in concurrency

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should practice creation, modification and removal of indexes, need to implement different algorithms used for SQL operations. Students also need to practice query optimization schemes, transaction management, concurrency control algorithms, and recovery techniques.

Prescribed Text

- **Database System Concepts,** by Abraham Silberschatz,, Henary Korth, S. Sudarshan, McGraw-Hill Education, Sixth Edition, 2010
- Raghu Ramakrishnan, and Johannes Gehrke, Database Management Systems, 3rd Edition ,McGraw-Hill, 2007
- Ramez Elmasri and Shamkant B. Navathe, Fundamentals of Database Systems, 6th Edition, Pearson Addison Wesley; 2010

Course Title: Network Security **Credit: 3**
Course No: CSIT.423.3 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eight
Level: B. Sc. CSIT

1. Course Introduction

This course introduces key concepts of network security. The topics include the basic concepts of network security including application, transport, IP and data link layer security mechanisms and protocols. The course covers the wireless security principles as well as the use of firewalls to secure networks.

2. Objectives

The objective of the course is to introduce basics of network security principles so that students will be able to use network and internet security techniques including transport and IP security approaches together with the use of firewall to secure the public and private networks.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand basics of network security • Understand security in OSI • Discuss attacks on network • Understand and explore about NAC, EAP	**Unit I: Introduction (7 Hrs)** 1.1. Overview of network security, Goals of Network Security, Methods to achieve network security 1.2. Security Architecture of OSI Reference Model 1.3. Security Services and Layering: Link to Link Encryption, End-to-End Encryption 1.4. Threats and Attacks in Network, Denial of Service Attacks, Repudiation Attacks 1.5. Network Access Control (NAC), NAC enforcement methods, Extensible Authentication Protocol (EAP)
• Understand basic security mechanisms at application layer • Discuss Email Security Protocols • Explore about DNS Security, Secured HTTP and security in ecommerce using SET.	**Unit II: Application Level Security(8 hr)** 2.1. Security issues at application layer 2.2. Email-Security, Email Security Services, Pretty Good Privacy (PGP), Services of PGP, Privacy Enhancement Mail (PEM), Secure Multipurpose Internet Mail Extension (S/MIME), Domain Keys Identified Mail (DKIM) 2.3. DNS Security, Domain Name System Security Extension (DNSSEC) 2.4. S-HTTP, Secure Electronic Transaction (SET)
• Explore details of SSL and TLS. • Understand the differences	**Unit III: Transport Level Security (6 hr)** 3.1. Security issues at transport layer 3.2. Secured Socket Layer (SSL), Features of SSL,

between SSL and TLS • Understand an overview of HTTPS (HTTP over SSL). • Understand an overview of Secure Shell (SSH).	Architecture of SSL 3.3. Transport Layer Security (TLS), Features of TLS, Architecture of TLS, Comparison of SSL and TLS 3.4. HTTPS, SSH, SSH Services
• Present an overview of IP security (IPsec). • Explain the difference between transport mode and tunnel mode. • Understand the concept of security association. in IPSec • Summarize use of IPsec in VPN	**Unit IV: IP Security (5 hr)** 4.1. Overview of IP Security 4.2. IPSec Protocol, Architecture of IPSec Protocol: IPSec Policy AH Protocol, ESP Protocol, Transport and Tunnel Mode of IPSec, Key Management in IPSec 4.3. Applications of IPSec 4.4. Virtual Private Network(VPN), Ensuring VPN using IPSec
• Understand the security attacks at data link layer • Discuss different Ethernet security approaches	**Unit V: Data Link Layer Security (5 Hrs)** 5.1. Attacks at Data Link Layer: ARP Spoofing, MAC Flooding, Port Stealing 5.2. Securing Ethernet LANs: Port Security, Preventing ARP Spoofing, Spanning Tree Protocols, Preventing Attacks on STP, 5.3. Securing VLANs
• Understand the essential elements of the IEEE 802.11 wireless LAN standard. • Explore the various components of the IEEE 802.11i wireless LAN security architecture.	**Unit VI: Wireless Network Security(6 Hrs)** 6.1. IEEE 802.11 Wireless LAN Overview 6.2. IEEE 802.11i Wireless LAN Security 6.3. Wireless Application Protocol Overview 6.4. Wireless Transport Layer Security 6.5. WAP End-to-End Security
• Understand concepts of firewalls • Explore types of firewalls • Explain the use of firewalls in secured networks	**Unit VII: Firewalls (4 Hrs)** 7.1. Introduction of firewalls, Need for Firewalls 7.2. Types of Firewalls: Packet Filtering, Stateful Inspection, Application Level Gateways, Circuit Level Gateways, Host Based Firewalls, 7.3. Securing Networks by configuring Firewalls
• Understand the concepts of network security management • Understand the use of SNMP • Explore the concepts of USM and VACM	**Unit VIII: Network Management Security (4 Hrs)** 8.1. Basic Concepts of SNMP, Protocol Context of SNMP 8.2. SNMP V1, V2, V3 8.3. User Security Model (USM) 8.4. View Based Access Control Model (VACM)

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
<tr><td></td><td>Attendance</td><td>20%</td><td>Practical Exam</td><td>50%</td></tr>
<tr><td></td><td>Internal Exams</td><td>50%</td><td></td><td></td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs to simulate the network security protocols. The instructor should facilitate the appropriate use of security tools to simulate the security mechanisms in above mentioned chapters. Students should be able to configure the firewalls and other network security management tools. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. William Stallings, “Network Security Essentials: *applications and standards”*, Prentice Hall

References

1. William Stallings, "Cryptography and Network Security: Principles and Practices", Pearson Education.
2. Michael T. Goodrich and Roberto Tamassia, “Introduction to Computer Security”, Pearson Education
3. Chris Brenton and Cameron Hunt, ‘Mastering Network Security”, SYBEX
4. Eric Maiwald , “Network Security A Beginner’s Guide”, McGraw-Hill
5. B. A. Forouzan, "Cryptography & Network Security", Tata Mc Graw Hill.

Course Title: Real Time Systems **Credit: 3**
Course No: CSIT.423.4 **Number of period per week: 3+3**
Nature of the Course: Theory+Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

This course introduces theory, mechanisms, and implementations of real-time computer systems. It introduces real-time systems, real-time scheduling, real-time synchronization, real-time operating system kernels, and real-time programming languages. It also covers design and analysis of real-time resource management algorithms (e.g., scheduling, synchronization), their implementations in production operating system kernels, experimental studies of those implementations, and real-time application development.

2. Objectives

Upon completion of this course students should be able to do the following things:

- To identify problems as hard, firm or soft real-time system and give justification
- To articulate and contrast different definitions in real-time systems
- To comprehend formal methods based design approaches and utilize design tools to model real-time systems formally or semi-formally;
- To understand the impact of hardware architectures for real-time performance;
- To analyze the scheduling feasibility of a set of independent tasks;
- To understand resource policies and system services for inter tasks communication and synchronization;
- To differentiate between various performance analysis techniques;
- To understand real-time software testing, verification and system integration.
- To be aware of performance optimization techniques.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand overview of the nature of real - time systems • Understand brief historical review and acquaint the reader withpertinent terminology	**Unit I: Fundamentals of Real Time Systems (5Hrs)** 1.1. Definition and concept of real time systems 1.2. Design Challenges 1.3. Evolution of real time systems 1.4. Advancements on modern real time systems
• Understand the detailed review of central computer architecture • Understand the concepts from the perspective of the real - time systems designer	**Unit II: Hardware for real time systems (6Hrs)** 2.1. Processor architecture: Von Neumann architecture, instruction processing, interrupt considerations 2.2. Memory technologies: memory accessibility, class, and hierarchy 2.3. Architecture advancements and peripheral interfacing

• Understand the impact of advanced architectural features on real - time performance • Understand different memory technologies, input/output techniques, and peripheral support for embedded systems	2.4. Microprocessor versus microcontroller 2.5. Distributed real time architecture
• Understand the core of the text for those who are building practical real - time systems • Understand three principal real - time kernel services: scheduling/dispatching, intertask communication/ synchronization, and memory management	**Unit III: Real time operating system (8Hrs)** 3.1. Basics of RTOS 3.2. Scheduling Frameworks: Round-Robin, cyclic code, fixed priority, dynamic priority scheduling 3.3. System services for application 3.4. Memory management issues
• Understand specific language features desirable in good software engineering practice in general and real - time systems design in particular • Understand explicit criteria for rating a language ’ s ability to support real - time systems and to alert the user to the possible drawbacks of using each language in real - time applications	**Unit IV:Programming languages for real time systems (7Hrs)** 4.1. Coding of Real-Time Software: Fitness of a Programming Language for Real-Time Applications, Coding Standards for Real-Time Software 4.2. Assembly Language 4.3. Procedural Languages 4.4. Object-Oriented Languages: Synchronizing Objects and Garbage Collection, Cardelli’s Metrics and Object-Oriented Languages, Object-Oriented versus Procedural Languages
• Understand specific techniques in real - time system specification with illustrative examples • Understand structured and object - oriented methodologies are discussed as alternative paradigms for requirements writing	**Unit V: Requirements Engineering Methodology (6Hrs)** 5.1. Requirements Engineering for Real-Time Systems 5.2. Formal and Semiformal Methods in System Specification 5.3. The Requirements Document
• Understand design specification techniques used in both structured and object - oriented design	**Unit VI:Real time software design approaches (9Hrs)** 6.1. Qualities of Real-Time Software 6.2. Software Engineering Principles 6.3. Procedural Design Approach 6.4. Object-Oriented Design Approach 6.5. Life Cycle Models: Waterfall Model, V-Model, Spiral Model, Agile Methodologies
• Understand the future of real - time systems hardware,	**Unit VII: Future of Real time systems (4Hrs)** 7.1. Future of Real-Time Hardware, Real-Time

software, and applications	Operating Systems 7.2. Future of Real-Time Programming Languages: The UML++ as a Future "Programming Language" 7.3. Future of Real-Time Systems Engineering and Real-Time Applications

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will beasked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for major units in the syllabus. They should practice design and implementation of real time systems that demonstrates different concepts discussed is class. However, nature of programming can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

– Phillip A. Laplante, Seppo J. Ovaska, Real Time Systems Design and Analysis, 4th Edition, Wiley-IEEE Press; (2011)

References

– Jane W. S. Lui, Real Time Systems, First Edition, Pearson Education, 2000
– Elecia White, Making Embedded Systems: Design Patterns for Great Software, 1st Edition(2011)
– Cooling J.E., Software Design for Real-Time Systems, International Thompson Computer Press, London, England, 1991

Course Title: Mobile Application Development **Credit: 3**
Course No: CSIT.424.1 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

Today's applications are increasingly mobile. Computers are no longer confined to desks and laps but instead live in our pockets and hands. This course teaches students how to build mobile apps for Android, iOS, and Windows Phone, the BlackBerry that is today's leading mobile operating platforms.

2. Objectives

By the end of this course, students will be able

- Understand system requirements for mobile applications
- Generate suitable design using specific mobile development frameworks
- Generate mobile application design
- Implement the design using specific mobile development frameworks
- Deploy the mobile applications in marketplace for distribution

3. Specific Objectives and Contents

Specific Objectives	Contents
• Discuss need and benefits of mobile Apps • Understand and exemplify web services • Explain various web service language formats • Demonstrate creation of web services • Use tools to debug web services	**Unit I: Mobile Applications(8 hr Hrs)** 1.1. Mobile Web Presence: Mobile Content, Mobile Browser 1.2. Mobile Applications: When to Create App, Benefits of Mobile App, App as Web App 1.3. Web Services: Definition, Examples, and Advantages of Web Services 1.4. Web Service Language Formats: XML, JSON, Transferring Non-textual Data 1.5. Creating Example Web Service: Using MS Stack, Using LAMP Stack 1.6. Debugging Web Services: Tools, Advanced Web Service Techniques
• Discuss mobile screens and mobile application users • Explain various mobile platforms • Understand concepts of adaptive mobile websites	**Unit II: Mobile UI Design and Mobile Web Sites (10 hr)** 2.1. Effective Use of Screen Real Estate, Understanding Mobile Application Users 2.2. Understanding mobile Information Design, and Mobile Platforms, Using Tools of Mobile Interface Design 2.3. Choosing Mobile Web Option, Adaptive Mobile Websites

• Demos rate use of HTML5 in developing Mobile Web Apps	2.4. Dedicated Mobile Websites, Mobile Web Apps with HTML5
• Understand Android and discuss its competitors • Discuss different tools used for developing android applications • Explain android development practices • Develop sample android App	**Unit III: Working with Android (10 hr)** 3.1. Why Android?, Supporters of Android, Competition with itself 3.2. Tools: JDK, Eclipse, SDK, Eclipse ADT Plug-in, Additional SDK Components 3.3. Development, Connecting to the Google Play, Android Development Practices, Building App in Android
• Discuss IOS and tools used for developing IOS applications • Explain various elements of IOS Apps • Discuss basic features of Objective C • Develop sample iPhone Apps	**Unit IV: Working with IOS (12 hr)** 4.1. Apple iPhone, Tools (Hardware, xCode, iOS SDK iOSGuideline) 4.2. Anatomy of iOS App, xCode IDE, iOS Simulator, Debugging Code, Instruments 4.3. Objective C Basics: Classes, Control Structures, Try-Catch 4.4. Hello World App, Building App iOSOther useful iOS things
• Discuss iPhones and tools used for developing iPhone applications • Explain elements of iPhone Apps • Develop sample iPhone App	**Unit V: Working with Windows iPhone (5 Hrs)** 5.1. Tools Needed: Hardware, Visual Studio and Windows Phone SDK 5.2. Windows Phone Project: Silverlight vs Windows phone, Anatomy of Windows phone App, Windows phone Emulator 5.3. Creating App in Windows phone, Distribution, Other useful windows phone things
• Discuss BlackBerry and tools used for developing BlackBerry applications • Explain elements of BlackBerry Apps • Develop sample BlackBerry Apps	**Unit VI: Working with BlackBerry (5 Hrs)** 5.4. BlackBerry Devices and Playbook 5.5. Tools: BlackBerry Developer Program, Code signing Keys BlackBerry Java Development Environment, Developing App with BlackBerry, Eclipse Specifics for BlackBerry, Development with WebWorks 5.6. Other useful BlackBerry things, Blackberry Distribution

Evaluation System

Undergraduate Programs							
External	**Marks**	**Internal**	**Weight**	**Marks**	**Practical**	**Weight**	**Mark**

Evaluation		Evaluation	age			age	
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class (es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for all of the units in the syllabus. Students should be able to Mobile Apps by using various concepts and Platforms discussed in class. The lab work should be practiced for minimum of 3 lab hours per week

Prescribed Text

- Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012

- Charlie Collins, Michael Galpin and Matthias Kappler, “Android in Practice”, DreamTech, 2012
- James Dovey and Ash Furrow, “Beginning Objective C”, Apress, 2012
- David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, “Beginning iOS 6
- Development: Exploring the iOS SDK”, Apress, 2013.

Course Title: Distributed Database Management System **Credit:** 3
Course No: **CSIT.424.2** **Number of period per week:** 3+3
Nature of the Course: Theory + Lab **Total hours:** 45+45
Year: Fourth **Semester:**Eight
Level: B. Sc. CSIT

1. Course Introduction

This course is designed to develop acquaintance with fundamental concepts of distributed databases. The course starts with the basic concepts and also includes distributed database design, distributed query processing, distributed transaction management, distributed concurrency control, distributed recovery, and introduction to parallel databases.

2. Objectives

On completion of this course, students will be able to develop knowledge in different basic to advanced concepts of distributed databases and fundamental concepts of parallel databases.

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand the concepts of distributed data processing • Know about distributed database systems • Comparison between distributed and centralized database systems • Understand the benefits of distributed databases • Gaining knowledge about different design issues of distributed databases • Know about different architectures of distributed database management systems	**Unit One: Introduction [7 Hrs.]** 1.1. Distributed Data Processing 1.2. What is a Distributed Database System? 1.3. Distributed vs. Centralized Database System 1.4. Promises of DDBSs: Transparent Management of Distributed and Replicated Data, Reliability Through Distributed Transactions, Improved Performance, Easier System Expansion 1.5. Design Issues: Distributed Database Design, Distributed Directory Management, Distributed Query Processing, Distributed Concurrency Control, Distributed Deadlock Management, Reliability of Distributed DBMS, Replication, Relationship among Problems, Additional Issues 1.6. Distributed DBMS Architecture: ANSI/SPARC Architecture, A Generic Centralized DBMS Architecture, Architectural Models for Distributed DBMSs, Autonomy, Distribution, Heterogeneity, Architectural Alternatives, Client/Server Systems, Peer-to-Peer Systems, Multidatabase System Architecture
• Understand about the top down design process of distributed	**Unit Two: Distributed Database Design [8 Hrs.]** 2.1. Top-Down Design Process

Databases • Know about different design issues of distribution of data • Gaining knowledge about fragmentation • Know about allocation • Understanding the concepts of data replication and different replication protocols	2.2. Distribution Design Issues: Reasons for Fragmentation, Fragmentation Alternatives, Degree of Fragmentation, Correctness Rules of Fragmentation, Allocation Alternatives, Information Requirements 2.3. Fragmentation: Horizontal Fragmentation, Vertical Fragmentation, Hybrid Fragmentation 2.4. Allocation: Allocation Problem, Information Requirements, Allocation Model, Solution Methods 2.5. Data Replication and Replication Protocols
• Know about query processing problem in distributed databases • Understanding objectives of distributed query processing • Know the complexity of relational algebra operations • Know about different query processing characterization • Know about different layers of query processing	**Unit Three: Overview of Query Processing [7 Hrs.]** 3.1. Query Processing Problem 3.2. Objectives of Query Processing 3.3. Complexity of Relational Algebra Operations 3.4. Characterization of Query Processors: Languages, Types of Optimization, Optimization Timing, Statistics, Decision Sites, Exploitation of the Network Topology, Exploitation of Replicated Fragments, Use of Semijoins 3.5. Layers of Query Processing: Query Decomposition, Data Localization, Global Query Optimization, Distributed Query Execution
• Know the concept of transaction • Know the proprieties of transaction • Understand different types of transactions	**Unit Four: Introduction to Transaction Management [5 Hrs.]** 4.1. Definition of a Transaction: Termination Conditions of Transactions, Characterization of Transactions, Formalization of the Transaction Concept 4.2. Properties of Transactions: Atomicity, Consistency, Isolation, Durability 4.3. Types of Transactions: Flat Transactions, Nested Transactions, Workflows
• Know about serializability concepts • Understand different lock-based concurrency control algorithms • Understand different timestamp-based algorithms • Know about optimistic algorithms • Know to handle deadlock in distributed databases	**Unit Five: Distributed Concurrency Control [8 Hrs.]** 5.1. Serializability Theory 5.2. Locking-Based Concurrency Control Algorithms: Centralized 2PL, Distributed 2PL 5.3. Timestamp-Based Concurrency Control Algorithms: Basic TO Algorithm, Conservative TO Algorithm, Multiversion TO Algorithm 5.4. Optimistic Concurrency Control Algorithms 5.5. Deadlock Management: Deadlock Prevention, Deadlock Avoidance, Deadlock Detection and

	Resolution
• Know about reliability concepts • Know about failures in distributed databases • Know about local reliability • Know about distributed reliability protocols • Know to deal with site failures • Know the concept of network partitioning	**Unit Six: Distributed DBMS Reliability [6 Hrs.]** 6.1. Reliability Concepts and Measures: System, State, and Failure; Reliability and Availability; Mean Time between Failures/Mean Time to Repair 6.2. Failures in Distributed DBMS: Transaction Failures; Site (System) Failures; Media Failures; Communication Failures 6.3. Local Reliability Protocols: Architectural Considerations; Recovery Information; Execution of LRM Commands; Checkpointing; Handling Media Failures 6.4. Distributed Reliability Protocols: Components of Distributed Reliability Protocols; Two-Phase Commit Protocol; Variations of 2PC 6.5. Dealing with Site Failures: Termination and Recovery Protocols for 2PC, Three-Phase Commit Protocol 6.6. Network Partitioning: Centralized Protocols, Voting-based Protocols
• Know about parallel database architectures • Understand about placement of parallel data in database • Know the concept of parallel query processing • Know about load balancing	**Unit Seven: Parallel Database Systems [4 Hrs.]** 7.1. Parallel Database System Architectures: Objectives; Functional Architecture; Parallel DBMS Architectures 7.2. Parallel Data Placement 7.3. Introduction to Parallel Query Processing 7.4. Load Balancing: Parallel Execution Problems; Intra-Operator Load Balancing; Inter-Operator Load Balancing; Intra-Query Load Balancing

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20

Full Marks 60+20+20 = 100

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

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   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type question/long menu driven programs	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam.

Laboratory Work

The laboratory work develops practical knowledge on different concepts of Distributed database design. Students should be able to design distributed database and distributed query to retrieve, from distributed database.

Prescribed Text:

1. Principles of Distributed Database Systems, **Özsu**, M. Tamer, **Valduriez**, Patrick, Third Edition.

References:

1. Distributed Database Management Systems: A Practical Approach, Saeed K. Rahimi, Frank S. Haug.
2. Distributed Database Systems, Chhanda Ray

Course Title: Wireless Networks **Credit: 3**
Course No: CSIT.424.3 **Number of period per week: 3+3**
Nature of the Course: Theory+Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

The course addresses the fundamentals of wireless communications and provides an overview of existing and emerging wireless communications networks. It covers radio propagation and fading models, fundamentals of cellular communications, multiple access technologies, and various wireless networks, including past and future generation networks. Simulation of wireless systems under different channel environments will be integral part of this course.

2. Objectives

The course aims at providing basic knowledge about problems and design approaches in wireless communication systems. This includes engineering models in radio propagation and the application of antennas to wireless communication. An introduction to spectrum resource management issues is also given in the course. Upon completion of the course, the student will be able to:

- Characterize fading multi-path radio channels in terms of Doppler spectrum, coherence time, power delay profile, and coherence bandwidth.
- Distinguish the difference between large-scale fading and small-scale fading.
- Describe and explain the effects of fading multi-path channels on the link performance of wireless communication systems.
- Provide possible solutions to the problem of signal fading in wireless communication links. Describe different types of diversity and how they improve performance for mobile radio channels.
- Apply propagation models and design basic radio communication links with respect to signal-tonoise ratio and outage probabilities. Special emphasis is given to propagation models for mobile and portable wireless communication.
- Plan and analyse simple wireless networks in terms of coverage and capacity.
- Understand about multiple access techniques and slandered
- Describe and explain mobility management strategies and traffic calculation.
- Describe and understand about concept of mobile IP, protocols and routing in ad-hoc network.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understands basics of wireless	**Unit I: Overview of wireless communications and systems(2 Hrs)** 1.1. Introduction to Wireless Communications

communication, challenges, its history • Understand the different standard of wireless communication	1.2. Challenges in wireless communication networks 1.3. Cellular systems from 1G to 3G 1.4. Wireless 4G systems
• Understand effects of fading in multipath environment, fading models and channel modeling • Distinguish the difference between large-scale fading and small-scale fading. • Able to calculate the receive power in different fading model	**Unit II: Wireless Channel Characterization(7 Hrs)** 2.1. Multipath Propagation Environment 2.2. Small Scale Fading 2.2.1 Fading Effects due to Multipath Time Delay Spread 2.2.2 Fading Effects due to Doppler Spread 2.3. Channel Models 2.4. Fading models: 2.4.1 Rayleigh Fading Distribution 2.4.2 Ricean Fading Distribution 2.5 Large Scale Path-loss and Shadowing 2.5.1 Free-space Path loss Model 2.5.2 Propagation Over Reflecting Surface (smoothing plane) 2.5.3 Long Distance Path loss with Shadowing: 2.5.4 Okumura-Hara Path Loss Model
• Understand the pulse shaping as well as requirement of modulation and selection of modulation scheme • .Design of transmitter and receiver for different digital modulation schemes	**Unit III: Band Pass Transmission Technique for Mobile Radio (9 Hrs)** 3.1. An overview of Digital Communication 3.2. Pulse Shaping Technique 3.2.1 Nyquist Pulse Shaping 3.2.2 Raised Cosine Roll-off Filter 3.3. Modulation Techniques For Mobile Radio 3.3.1 Analog and Digital Modulation – An overview 3.3.2 Criteria of Choosing Modulation Schemes 3.3.3 Geometric Representation of Modulated signal 3.3.4 Power Spectral Density 3.3.5 Probability of Error 3.4 Digital Modulation Techniques 3.4.1 Digital Linear Modulation (BPSK, DPSK, QPSK) 3.4.2 Minimum Shift Keying (MSK) 3.4.3 Gaussian Minimum Shift Keying (GMSK) 3.4.4 M-array (MPSK, MFSK, QAM and OFDM) Modulation and Demodulation
• Understand the basic concept of equalization and diversity	**Unit IV: Equalization, Diversity and Channel Coding(4 Hrs)** 4.1 Basics of equalization. Equalization in communications

Techniques • Represent the knowledge about diversity in different paradigm • Design of RAKE receiver	receivers, linear equalizers 4.2 Non-linear equalization, decision feedback and maximum likelihood sequence estimation equalizations 4.3 Adaptive equalization algorithms, zero forcing, least mean square, recursive least squares algorithms, fractionally spaced equalizers 4.4 Diversity methods, advantages of diversity, basic definitions 4.5 Space diversity, reception methods (selection, feedback, maximum ratio and equal gain diversity) 4.6 Polarization, frequency and time diversity 4.7 RAKE receivers and interleaving
• Understand fundamental concept of cellular network. • Plan and analyse simple wireless networks in terms of coverage and capacity.	**Unit V: Fundamental of Cellular Network (6 Hrs)** 5.1 Cellular Concept and Operational Channel 5.2 Frequency Reuse and Channel Assignment Strategies 5.3 Interference and system capacity, co-channel and adjacent channel interference, power control measures 5.4 Grade of service, definition, standards 5.5 Coverage and capacity enhancement in cellular network, cell splitting, sectoring, repeaters, microcells
• Understand the different multiple access techniques used in wireless network • Understand the different slandered used in multiple access techniques	**Unit VI:Multiple Access in Wireless Network(5 Hrs)** 6.1. Frequency Division Multiple Access (FDMA) Principle and Application 6.2. Time Division Multiple Access (TDMA), principles and applications 6.3. Spread Spectrum Multiple Access, Frequency Hopped Multiple Access, Code Division Multiple Access, hybrid spread spectrum multiple access techniques 6.4. Space Division Multiple Access 6.5. Standards for Wireless Local Area Networks
• Explore and manage the mobility in wireless network • Able to calculate the traffic in handoff associated network	**Unit VII: Mobility Management in Wireless Network(5 Hrs)** 7.1. Introduction to Mobility Management 7.2. Call Admission Control (CAC) 7.3. Handoff Management 7.3.1 Handoff Strategies 7.3.2 Handoff Types 7.4. Location Management For Cellular Network 7.5. Location Management For PCS Network 7.6. Traffic Calculation
• Understand the concept of	**Unit VIII: Wireless / Wireline Internetworking(5 Hrs)**

internetworking as well as mobile IP • Learns about the different protocols used in wireless network • Understand about AD-HOC network and its routing	8.1.Introduction to Internetworkingfor Wireless Networks 8.2. Concept of mobile IP, Architecture and Operation 8.3. Tunnelling in mobile IP 8.4.Mobility in IPv6 8.5.Transmission Control Protocol (TCP) 8.6. Wireless Application Protocol (WAP) 8.7. Wireless Markup Language (WML) 8.8.Mobile AD HOC Network (MANET) 8.9.AD HOC Routing Protocols

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
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<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will beasked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture
- Field visit

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should write programs and prepare lab sheet for most of the units in the syllabus. Majorly, students should practice design and implementation of wireless network. Students are advised to implement the modulator de-modulator, frequency planning, channel assignment as well as routing algorithms used in wireless network. Students are advised to use MATLAB simulator. However, nature of programming can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week. Student are advised to visit the mobile service operators, network service providers, internet service providers and prepare the report including architecture, service, and functioning of the wireless network.

Prescribed Text

1. **Jon W. Mark and Weihua Zhuang**, *Wireless Communication and Networking*, Prentice Hall

References

2. **K. Feher,** *Wireless Digital Communications*, Prentice Hall
3. **T. Rappaport,** *Wireless Communications*, Prentice Hall
4. **J. Schiller,** *Mobile Communications*, Pearson

Course Title: Cloud Computing **Credit: 3**
Course No: CSIT.424.4 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

The course introduces the ideas and techniques underlying the principles of cloud computing. This course covers a series of current cloud computing technologies, including technologies for Infrastructure as a Service, Platform as a Service, and Software as a Service. This course is designed to introduce the concepts of Cloud Computing as a new computing paradigm. The students will have an opportunity to explore the Cloud Computing various terminology, principles and applications. The course will expose students to different views of understanding the Cloud Computing such as theoretical, technical and commercial aspects.

2. Objectives

The primary learning outcomes are that the students will be able to: Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing, Discuss system virtualization and outline its role in enabling the cloud computing system model, Analyze various cloud programming models and apply them to solve problems on the cloud.

The main objective of this course is:

- To provide students with the fundamentals and essentials of Cloud Computing.
- To provide students a sound foundation of the Cloud computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios.
- To provide the knowledge about the SOA, cloud security and cloud disaster management

3. Specific Objectives and Contents

Specific Objectives	Contents
• Understand basics cloud framework • Understand concepts of cloud computing • Understand the features of cloud computing • Understand the cloud	**Unit I: Introduction (9 Hrs)** 1.1. Cloud, Cloud computing, Components of cloud computing, Characteristic features of cloud computing, 1.2. Evolution of cloud computing, Challenges for the cloud computing, Benefits of cloud computing, 1.3. Grid computing, Cloud Computing vs Grid Computing, Distributed Computing in Grid and Cloud, 1.4. Cloud deployment models: Public, Private, Hybrid, Community,

deployment models	1.5. Cloud Service Models: IaaS, PaaS, SaaS, 1.6. Challenges for cloud computing, Legal issues in cloud computing.
• Understand concepts of virtualization and it approaches • Explore concepts of virtualization in cloud environment	**Unit II: Virtualization (5 Hrs)** 2.1. Basic Concepts of virtualization, Hardware virtualization, Server virtualization, Storage virtualization, Data Centre virtualization OS virtualization, Para virtualization, 2.2. Role of virtualization in enabling cloud services, Cloud computing as a virtualized service.
• Understand the cloud migration and its need • Explore the cloud migration model • Determine the risks during cloud migration	**Unit III: Cloud Migration(4 Hrs)** 3.1. Cloud Migration and its types, Need for Cloud Migration, 3.2. Model of Migration into a cloud, 3.3. Migration risks in Cloud and Mitigation.
• Understand various cloud service models • Understand and analyze various aspects of the cloud service models • Explore the real world cloud services	**Unit IV: Cloud Service Models (15 Hrs)** 4.1. Infrastructure-as-a-Service (IaaS), 4.2. Platform-as-a-Service (PaaS), Key Characteristics of PaaS, 4.3. Software-as-a-Service (SaaS): SaaS Implementation Issues, Key Characteristics of SaaS, Benefits of the SaaS Model, 4.4. Communication-as-a-Service (CaaS): Advantages of CaaS, 4.5. Monitoring-as-a-Service (MaaS), 4.6. Jericho Cloud Cube Model, 4.7. Amazon's Web Services, 4.8. Cloud Computing from the Google Perspective, 4.9. Window Azure and Online Services.
• Understand Service Oriented Architecture (SOA) • Explore significance of SOA in Cloud Computing	**Unit V: SOA and Cloud (4 Hrs)** 5.1. Service Oriented Architectures (SOA), 5.2. Combining the cloud and SOA 5.3. Characterizing SOA, 5.4. Importance of SOA to cloud computing
• Understand security in cloud • Understand risk assessment in cloud • Explore various intrusion detection mechanisms in cloud environment. • Understand how to handle cloud disasters and how to mitigate the disaster	**Unit VI: Cloud Security (8 Hrs)** 6.1. Cloud Security Challenges, Dimensions of Cloud Security: Security & Privacy, Compliance, and Legal or Contractual Issues, 6.2. Risk Management, Security Monitoring, Incident Response Planning, Security Architecture Design, Vulnerability Assessment, Data and Application Security, Virtual Machine Security, 6.3. Handling Disasters in Cloud, Disaster Recovery, Disaster Recovery Planning, Disaster Management.

Evaluation System

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External evaluation

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Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should have practical session for realization of cloud services as well as virtualization. The tools and frameworks for the simulation of cloud and virtualized environments can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

1. Dan C. Marinescu, *Cloud Computing: Theory and Practice*, Morgan Kaufmann.

References

1. Rajkumar Buyya, The University of Melbourne and Manjrasoft Pty Ltd., Australia, James Broberg, The University of Melbourne, Australia Andrzej Goscinski, Deakin University, Australia, C*loud Computing Principles and Paradigm*, John Wiley and Sons Inc. Publication.
2. John W. Rittinghouse and James F. Ransome, *Cloud Computing: Implementation Management and Security*,
3. George Reese, *Cloud Application architecture*, O'Reilly Media Inc.
4. Judith Hurwitz, Robin Bloor, Marcia Kaufman, Fern Halper, *Cloud Computing for Dummies*, Wiley Publishing Inc.
5. Borko Furht, Armando Escalante, *Handbook of cloud computing*, Springer, 2010
6. David S. Linthicum, *Cloud Computing and SOA Convergence in your Enterprise*, a step by step guide, Addison Wesley

Course Title: Information Retrieval **Credit: 3**
Course No: CSIT.425.1 **Number of period per week: 3+3**
Nature of the Course: Theory + Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

This is a undergraduate-level introductory course for information retrieval. It will cover algorithms, design, and implementation of modern information retrieval systems. Topics include: retrieval system design and implementation, text analysis techniques, retrieval model, search evaluation, retrieval feedback, applications in web information management.

2. Objectives

The Student should be made to:

- Learn the information retrieval models
- Be familiar with Web Search Engine
- Be exposed to Link Analysis
- Understand Hadoop and Map Reduce
- Learn document text mining techniques

3. Specific Objectives and Contents

Specific Objectives	Contents
• Define Information Retrieval and discuss it components • Understand framework of search engines • Differentiate IR from Web Search	**Unit I: Introduction (6 hr)** 1.1. Introduction, History of IR, Components of IR, Issues ,Open source Search engine Frameworks 1.2. The impact of the web on IR, The role of artificial intelligence (AI) in IR, 1.3. IR Versus Web Search, Components of a Search engine, Characterizing the web
• Discuss Boolean and Vector Space Model • Demonstrate TF-IDF Weighting and cosine similarity • Exemplify probabilistic IR and LSI • Describe Relevance feedback and query expansion	**Unit II: Information Retrieval (12 hr)** 2.1. Boolean and vector-space retrieval models, Term weighting – TF-IDF weighting, cosine similarity 2.2. Preprocessing, Inverted indices, efficient processing with sparse vectors 2.3. Language Model based IR, Probabilistic IR, Latent Semantic Indexing 2.4. Relevance feedback, Pseudo-relevance feedback and query expansion

• Understand structure of web and optimization ideas • Discuss architectures of we and crawling • Demonstrate web indexes and index compression	**Unit III: Web Search Engine-Crawling (8 Hrs)** 3.1. Web search overview, web structure, the user, paid placement, Search engine optimization/spam 3.2. Web size measurement, search engine optimization/spam 3.3. Web Search Architectures, crawling, meta-crawlers Focused Crawling, web indexes 3.4. Near-duplicate detection, Index Compression, XML retrieval.
• Demonstrate Link Analysis techniques and HITS algorithm • Discuss Searching and Ranking techniques • Exemplify relevance scoring and ranking of web search result • Demonstrate Recommendation generation algorithms	**Unit IV: Web Search (10 Hrs)** 4.1. Link Analysis, hubs and authorities, Page Rank and HITS algorithms, Searching and Ranking 4.2. Relevance Scoring and ranking for Web, Similarity, Hadoop & Map Reduce, Evaluation 4.3. Personalized search, Collaborative filtering and content-based recommendation of documents and products, handling invisible Web 4.4. Snippet generation, Summarization, Question Answering, Cross- Lingual Retrieval.
• Understand basics of document text mining • Demonstrate text classification, clustering and categorization algorithms	**Unit V: Document Text Mining(9 Hrs)** 5.1. Information filtering; organization and relevance feedback 5.2. Text Mining, Text classification and clustering, Categorization algorithms: naive Bayes; decision trees; and nearest neighbor – 5.3. Clustering algorithms: agglomerative clustering; k-means; expectation maximization (EM).

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
<tr><th>External Evaluation</th><th>Marks</th><th>Internal Evaluation</th><th>Weight age</th><th>Marks</th><th>Practical</th><th>Weight age</th><th>Mark</th></tr>
<tr><td>End semester examination</td><td rowspan="4">60</td><td>Assignments</td><td>20%</td><td rowspan="4">20</td><td>Practical Report copy</td><td>25%</td><td rowspan="4">20</td></tr>
<tr><td>(Details are given in the separate table at the end)</td><td>Quizzes</td><td>10%</td><td>Viva</td><td>25%</td></tr>
<tr><td></td><td>Attendance</td><td>20%</td><td>Practical Exam</td><td>50%</td></tr>
<tr><td></td><td>Internal Exams</td><td>50%</td><td></td><td></td></tr>
<tr><td>Total External</td><td>60</td><td>Total Internal</td><td>100%</td><td>20</td><td></td><td>100%</td><td>20</td></tr>
<tr><td colspan="8">Full Marks 60+20+20 = 100</td></tr>
</table>

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should implement IR algorithms discussed in the course by using weighting and similarity measures. Students also need to practice Web Search, Clustering, Classification, and Recommendation Generation Algorithms.

Prescribed Text

- *C. Manning, P. Raghavan, and H. Schütze*, Introduction to Information Retrieval, Cambridge University Press, 2008.
- *Ricardo Baeza, Yates and Berthier Ribeiro, Neto*, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011.
- *Bruce Croft, Donald Metzler and Trevor Strohman*, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009.
- *Mark Levene*, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.

Course Title: E-Governance | **Credit: 3**
Course No: CSIT.425.2 | **Number of period per week: 3+3**
Nature of the Course: Theory + Lab | **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

This course is aimed to understanding the concept of e-Governance to better delivery of government services to citizens, improved interactions with business and industry, citizen empowerment through access to information, efficient government management and resulting benefits can be less corruption, increased transparency, greater convenience, revenue growth and cost reductions.It cover the concept of e-Governance, different model of e-Governances and maturity levels, infrastructure and readiness for e-governance, data ware house and data mining for e-government services, initiatives in Nepal and recent trends of e-Government issues. Student will be analysis the major e-governance case study of Nepal and best case studies of aboard.

2. Objectives

After completion of course, Students will be able to:

- Understands the basic principle of e-Governance and importance of digital world.
- Analysed the different model of digital governance and its maturity levels.
- Define the e-Readiness to successful implementation of e-Governance and analyse current situation of Nepal.
- Determine the importance of data mining and data warehouse and open data in e-Governance.
- Analyse the situation of e-Governance in Nepal.
- Analyse the case study about different e-Government Projects.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Define e-Governance and importance • Explore changing nature of e-Governance services • List out the present global trends of e-Governance • Compare government and governance	**Unit I: Concept of e-Governance(10Hrs.)** 1.1. Definition of e-Governance 1.2. Importance of e-Governance 1.3. Evolution of e-Governance: Its scope and Contents 1.4. Present Global Trends of Growth in e-Governance 1.5. Differentiate Between e-Government and e-Governance
• Analyze the different digital model of e-Governance • List of level of maturity model and its parameters. • Justify e-Governance toward good governance.	**Unit II: e-Governance Models(15 Hrs.)** 2.1. Model of Digital Governance 2.1.1 Broadcasting Dissemination Model 2.1.2 Critical Flow Model 2.1.3 Comparative Analysis Model 2.1.4 Mobilization and Lobbying Model

	2.1.5 Interactive-Service Model/ Government-to-Citizen-to-Government (G2CG2G)Model 2.2. Evolution of e-Governance and Maturity Models 2.3. Characteristics of Maturity Model 2.4. Key Focus Area 2.5. Toward good governance through e-Governance Model
• Identify the e-Readiness parameters to success of e-government. • Analyzed the situation of e-Governance readiness in Nepal	**Unit III: e-Governance Infrastructure, Stage in Evolution and Strategic for Success (15)** 3.1. e-Readiness 3.1.1 Data System Infrastructure 3.1.2 Legal Infrastructure Preparedness 3.1.3 Institutional Infrastructure Preparedness 3.1.4 Human Infrastructure Preparedness 3.1.5 Technical Infrastructure Preparedness 3.2. Evolutionary Stage in e-Governance
• Describe the importance of data warehouse and mining in e-Government services. • Explore the area of data ware house and data mining on governance services.	**Unit IV:Application of Data Warehouse and Data Mining in Government (5Hrs.)** 4.1. National Data Warehouses 4.2. Area for Data Warehouse and Data Mining 4.3. Big data in e-Governance
• Understand the open standards and GA of Nepal • Review the status of government data center in Nepal • Describe the e-Government related Act and policies of government of Nepal.	**Unit V: e-Governance of Nepal (10Hrs.)** 5.1. Evolution of e-Governance in Nepal 5.2. Government Enterprises Architecture(GEA) 5.3. E-Government Master plan 5.4. GIDC and Data Centre 5.5. Electronic Traction Act 2063 5.6. Information Communication Technology Policy 2072 5.7. Digital signature
• Understand recent trends in e-Governance • Describe e-Democracy • Describe internet governance • Understands the web standard to e-Governance.	**Unit VI:Recent Trends in e-Governances (15Hrs.)** 6.1. e-Government 2.0: Next Generation Governance 6.2. e-Democracy 2.0 6.3. Open Data: Definition, Principle, uses 6.4. Mobile Governance 6.5. Open Standards for Web Presence 6.6. Government Cloud Services and Open Sources
• Analyze the case study of case study of Nepal • Analyzed selected case study of successful e-Government project. • Create the report of case study	**Unit VII: Case Study (20Hrs.)** 7.1. ICT Development Project ADB in Nepal 7.2. National ID in Nepal 7.3. Government Electronic Procurement System of Nepal (GEPSON) 7.4. IT park Kavre, Banepa 7.5. e-Village/Tele Centre in Nepal 7.6. Smart City in Nepal 7.7. Digital India Project in India

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will beasked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Case Study

Student should analyses the case study of e-Governance practices. Students are recommended to visit to data center, e-Village and Tele-center among countries. The case study should be practiced for one case study per week.It is highly recommended that prepared case study report and presentation on group which is found in study period. A group of four or five students can work together.

Prescribed Texts

Prabhu, C. S. R. (2012). *E-governance: concepts and case studies*. New Delhi: Prentice-Hall of India.

References

Srinivas Raj, B. (2008). *E-governance techniques: Indian and global experiences*. New Delhi, India: New Century Publications.

Bhatnagar, S. C. (2009). *Unlocking e-government potential: concepts, cases and practical insights*. New Delhi, India : Thousand Oaks, Calif: SAGE.

Agarwal, A. (Ed.). (2007). *eGovernance: case studies*. Hyderabad: Universities Press.

UN E-Government Survey 2016: http://www.unpan.org/

Electronic Transaction Act 2063: http://www.lawcommission.gov.np/

ICT Policy 2072: http://moic.gov.np/np/

E-Villages and Tele centers: http://doit.gov.np/

GIDC: http://nitc.gov.np/

Course Title: Embedded System Programming **Credit: 3**

Course No: CSIT.425.3 **Number of period per week: 3+3**

Nature of the Course: Theory + Lab **Total hours: 45+45**

Year: Fourth, Semester: Eighth

Level: B. Sc. CSIT

1. Course Introduction

Embedded Systems are everywhere. Every time you look at your watch, answer the phone, take a picture, and drive cars you are interacting with an embedded system. They far outnumber traditional computers. Learning to design and program embedded systems is a critical skill that is necessary for many industry and scientific jobs. In this course you will learn the basics of designing, interfacing, configuring, and programming embedded systems.

2. Objectives

After completing the course students will know

- How building and loading programs differ from desktop or server computers
- Basic debugging techniques--a critical skill when working with minimally endowed embedded systems
- Handling different types of memory
- Interrupts, and the monitoring and control of on-chip and external peripherals
- Determining whether you have real-time requirements, and whether your operating system and application can meet those requirements
- Task synchronization with real-time operating systems and embedded Linux

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Define Embedded Systems and its components • Understand design of Embedded Systems • Discuss C language and other languages used for Embedded Programming	**Unit I: Introduction (5)** 1.1. What is Embedded System (ES)?, Real-time Systems, Components of ES 1.2. Requirements that Affect Design Choices, Embedded Design Examples (Digital Watch, Video Game Player) 1.3. Embedded Software Developer, C language for Embedded Programming, Other Embedded Languages

- Understand Hardware Basics of Embedded Systems - Discuss Embedded Processors and Communication Basics - Exemplify and Demonstrate Embedded Programs - Explain process of compiling, linking, and locating programs - Exemplify compiling, linking, and locating process - Describe and Exemplify Downloading and Debugging of Embedded Programs	**Unit II: Embedded Hardware & Software (12)** 2.1. Hardware Basics: Schematic Fundamentals, Memory Map, How to Communicate?, Processor, PXA255 XScale Processor, External Peripherals, Hardware Initialization 2.2. Embedded Programs: Hello World Program, LED Blinking Program, Role of Infinite Loop 2.3. Compiling, Linking and Locating: Build process, Compiling, Linking, Startup Code, Locating, Building the LED Blinking Program (compile, link and locate), Format the Output File, Makefiles 2.4. Downloading and Debugging: Downloading LED Blinking Program, Debug Monitors (Downloading and Running Programs with ReBoot) 2.5. Remote Debuggers, Emulators, Other Useful Tools
- Discuss memory system and types used in Embedded Systems - Demonstrate effect of Endianness in Embedded Software Development - Explain memory testing and problem related to this - Demonstrate techniques used for validating memory content	**Unit III: Memory (8)** 3.1. Types of Memory, Types of RAM and ROM, Hybrid Types, DMA, Endian Issues, Endianness in Devices and Networking 3.2. Memory Testing, Common Memory Problems, Electrical Wiring Problems, Missing Memory Chips, Improperly Inserted Chips 3.3. Developing Test Strategy: Data Bus Test, Address Bus Test, Device Test 3.4. Validating memory Content (Checksum & CRC), Using Flash Memory, Working with Flash Memory, Flash Drivers
- Discuss and exemplify Bit manipulation techniques - Demonstrate the use of serial device driver - Understand device driver design and APIs - Explain interrupt and use of interrupt service routines - Use peripherals and	**Unit IV: Peripherals and Interrupt (10)** 4.1. Control and Status Registers, Bit Manipulation (Testing, Setting, Clearing, Toggling, and Shifting Bits, Bitmasks, Bit fields), Struct Overlays 4.2. Device Driver Philosophy: Serial Device Driver, (Register Interface, State Vraiables, Initialization Routine, Device Driver API) 4.3. Testing Serial Device Driver, Extending Functionality, Device Driver Design 4.4. Interrupts: Overview, Priority, Levels and Edges, Enabling and Disabling, Interrupt Map, Interrupt

interrupts to improve LED Blinking program	Service Routine 4.5. Shared Data and Race Conditions, Improved LED Blinking Program, Working of Timers,
- Understand role of Real-time scheduling is Embedded Systems - Discuss Tasks and it implementation or execution in Embedded Systems - Describe Interrupts and Interrupt Handling Mechanism - Discuss operating system examples used in Embedded Systems	**Unit V: Operating Systems II (10)** 5.1. Purpose, Scheduler, Real-time Scheduling, Scheduling Points, Locking and Unlocking 5.2. Task States, Task Context, Task Priorities, Task Mechanics, Task Synchronization 5.3. Message Passing, Other Functionality, Interrupt Handling, RTOS Characteristics, When to use RTOS?, RTOS Selection Process 5.4. eCos Examples: Introduction, Task Mechanics, Task Synchronization, Message Passing, Interrupt handling 5.5. Embedded Linux Examples: Introduction, Accessing Hardware, Task Mechanics, Task Synchronization, Message Passing, Interrupt handling

Evaluation System

Undergraduate Programs							
External Evaluation	**Marks**	**Internal Evaluation**	**Weight age**	**Marks**	**Practical**	**Weight age**	**Mark**
End semester examination	60	Assignments	20%	20	Practical Report copy	25%	20
(Details are given in the separate table at the end)		Quizzes	10%		Viva	25%	
		Attendance	20%		Practical Exam	50%	
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will be asked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
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			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

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Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination. Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Students should practice small scale Embedded programs that uses processor architecture, memory system, peripherals and interrupt. Besides this student should use Embedded OS features discussed in class.

Prescribed Text

- Programming Embedded Systems, 2nd Edition, Anthony Massa, Michael Barr, O'Reilly Media, Inc, *2006*
- Computers as Components: Principles of Embedded Computing System Design, W. Wolf, Morgan Kaufmann, Second Edition, 2008.
- Introduction to Embedded Systems, A Cyber-Physical Systems Approach, 2011
- Introduction to Embedded Systems, David Russell, 2010.

Course Title: Human-Computer Interaction **Credit: 3**
Course No: CSIT.425.4 **Number of period per week: 3+3**
Nature of the Course: Theory+Lab **Total hours: 45+45**
Year: Fourth, Semester: Eighth
Level: B. Sc. CSIT

1. Course Introduction

This course presents the foundations of Human-Computer Interaction (HCI) where the contents are structured in Basic definitions and motivations of HCI, including history, theories, interaction paradigms, design principles and models.

2. Objectives

Upon completion of the course, Students will be able to:

- → Explain the capabilities of both humans and computers from the viewpoint of human information processing.
- → Describe typical human–computer interaction (HCI) models, styles, and various historic HCI paradigms.
- → Apply an interactive design process and universal design principles to designing HCI systems.
- → Describe and use HCI design principles, standards and guidelines.
- → Analyze and identify user models, user support, socio-organizational issues, and stakeholder requirements of HCI systems.

3. Specific Objectives and Contents

Specific Objectives	**Contents**
• Understand importance of human computer interaction • Understand the fundamental components of interactive system • Understand the psychological and physiological attributes of the user and computer • Understand historical perspective on the evolutionof interactive systems	**Unit I: Foundations of Human–Computer Interaction** 1.1. Human Capabilities : input output channels, human memory, thinking, reasoning, emotion 1.2. The Computer 1.3. The Interaction : models of interaction, ergonomics 1.4. Paradigms: paradigms for interaction
• Understand the key elements in the interaction design process • Understand the user-centered design within a software engineering framework.	**Unit II: The Design Process** 2.1. Interaction Design Basics 2.2. HCI in the Software Process 2.3. Design Rules 2.4. Universal Design

• Overview of implementation support for the programmer of an interactive system.	**Unit III: Implementation Support** 3.1. Elements of windowing systems 3.2. Implementation Tools 3.3. User Interface Management System
• Understand the techniques used to evaluatethe interactive system to see if it satisfies user needs. • To design a system to be universallyaccessible,regardless of age, gender,cultural backgroundor ability • Understand the provision of usersupport in the form of help systems and documentation	**Unit IV:Evaluation Techniques and User Support** 4.1. Introduction and Goals of Evaluation 4.2. Expert Analysis and User Participation 4.3. Evaluation Method 4.4. Universal Design Principles 4.5. Requirements of User Support 4.6. Approaches to User Support. 4.7. Designing User Support System
• Understands the models with psychological or cognitiveorigins, where the emphasis is on formulating aspects of user behavior such as goal formation and problem solving • Understand socio-technical models	**Unit V: User Models** 5.1. Cognitive Models 5.2. Socio-organizational issues 5.3. Stake holder requirements
• Understand revisit group interaction, this time focusing on groupware technology itself • Understand the design and use of hypertext and multimediasystems as interactive system	**Unit VI: Groupware, Ubiquitous Computing, Virtual and Augmented Reality, Hypertext and Multimedia** 6.1 Groupware and Computer-supported Collaborative Work 6.2 Ubiquitous Computing 6.3 Virtual Reality and Augmented Reality 6.4 Hypertext, Multimedia and the World Wide Web

Evaluation System

<table>
<tr><th colspan="8">Undergraduate Programs</th></tr>
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					Exam		
		Internal Exams	50%				
Total External	60	Total Internal	100%	20		100%	20
Full Marks 60+20+20 = 100							

External evaluation

1. **End semester examination:**
   It is a written examination at the end of the semester. The questions will beasked covering all the units of the course. The question model, full marks, time and others will be as per the following grid.

2. **External Practical Evaluation:**
   After completing the end semester theoretical examination, practical examination will be held. External examiner will conduct the practical examination according to the above mentioned evaluation. There will be an internal examiner to assist the external examiner. Three hours time will be given for the practical examination. In this examination Students must demonstrate the knowledge of the subject matter.

Full Marks: 100, Pass Marks: 45, Time: 3 Hrs

Nature of question	Total questions to be asked	Total questions to be answered	Total marks	Weightage
Group A: multiple choice*	20	20	20×1 = 20	60%
Group B: Short answer type questions	7	6	6×8 = 48	60%
Group C: Long answer type questions	3	2	2×16 =32	60%
			100	100%

Each student must secure at least 50% marks in internal evaluation in order to appear in the end semester examination. Failed student will not be eligible to appear in the end semester examinations.

Internal evaluation

Assignment: Each student must submit the assignment individually. The stipulated time for submission of the assignment will be seriously taken.

Quizzes: Unannounced and announced quizzes/tests will be taken by the respective subject teachers. Such quizzes/tests will be conducted twice per semester. The students will be evaluated accordingly.

Attendance in class: Students should regularly attend and participate in class discussion. Eighty percent class attendance is mandatory for the students to enable them to appear in the end semester examination.

Below 80% attendance in the class will signify NOT QUALIFIED (NQ) to attend the end semester examination.

Presentation: Students will be divided into groups and each group will be provided with a topic for presentation. It will be evaluated individually as well as group-wise. Individual students have to make presentations on the given topics.

Mid-term examination: It is a written examination and the questions will be asked covering all the topics in the session of the course.

Discussion and participation: Students will be evaluated on the basis of their active participation in the classroom discussions.

Instructional Techniques: All topics are discussed with emphasis on real-world application. List of instructional techniques is as follows:

- Lecture and Discussion
- Group work and Individual work
- Assignments
- Presentation by Students
- Quizzes
- Guest Lecture

Students are advised to attend all the classes and complete all the assignments within the specified time period. If a student does not attend the class(es), it is his/her sole responsibility to cover the topic(s) taught during that period. If a student fails to attend a formal exam/quiz/test, there won't be any provision for re-exam. Unless and until the student clears one semester he/she will not be allowed to study in the following semesters.

Laboratory Work

Student should have practical session for realization of design, implementation, and evalution of interactive systems. Students should also implement the cognitive models and social-organizational issues for human computer interaction. The tools and frameworks for the simulation of human computer interaction can be decided by the instructor. The lab work should be practiced for minimum of 3 lab hours per week.

Prescribed Text

– Dix, A., Finlay, J., Abowd, G.D., & Beale, R. (2004). *Human computer interaction* (3rd ed.). Prentice Hall

References

– Preece, J., Rogers, Y., & Sharp, H. (2015). *Interaction design: Beyond human-computer interaction* (4th ed.) John Wiley & Sons Ltd
– Moggridge, B. (2007) Designing Interactions. Cambridge, MA: The M.I.T. Press

– Lazar, J., Feng, J.H., Hochheiser, H. (2010). Research Methods in Human-Computer Interaction, Wiley