



Department of Information and Communication Technology
Faculty of Engineering and Technology
Islamic University

Curriculum for
Bachelor of Science in Engineering (B.Sc. Engg.) in
Information and Communication Technology
Session: 2025-2026

Contact Address

Department of Information and Communication Technology
Islamic University, Kushtia-7003, Bangladesh
E-mail: chairmanict@iu.ac.bd, chairmanictiu@gmail.com
Web Site: ictiu.ac.bd

Bachelor of Science in Engineering (B.Sc. Engg.) Curriculum
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1. Vision of the University

To provide for instructions in theology and other fields of Islamic studies and comparative jurisprudence and other branches of study at graduate and post-graduate levels as the university may think fit, and prepare for the advancement and dissemination of knowledge including post-doctoral research and training.

Mission of the University

Quality Policy

2. Vision of the Department

The Department of Information and Communication Technology (ICT) aims to discover engineering knowledge and novel information technologies, thereby improving technology-based graduate's skills to build digital Bangladesh.

3. Mission of the Department

The mission of the ICT Department is to provide competence-based graduates and carry out research in science and technology for socio-economic development. The mission of the department is:

M1	To produce a core of skilled human beings and long-term IT professionals through high-quality IT education combined with other engineering fields, committed to serving the country and also the domestic or overseas IT industries, with ethics.
M2	To introduce new knowledge, new technologies and innovative applications such as the Internet of Things, data science, block chain, artificial intelligent etc., to cover the concept of the fourth industrial revolution.
M3	To provide sufficient facilities/guidelines and environment for graduates to be highly interested in advanced knowledge and research.

4. Program Education Objectives (PEO)

The department of ICT at IU has adopted the following educational objectives are:

PE01	Graduates will be able to understand and apply basic science, physical science, mathematics, and statistics to solve the difficult problems in ICT fields.
PE02	Graduates will be able to exploit their theoretical and practical knowledge in order to identify appropriate design specifications and solutions for the systems, components and/or processes that can meet IT needs.
PE03	Graduates will be able to develop sustainable technologies and computing applications to provide a better place for mankind, and they will take on ethical responsibilities related to the use of the invented technology.

5. PEO to Mission Statement Mapping

Mission Statement	PEO1	PEO2	PEO3
M1	High	High	Medium
M2	Low	High	High
M3	Low	Medium	High

Correlation: 3-High, 2-Medium, 1-Low

6. Program Outcomes

POs	Category	Program Outcomes
P01	Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering Problems.
P02	Problem Analysis	Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences.
P03	Design/Development of Solutions	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consider for public health and safety as well as cultural, societal and environ- mental concerns.
P04	Investigations	Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions
P05	Modern tool usage	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
P06	The engineer and society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
P07	Environment and sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sus- trainable development.
P08	Ethics	Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering
P09	Individual work and teamwork	Function effectively as an individual and as a member or leader of teams as well as in multidisciplinary settings.
P010	Communication	Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give

P011	Project management and finance	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.
P012	Life Long Learning	Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.

7. Mapping of PEOs to PLOs

PEO/PO	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	P012
PE01	3	3	2	1	1	1	1	2	2	1	1	2
PE02	2	3	3	3	3	3	1	1	1	1	2	2
PE03	2	3	2	3	3	2	3	3	3	3	3	3

Correlation: 3- Strong, 2-Medium, 1-Low

8. Overall Marks and Credits Distribution for B.Sc. Engg. in ICT (Session: 2025-2026)

Course Type	Course Name	Marks	Total Marks	Marks (%)	Credits		Credits (%)
Humanities	Sociology	100	700	9.33	2	11.5	7.18
	Economics	100			2		
	Technical and Communicative English	200			3.5		
	Industrial Management and Accountancy	100			2		
	Ethics and Cyber Law	100			2		
	Non-credit course	100			-		
	Basic Science	Physics			100		
Mathematics		300	9				
Statistics		100	2				
Major Engineering	Theoretical	3000	6300	84	85	134.5	84.06
	Laboratory	2700			40.5		
	Project	100			4		
	Field work	100			1		
	Viva-voce	400			4		
	Total				7500		

Courses Brief

1st Year 1st Semester-2026

Course Code	Course Title	Marks	Credits	Contact hours/week
PHY-1101	Physics	100	3	3
ICT-1101	Discrete Mathematics	100	2	3
ICT-1102	Basic ICT Laboratory	100	1.5	3
EEE-1101	Electricity and Electromagnetism	100	3	3
EEE-1102	Electricity and Electromagnetism Laboratory	100	1.5	3
MATH-1101	Calculus and Differential Equations	100	3	3
HUM-1101	Communicative English	100	2	2
HUM-1102	Communicative English Laboratory	100	1.5	2
NCC-01	Bangladesh Studies (for Alim Background and Non-Muslim Students)	100	0	2
NCC-02	Islamic Studies (for Muslim & HSC background students)	100	0	2
Total		900	17.5	26

1st Year 2nd Semester-2026

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-1201	Electronic Devices and Circuits	100	3	3
ICT-1202	Electronic Devices and Circuits Laboratory	100	1.5	3
ICT-1203	Structured Programming Language	100	3	3
ICT-1204	Structured Programming Language Laboratory	100	1.5	3
ICT-1205	Numerical Methods and Analysis	100	2	3
ICT-1206	Numerical Methods and Analysis Laboratory	100	1.5	3
MATH-1201	Geometry and Complex Variables	100	3	3
HUM-1201	Sociology	100	2	2
ICT-1000	Viva-voce	100	1	2
Total		900	18.5	25

2nd Year 1st Semester-2027

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-2101	Digital Electronics and Logic Design	100	3	3
ICT-2102	Digital Electronics and Logic Design Laboratory	100	1.5	3
ICT-2103	Data Structure and Algorithm	100	3	3

ICT-2104	Data Structure and Algorithm Laboratory	100	1.5	3
ICT-2105	Object Oriented Programming I	100	3	3
ICT-2106	Object Oriented Programming Laboratory I	100	1.5	3
ICT-2107	Signals and Systems	100	2	3
ICT-2108	Signals and Systems Laboratory	100	1.5	3
MATH-2101	Vector Analysis and Linear Algebra	100	3	3
Total		900	20	27

2nd Year 2nd Semester-2027

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-2201	Database Management Systems	100	3	3
ICT-2202	Database Management Systems Laboratory	100	1.5	3
ICT-2203	Web Engineering	100	3	3
ICT-2204	Web Engineering Laboratory	100	1.5	3
ICT-2205	Communication Systems	100	3	3
ICT-2206	Communication Systems Laboratory	100	1.5	3
ICT-2207	Object Oriented Programming II	100	2	3
ICT-2208	Object Oriented Programming II Laboratory	100	1.5	3
STAT-2201	Statistics for Communication Engineering	100	2	2
HUM-2201	Economics	100	2	2
ICT-2000	Viva-voce	100	1	2
Total		1100	22	30

3rd Year 1st Semester-2028

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-3101	Data Communication	100	3	3
ICT-3102	Data Communication Laboratory	100	1.5	3
ICT-3103	Wave Propagation and Antenna	100	3	3
ICT-3104	Wave Propagation and Antenna Laboratory	100	1.5	3
ICT-3105	Operating Systems	100	3	3
ICT-3106	Operating Systems Laboratory	100	1.5	3
ICT-3107	Computer Architecture and Organization	100	3	3
HUM-3101	Ethics and Cyber Law	100	2	3
ICT-3000	Viva-voce	0	0	0
Total		800	18.5	24

3rd Year 2nd Semester-2028

Course Code	Course Title	Marks	Credits	Contact
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				hours/week
ICT-3201	Microwave Engineering	100	3	3
ICT-3202	Microwave Engineering Laboratory	100	1.5	3
ICT-3203	Computer Networking	100	3	3
ICT-3204	Computer Networking Laboratory	100	1.5	3
ICT-3205	Artificial Intelligence	100	3	3
ICT-3206	Artificial Intelligence Laboratory	100	1.5	3
ICT-3207	Computer Graphics and Visualizations	100	3	3
ICT-3208	Computer Graphics and Visualizations Laboratory	100	1.5	3
ICT-3209	System Analysis and Software Engineering	100	3	3
ICT-3000	Viva-voce	100	1	2
Total		1000	22	29

4th Year 1st Semester-2029

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-4101	Machine Learning	100	3	3
ICT-4102	Machine Learning Laboratory	100	1.5	3
ICT-4103	Digital Image Processing	100	3	3
ICT-4104	Digital Image Processing Laboratory	100	1.5	3
ICT-4105	Information Theory and Coding	100	3	3
ICT-4106	Information Theory and Coding Laboratory	100	1.5	3
ICT-4107	Microprocessor and Microcontroller	100	3	3
ICT-4108	Microprocessor and Microcontroller Laboratory	100	1.5	3
ICT-4002	Design Project	0	0	0
Total		800	18	24

4th Year 2nd Semester-2029

Course Code	Course Title	Marks	Credits	Contact hours/week
ICT-4201	Wireless Communications	100	3	3
ICT-4202	Wireless Communications Laboratory	100	1.5	3
ICT-4203	Optical Communications	100	3	3
ICT-4204	Optical Communications Laboratory	100	1.5	3
ICT-4205	Cryptography and Network Security	100	3	3
ICT-4206	Cryptography and Network Security Laboratory	100	1.5	3
ICT-4207	Software Project Management and Quality Assurance	100	2	3
ICT-4208	Field Work/Industrial Attachment	100	1	4
HUM-4201	Industrial Management and Accountancy	100	2	2
ICT-4000	Viva-Voce	100	1	2

ICT-4002	Design Project	100	4	6
Total		1100	23.5	35

1. Assessment Methods of COs

Assessment Method	CO1	CO2	CO3	Total
Final Exam	20%	20%		40%
Midterm Exam	20%	10%		30%
Class Tests	10%			10%
K/S/ATest1			10%	10%
K/S/ATest2			10%	10%
Total	50%	30%	20%	100%

2. Grading Policy

Marks Obtained	Letter Grade	Numerical Evaluation	Definition
80%andabove	A+	4.00	Excellent
75% <80%	A	3.75	Excellent
70% <75%	A-	3.50	Very Good
65% <70%	B+	3.25	Good
60% <65%	B	3.00	Good
55% <60%	B-	2.75	Good
50% <55%	C+	2.50	Average
45% <50%	C	2.25	Average
40% <45%	D	2.00	Below Average
below40%	F	0.00	Failing

B.Sc. Engg. Session: 2025-2026

1st Year 1st Semester – 2026

Course Outline

1. General Information

Physics	PHY-1101	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	Basic Physics at Higher Secondary Level

2. Course Summary

This course is an introduction to a broad range of topics in Modern Physics. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Physics classes. The course covers Special Relativity, Quantum Mechanics, Atomic Physics, Statistical Physics, Solid State Physics, Heat and Thermodynamics and Properties of Matter.

3. Course Objectives

To provide knowledge on fundamental physics including Heat and Thermodynamics, properties of matter and also on modern physics including theory of relativity, quantum theory, photo-electric effect, nuclear reactions etc.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Discuss about heat and thermodynamics in physics	P02	Cognitive(C4)	25	
C03	Analyze the properties of matter	P02 P03	Affective(A3)	20	
C04	Understand about modern physics	P03	Cognitive(C4)	15	
C05	Explain about nuclear reactions	P03	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course Fundamental and Modern Physics, The content and policies for the class.	
L-(4-9)	Heat and Thermodynamics: Principles of temperature measurements, Platinum resistance thermometer, Thermo-electric thermometer, Pyrometer, Kinetic theory of gases, Maxwell's distribution of molecular speeds, mean free path, equipartition of energy Brownian motion, van der waal's equation of state. Thermodynamics laws. Efficiency of heat engines, Carnot theorem, Entropy and Disorder, Thermodynamic functions, Maxwell relations, Clausius-Clapeyron equation, Gibbs phase rule.	
CT-1	Tutorial Exam	
L-(11-16)	Properties of Matter : States of matter, Elastic properties of solids, Coefficients of elasticity, Energy calculation, Flow of liquids, Equation of continuity, Laminar and turbulent flow, Reynolds number & its significance, Bernoulli's theorem and its application, Viscosity, Poiseuille's equation, Motion in a viscous medium, Determination of coefficient of viscosity, Surface tension, Surface tension as a molecular phenomenon, Surface tension and surface energy, Capillarity and angle of contact, Quincke's method.	
CT-2	Tutorial Exam	
L-(18-24)	Modern Physics: Michelson-Morley's experiment, Galilean transformation, Special theory of relativity & its consequences, Quantum theory of Radiation, Photo-electric effect, Compton effect, wave particle duality, Interpretation of Bohr's postulates, Radioactive disintegration, Properties of nucleus, Nuclear reactions, Fission, Fusion, Chain reaction, Nuclear reactor.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Perspective of Modern Physics	Arthur Beiser	McGraw Hill	
2	Concepts of Modern Physics	Arthur Beiser	Tata McGraw Hill	

S/N	Reference Books and	Writer Name	Publisher Name	Edition
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	Other Materials			
1	Heat and Thermodynamics	N. Subrahmanyam and Brij Lal	S. Chad & Co. Ltd	
2	Fundamentals of Physics	Halliday, Resnick & Walker	John Wiley & Sons Inc	
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Discrete Mathematics	ICT-1101	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic Algebra and Calculus

2. Course Summary

To provide knowledge to transform natural language statements to propositional statements. To express a logic sentence in terms of predicates, quantifiers, and logical connective, perform modulo arithmetic and computer arithmetic. To apply rules of inference, mathematical induction, counting, advanced counting techniques, relations, graph, and tree data structures to solve problems.

3. Course Objectives

Ideas of mathematical logic, concepts of set theory, mathematical induction, counting, advanced counting techniques, relations, graph, and tree data structures. To impart the mathematical concepts required to computer science.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Acquire general idea about the course	PO1	Cognitive(C3)	20	Please refer to Section 8
CO2	Explore different types of discrete structure and mathematical logic.	PO2	Cognitive(C4)	20	
CO3	Understand about number theory and some algorithms.	PO3	Affective(A3)	20	
CO4	Apply counting and advanced counting techniques to solve real-world problem	PO2	Cognitive(C4)	15	

C05	Solve a variety of basic recurrence relations and analyze a problem to determine underlying recurrence relations.	P04	Cognitive(C3)	15	
C06	Know about how to generate tree and graph for solving real life problems.	P02 P03	Cognitive(C3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course Fundamental and about discrete mathematics and numerical methods, The content and policies for the class.	
L-(4-7)	Discrete Structure: Proposition and notation, Connectives, proposition formulas and truth tables, Conditional and Bi-conditional , tautologies, equivalence of formulas, duality law, set operations, normal forms, ordering and uniqueness of normal forms, methods of proof, Predicate calculus- predicates, statement function, variables and quantifiers, predicate formulas, free and bound variables, the universe of discourse, Rules of Inference- universal specification, existential generalization and universal generalization, Mathematical induction.	
L-(8-12)	Elements of Number Theory: Division in the integers, prime numbers, the fundamental theorem of Arithmetic, division algorithm, modular arithmetic, Euclidean algorithm, data encryptions using prime number.	
CT-1	Tutorial Exam	
L-(14-20)	Counting and Relations: Counting arguments, the pigeonhole principle, permutations and combinations, Finite probability space, events, discrete probability, probability theory, solving recurrence relations, divide-and-conquer relations, generating functions, relations and their properties, n-ary relations and their applications, representing relations, closure relations, equivalence relations	
CT-2	Tutorial Exam	
L-(22-25)	Graphs and Trees: Graph terminology, paths and circuits, connectedness, matrix representation of graphs, isomorphism of graphs, trees, rooted trees, path lengths in rooted trees, tree representation and traversing.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Discrete Mathematics and Its Applications	Kenneth H. Rosen	WCB/ McGraw-Hill	
2	Introductory Methods of	S. S. Sastry		

	Numerical Analysis			
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S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Discrete Mathematical Structures	Bernard Kolman, Robert C. Busby	Sharon Ross, Prentice Hall of India.	
2	Discrete Mathematical Structures with Applications to Computer Science	J.P.Tremblay, R. Manohar	Tata McGraw Hill Publishing Company Ltd.	
3	Numerical Mathematical Analysis	J B Scarborough.		
4	Object Oriented Numerical Methods	V Rajaraman.		

Course Outline

1. General Information

Basic ICT Laboratory	ICT-1102	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

The practical knowledge on computer systems and IT tools are highly significant to develop expertise on IT field. The course covers different hardware and software of computer systems, Microsoft offices, Picture/Image processing and different Web Technology.

3. Course Objectives

This course addresses essential foundation of ICT applications.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
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C01	Acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Assemble the Computer System.	P01	Cognitive(C4)	20	
C03	Demonstrate and Apply Microsoft Offices.	P03	Affective(A3)	20	
C04	Apply IT Tools and Software for Picture Processing	P03	Cognitive(C4)	20	
C05	Technique to use different Web Technology	P02 P03	Cognitive(C3)	20	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-5)	Course Overview: General idea about the ICT Laboratory, To supply the experimental list for this Laboratory.	
L-(6-14)	Assemble the Computer System: Different hardware of a computer system, The computer system, Different software to a computer system for working environment	
	Tutorial Exam	
L-(16-18)	Demonstrate and Apply Microsoft Offices: The software, The MS Word, Excel and Power point file, Spreadsheet and work sheet using appropriate software, The given problems using MS Excel.	
	Tutorial Exam	
L-(20-21)	Apply IT Tools and Software for Picture Processing: The appropriate software to edit the picture /Image.	
L-(22-24)	Technique to use different Web Technology: The different techniques of Web Technology for the given specific purposes.	
	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	William, Sawyer, Hutchinson: Using Information Technology- A Practical Introduction to Computers and Communications	McGraw-Hill	McGraw-Hill	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
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1	V Rajaraman: Fundamentals of Computers			
2	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Electricity and Electromagnetism	EEE-1101	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	PHY-1101

2. Course Summary

This course to develop expertise on electrical engineering. The knowledge on electrical circuits and filter circuits are highly significant for communication engineering. The course covers Circuit Theory, Transients, AC Fundamentals, and Filter Circuits.

3. Course Objectives

To provide exposure to basic electrical engineering concepts to the students. As well as the students will have sound knowledge of the nature of electricity, emf wave and how they relate to everyday phenomena.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Acquire general idea about the course	P01	Cognitive(C3)	10	Please refer
CO2	Define and explain the meaning/function of charge, current, voltage, power, energy, resistors (R), and the fundamental principles of Ohm's law, KVL and KCL including an understanding of	P01 P02	Cognitive(C4)	20	

	electrical safety.				to Section 8
C03	Understand the behavior of inductances (L) and capacitances (C).	P02 P03	Affective(A3)	20	
C04	Analysis electric circuit theorem.	P03	Cognitive(C4)	15	
C05	Understand the phenomena of AC power and AC circuit analysis.	P03 P04	Cognitive(C3)	15	
C06	Apply the filter circuits.		Cognitive(C4)	10	
C07	To describe the concepts in electromagnetism that applied in real-life situations.	P01 P02 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course Overview: The mission and vision of the Department, General idea about the course Fundamental and Modern Physics, The content and policies for the class.	
L-2	Circuit Fundamentals: Define and classify the circuit, Voltage and current divider rule, The open and shorts circuits in a series and parallel resistors.	
L-(3-8)	Circuit Theory: Kirchhoff's voltage and current Law. Kirchhoff's Current Law, Circuit, Branch, Mesh, and Nodal current methods, Superposition, Thevenin's, Norton's, Maximum Power Transfer, and Delta and Star Conversion theorems.	
L-(9-12)	Electromagnetism: Electric fields, charges, dipoles, Gauss's law, magnetic force, relation between magnetism and electricity, Amperes circuital law, Biot-Savart law, force between two parallel conductors, Faraday's Law, Maxwell's equations, traveling and standing Waves, generating electromagnetic waves, plane EM Waves, electric dipole EM waves	
CT-1	Tutorial Exam	
L-(13-14)	Transients: The Transients, Transient in R-L Circuits (D.C), Short Circuit Current, Time Constant, R-L Circuits (A.C), R-C Series Circuits (D.C), R-C Series Circuits (A.C), Double Energy Transients.	
L-(15-17)	A.C Fundamentals: Sinusoidal AC Voltage Generation, Alternating Voltage & Current equation, Average and RMS Value of AC Voltage and Current, The Derivative, Response of R, L, C to AC Quantities, Average, Apparent and Reactive Power, The phase relation of sine wave.	
CT-2	Tutorial Exam	
L-(18-20)	Series and Parallel AC Circuits: The phasor Diagram of Series RL, RC & RLC Circuits, Active and Reactive Components of Circuit Current, Admittance & Susceptance (B) of Parallel RL, RC, RLC Circuit, Resonance, Bandwidth and Q-factor of RL, RC, RLC Circuits.	
L-(21-25)	Filters: Symmetrical Networks, The different types of filter circuits.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Introductory Circuit Analysis	R L Boylestad	Universal Book Stall	
2	Electrical Technology (Vol I)	B.L. Theraja and A.K. Theraja	S. Chand & Co. Ltd.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Physics Part II	Resnick & Haliday		
2	Network Analysis	Van Valkenberg		
3	Numerical Mathematical Analysis	J B Scarborough.		
4	A textbook of Optics	N. Subrahmanyam and BrijLal		

Course Outline

1. General Information

Electricity and Electromagnetism Laboratory	EEE-1102	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

The practical knowledge on electrical engineering is highly significant to develop expertise on IT field. The course covers basic circuit theory, conversion of circuit, ac characterization R-L, R-C, R-L-C series parallel circuits and design and apply the filter circuits.

3. Course Objectives

To provide practical knowledge of design and implement electric circuits.

4. Course Outcomes

CO	CO Description	PO	Domain	Weight	Assessment
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			(LoBT)		Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Gain the practical understanding of different circuit theories	P01 P02	Cognitive(C4)	50	
C03	Design and implement some common electric circuits.	P03	Affective(A3)	30	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-5)	Course Overview: General idea about the ICT Laboratory, The experimental list for this Laboratory.	
L-(6-14)	Circuit Analysis: Voltage and current divider rule, KCL and KVL, Series and parallel circuit and calculate voltage and current in open/short mode.	
	Tutorial Exam	
L-(16-18)	Circuit Theory Analysis and Application: Different circuits, the different circuit theorems.	
	Tutorial Exam	
L-(20-21)	Series-Parallel ac Circuit Analysis: Series to parallel and parallel to series circuit, different properties of series and parallel R-L, R-C, R-L-C circuits.	
L-(22-25)	To Design and Apply Filter Circuits: The efficiency of different filter circuits.	
	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Introductory Circuit Analysis	R L Boylestad	Universal Book Stall	
2	Electrical Technology (Vol I)	B.L. Theraja and A.K. Theraja	<i>S. Chand & Co. Ltd.</i>	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Physics Part II	Resnick & Haliday		
2	Network Analysis	<i>Van Valkenberg</i>		
3	A textbook of Optics	J B Scarborough.		
4	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Calculus and Differential Equations	MATH-1101	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	Basic Mathematics at Higher Secondary Level

2. Course Summary

This course is an introduction to a broad range of topics in Mathematics. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Mathematics classes. The course covers Differential Calculus, Integral Calculus, Differential Equations, Explicit Solution of Higher-Order Linear Differential Equations, and Series Solutions of Linear Differential Equations.

3. Course Objectives

To provide knowledge of differentiation, different techniques of differentiation and its applications, integration, different techniques of integrations and its applications.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	10	Please refer to Section 8
C02	Find the derivatives and integration of mathematical expressions.	P02	Cognitive(C4)	30	
C03	Formulate different phenomena using derivatives and integration.	P03	Affective(A3)	30	
C04	Model of different phenomena through the form of differential equations.	P04	Cognitive(C4)	15	
C05	Solve the differential equations.	P05	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic
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L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course Fundamental Mathematics, The content and policies for the class.
L-(4-7)	Differential Calculus: Function, Limits, and continuity, The concepts of differentiation, Successive differentiation, partial differentiation, applications of differentiation.
L-(8-13)	Integral Calculus: The methods of substitution, integration by parts, Integration of special trigonometric and rational functions, definite and indefinite integrals, applications of integrations.
CT-1	Tutorial Exam
L-(15-18)	Differential equations: Mathematical modeling of real problems, First-Order Ordinary Differential Equations, Exact Differential Equations and Integrating Factors, Separable Equations and Equations reducible to this form, Linear Equations
CT-2	Tutorial Exam
L-(15-20)	Explicit Solution of Higher-Order Linear Differential Equations: Basic Theory, Homogeneous Linear Equation with Constant Coefficients, Method of Undetermined Coefficients, Variation of Parameters, Cauchy-Euler Equation.
L-(21-25)	Series Solutions of Linear Differential Equations: Power Series Solutions about an Ordinary Point, Solutions about Singular Points
CT-3	Tutorial Exam

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Differential Calculus	Edwards		
2	An Elementary Treatise on Differential Equations and Their Applications	H T H Piaggio		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Calculus-I	Paul Dawkins		
2	Differential Equations	Sapely L Ross		
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Communicative English	HUM-1101	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Humanities
		Prerequisite Course	Basic English at Higher Secondary Level

2. Course Summary

To understand and demonstrate basic pattern of communication skills, process of communication and to develop oral, listening, reading, and writing skills.

3. Course Objectives

To develop skills on English reading, writing, speaking, and listening.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	10	Please refer to Section 8
C02	Find the basic concepts modals, phrases & idioms, prefixes & suffixes.	P02	Cognitive(C4)	30	
C03	Find the basic knowledge of sentence structures, Introduction to phonetic symbols, dialogue.	P03	Affective(A3)	30	
C04	Deep knowledge of Four Skills such as Reading, Writing, Listening and speaking.	P03	Cognitive(C4)	30	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course Overview: The mission and vision of the Department, General idea about the course, The content and policies for the class.	
L-(2-5)	Grammar: Grammatical principles, modals, phrases and idioms prefixes and Suffixes, sentence structures, why and yes/no questions, conditional sentences.	
L-(6-11)	Vocabulary: Technical and scientific vocabulary, defining terms	

CT-1	Tutorial Exam	
L-(13-16)	Spoken English: Phonetic symbols, dialogue, responding to particular situations, extempore speech.	
L-(17-18)	Reading: About comprehension of technical & nontechnical materials-skimming, scanning, inferring & responding to context.	
CT-2	Tutorial Exam	
L-(20-21)	Technical Writing: Paragraph and composition writing on scientific and other themes, report writing, research paper writing, library references.	
L-(22-25)	Professional Communication: Business letter, Job application, memos, quotations, tender notice.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Differential Calculus	Edwards		
2	An Elementary Treatise on Differential Equations and Their Applications	H T H Piaggio		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Calculus-I	Paul Dawkins		
2	Differential Equations	Sapely L Ross		
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Communication English Laboratory	HUM-1102	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Practice
		Contact Hours	3/week
		Course Status	Humanities
		Prerequisite Course	HUM-1101

2. Course Summary

To understand and demonstrate basic pattern of communication skills, process of communication and to develop oral, listening, reading, and writing skills.

3. Course Objectives

To develop skills on English reading, writing, speaking, and listening.

4. Course Outcomes

C0	C0 Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Read English fluently	P01 P02	Cognitive(C4)	30	
C03	Write English fluently	P03	Affective(A3)	20	
C04	Speak English fluently	P03	Cognitive(C4)	30	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-5)	Course Overview: General idea about the ICT Laboratory, The role for this Laboratory.	
L-(6-14)	Vocabulary Test: Vocabulary	
	Tutorial Exam	
L-(16-18)	Spoken English Test: Spoken English	
	Tutorial Exam	
L-(20-21)	Reading, Writing, and Listening Test: Reading, Writing, and Listening efficiency.	
L-(22-25)	Technical writing and Professional Communication: Technical writing and professional communication	
	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	A Practical English Grammar.	A.J. Thomas & A.V Martinet		
2	Technical writing.	John M. Lennon		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
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1	Oxford Handbook of Commercial Correspondence	A. Ashley		
2	Writing Scientific English.	. J. Swales		
3	Complete Course in English.	Robert J. Dixon		

Course Outline

General Information

Bangladesh Studies	NCC-01	Semester	1 st Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	0.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	NCC
		Topics Covered	As per design of faculty and university

General Information

Islamic Studies	NCC-02	Semester	First Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	0.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	NCC
		Topics Covered	As per design of faculty and university

1st Year 2nd Semester-2026

Course Outline

1. General Information

Electronic Devices and Circuits	ICT-1201	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite	Physics, Chemistry and Mathematics at Higher Secondary

	Course	Level.
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2. Course Summary

This course provides a comprehensive introduction to the basic idea about semiconductor diodes and its application. This course introduces dc power supply, transistor and its applications. This course also focuses on integrated circuit.

3. Course Objectives

To provide knowledge on semiconductor devices, their electronic characteristics, provide the knowledge of Diode circuits, Transistor circuits, Amplifier circuits, Oscillator circuits, and the functions of operational amplifier.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course.	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Understand the properties of semiconductor.	P02	Cognitive(C4)	20	
C03	Understand the behavior of semiconductor devices such as diode, transistor, Field effect transistor.	P02 P03	Affective(A3)	25	
C04	Model and analysis of oscillator circuits.	P03	Cognitive(C4)	15	
C05	Understand the phenomena of Operational Amplifier.	P04	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course communication systems, The content and policies for the class.	
L-(4-9)	Semiconductor Diodes and Optoelectronic Devices: About Energy bands in solids, Types of Semiconductor Semiconductor diode, Forward and reverse biased p-n junction and their characteristics, junction breakdown, The Zener Diode, Varactor Diode, Tunnel Diode, PIN Diode, LED, Photodiodes, Phototransistors, LCD, solar cells.	
CT-1	Tutorial Exam	
L-(11-16)	DC Power Supply: Half-wave, full-wave and bridge rectifiers, General filter considerations, Capacitor filter, RC filter, Regulated power supply.	
L-(17-20)	Transistor and Transistor Amplifier: Bipolar Junction Transistor, construction, operation, biasing rule, CB, CE and CC configurations and their characteristics, Relations between α and β , DC load line, Q-point and maximum undistorted output. CB, CE and CC amplifiers, small signal low frequency model, Hybrid parameters, Power Amplifiers.	

CT-2	Tutorial Exam	
L-(22-24)	Oscillator: Feedback, Feedback types, Conditions of oscillation, Types of oscillators and their operation, Application of Oscillators, Non-sinusoidal oscillation, Types of Multivibrators and their uses.	
L-(25-27)	Operational amplifiers: Differential and common mode operation, OP-amp basics, Inverting and non-inverting modes, OP-amp applications.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Communication Systems	S. Haykin		
2	Analog Communication	V. Chandra Sekar		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Principle of Communication Engineering	Anokh Singh		
2	Fundamentals of Communication Systems	J. G. Proakis, M. Salehi		

Course Outline

1. General Information

Electronic Devices and Circuits Laboratory	ICT-1202	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1201

2. Course Summary

To observe the characteristics of diode, different circuit configurations of transistor, design and implementations of rectifier circuits, amplifier circuits, oscillator circuits. Observe different function of operational amplifiers.

3. Course Objectives

Electronics lab is helpful for the students to acquire the basic knowledge of electric circuits and its application. This course will prepare students to perform the analysis and design of various electronic circuits.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Know about the general idea of this course and required instruments.	P01	Cognitive(C3)	20	Please refer to Section 8
CO2	Acquire knowledge about the properties of semiconductor materials, semiconductor diodes with their V-I characteristics, diode rectifier circuits with and without filters and voltage regulator.	P02	Cognitive(C4)	30	
CO3	Gain the practical understanding of BJT biasing and different configurations.	P03	Affective(A3)	25	
CO4	Design and Implement oscillator circuits and practical op-amp circuits.	P03	Cognitive(C4)	25	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: General idea about the Electronic Laboratory, The experimental list for this Laboratory.	
L-(4-9)	Semiconductor Diodes and Optoelectronic Devices: The V-I characteristics of forward and reverse biased PN junction diode, Circuit diagram and observe the V-I characteristics, Zener diode as a voltage regulator.	
L-(10-12)	DC Power Supply: Half-wave and full-wave rectifiers without filters, Full-wave bridge rectifiers without filters.	
CT-1	Tutorial Exam	
L-(14-20)	Transistor and Transistor Amplifier: The input and output characteristics of CB, CE, and CC configurations of BJT, The input and output characteristics of CE, and CC transistor amplifiers	
CT-2	Tutorial Exam	
L-(22-25)	Oscillator: the frequency of different oscillator circuits, output waveforms of multi-vibrators.	
L-(26-30)	Operational Amplifier: Op-amp used as a integrator, differentiator, adder and comparator.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Integrated Electronics- Analog and Digital	J Millman, C. Halkias	Tata McGraw-Hill, India.	

	Circuits and Systems			
2	Electrical Technology (Vol. IV)	B. L. Theraja and A. K. Theraja	S. Chand &Co. Ltd, India	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Digital Electronics	W Gothmann William Gothmann	PHI (Pvt.) Ltd..	
2	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Structured Programming Language	ICT-1203	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Mathematics and ICT at Higher Secondary Level

2. Course Summary

This course will introduce the students to the fundamental concepts of programming language. This course focuses on Characters set, Tokens, Keywords, Identifiers, Control Flow, Functions and Program Structure, Pointers and Arrays, Structures & Union and File and Memory management of structured programming.

3. Course Objectives

This course is designed to provide knowledge and expertise on structured programming language by solving various problems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
	Understand the concept of structured	PO1	Cognitive(C3)	20	

C01	programming language				Please refer to Section 8
C02	Understand the concepts of C programming language, its variables, constants, library functions, operators and expressions	P02	Cognitive(C4)	20	
C03	Understand the different structures of control flow of instructions.	P03	Affective(A3)	20	
C04	Understand and use of different data structures and functions.	P03	Cognitive(C4)	15	
C05	Understand and use of sub-functions, divide a complete solution into modules	P04	Cognitive(C3)	15	
C06	Handle different format of data file and manage the run-time memory.	P05	Cognitive(C4)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Introduction: History of C, Importance of C, Basic structured of C programs, Programming style, and Executing a C program.	
L-(4-7)	Type, Operators and Expression: Characters set, Tokens, Keywords, Identifiers, Constants, Variables, Data types, Declaration of Variables, Arithmetic Operators, Relational and Logical Operators, Assignment Operators, Increment and decrement Operators, Conditional Operator, Bitwise Operators, Special Operators, Conditional expressions, Precedence and Order of Evaluation, Type Conversions, Input and Output.	
L-(8-12)	Statements and Blocks, IF-Else, Else-if, Switch, Loops-While and For, Loops-Do-While, Break and Continue, Goto and labels.	
CT-1	Tutorial Exam	
L-(14-20)	Control Flow: Basics of Functions, Functions Returning Non-integers, External Variables, Scope Rules, Header Files, Static Variables, Register Variables, Recursion, The C Preprocessor, File Inclusion, Macro Substitution, Conditional Inclusion.	
L-(21-27)	Declaration and use, index types, multidimensional arrays, Pointers and Address ,Pointer's and Function Arguments, Pointers and Arrays, Pointers to functions	
CT-2	Tutorial Exam	
L-(29-32)	Functions and Program Structure: Basics of Structures, Structures and Functions, Arrays of Structures, Pointer to Structure, Table Lookup, Unions.	
L-(33-38)	File and Memory management: Opening and Closing a file, Input /Output operations on Files, Error handling during I/O operations, Random access to Files, Command line arguments, Dynamic memory allocation, and pointer revisited.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Programming in ANSI C	Balaguruswami	<i>Tata McGraw-Hill publishing Co</i>	
2	The C programming language	brian w. kernighandenis m. ritchie	prentice hall software series	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Turbo C / C++ - The Complete Reference	Herbert Schieldt	McGraw-Hill	
2	C++ Object-oriented Programming	Mitchell, Macmillan		
3	The Apprentice C++ Programmer	Lee, Phillips	Thompson Computer Press	

Course Outline

1. General Information

Structured Programming Language Laboratory	ICT-1204	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203

2. Course Summary

The practical knowledge on programming knowledge to help students to develop programming skills to solve different problems. This course assist student to implement various concepts and structures of C programming language.

3. Course Objectives

This course is designed to improve skill and expertise on structured programming language by solving various problems

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Construct algorithms and flow charts as the part of problem analysis.	P01	Cognitive(C3)	15	Please refer to Section 8
C02	Write, compile and debug programs in C language.	P02	Cognitive(C4)	15	
C03	Use different data types, operators and expressions in a computer program.	P03	Affective(A3)	20	
C04	Design and implement programs involving decision structures, loops, arrays, structures and unions.	P03 P04	Cognitive(C4)	20	
C05	Understand and use of functions, divide a complete solution into modules.	P04 P05	Cognitive(C3)	15	
C06	Handle different format of data file and manage the run-time memory.	P05	Cognitive(C4)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: General idea about the ICT Laboratory and Software laboratory, The experimental list for this Laboratory.	
L-(4-9)	Type, Operators and Expression: Observe the characteristics of data types and operators, design and implement solutions of different problems using variables, identifiers, various operators and expressions, type conversions	
L-(10-15)	Control Flow: Observe the characteristics of control flow structures, design and implement solutions of different problems using Statements and Blocks, decision making statements, looping statements, jumping statements	
CT-1	Tutorial Exam	
L-(17-22)	Functions and Program Structure: Observe the characteristics of Functions, design and implement solutions of different problems using functions, user defined functions, Scope Rules, Static Variables, Register Variables, Recursion, nested blocks	
L-(23-29)	Pointers and Arrays: The characteristics of pointers and arrays, design and implement solutions of different problems using arrays and pointers, Pointers to functions	
CT-2	Tutorial Exam	
L-(31-35)	Structures & Union: The characteristics of structure and union, design and implement solutions of different problems using Structures, Structures and Functions, Arrays of Structures, Pointer to Structure, Unions.	
L-(36-41)	File and Memory management: The characteristics of file and memory management, design and implement solutions of different problems using file, Input /Output operations on Files, Error handling during I/O operations, Random access to Files, Dynamic memory allocation, and pointer revisited.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Book	Writer Name	Publisher Name	Edition
1	Programming in ANSI C	Balaguruswami	Tata McGraw-Hill publishing Co.	
2	The C programming language	brian w. kernighanden m. ritchie	prentice hall softwre series	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Object-Oriented Programming with C++	E Balagurusamy	<i>Tata McGraw Hill Publishing Company Ltd</i>	
2	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Numerical Methods and Analysis	ICT-1205	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	2.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic mathematics knowledge at B.Sc. (Engg.) Levels.

2. Course Summary

This course covers the different numerical methods of solving mathematical and scientific problems such as solving for the roots of nonlinear equations, numerical differentiation and integration, interpolating polynomials and ordinary differential equations.

3. Course Objectives

To provide knowledge of the basic concepts of The Numerical Methods, solution of Algebraic and Transcendental Equations, properties of Interpolation and Spline functions, Numerical Differentiation and Integration, understand Numerical solutions of Ordinary Differential Equation and Partial Differential Equation.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	To acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	To Discuss about the solution of Algebraic and Transcendental Equations	P02	Cognitive(C4)	20	
C03	Analyze the properties of Interpolation and Spline functions	P03	Affective(A3)	25	
C04	Understand about Numerical Differentiation and Integration	P03	Cognitive(C4)	20	
C05	Explain and understand Numerical solutions of ODE and PDE.	P04	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: To comprehend the mission and vision of the Department, Acquire general idea about the course Fundamental and Numerical Methods, Grasp the content and policies for the class.	
L-(4-9)	Solution of Algebraic and Transcendental Equations: Introduction, Bisection Method, Method of False position and Iteration Method, Newton-Raphson Method, Secant Method and Muller's Method, Lin-Bairstow's Method and Quotient- Difference Method.	
CT-1	Tutorial Exam	
L-(11-16)	Interpolation and Spline Functions: Errors in Polynomial Interpolation, Forward and Backward Differences, About Gauss Central Difference Formulae, Stirling's, Formula, Bessel's Formula and Langrage's Interpolation Formula, Linear and Quadratic Splines, Cubic B-Splines.	
CT-2	Tutorial Exam	
L-(19-25)	Numerical Differentiation and Integration, Numerical Solution of ordinary and Partial Differential Equation: Errors in Numerical Differentiation and Differentiation Formulae with function values. Integration- trapezoidal Rule, Simpson's 1/3 and 3/8 Rule and Romberg Integration, Taylor's Series, Euler's Method and Runge-kutta Method, Milne's Method, Laplace's Equation, Jacobi's Methods, Gauss-Seidel Method and ADI Method.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
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1	S.S. Sastry, "Introductory Methods of Numerical Analysis"		PHI Publication	Fifth Edition
2	Burden, Richard L. and Faires, J. Douglas, Numerical Analysis, Boston		MA: Brooks/Cole, Cengage Learning, 2011.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Numerical Methods for Engineers	Chapra, Steven C. and Canale, Raymond P	McGraw-Hill Higher Education 2010	
2	Applied Numerical Methods with MATLAB® for Engineers and Scientists	Chapra, Steven C.,	New York: McGraw-Hill, 2012.	
3	Numerical Mathematics and Computing	Cheney, Ward and Kincaid, David	Boston, MA: Brooks/Cole, Cengage Learning, 2013	

Course Outline

1. General Information

Numerical Methods and Analysis Laboratory	ICT-1206	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic Algebra and Calculus

2. Course Summary

To provide knowledge to problem formulation, implementation with C-programming language of mathematical systems of equation, ordinary differential equations and partial differential equations.

3. Course Objectives

Ideas of mathematical logic, concepts of set theory and Boolean Algebra. To impart the mathematical concepts and numerical methods required to computer science. To know the fundamental ideas of mathematical logic, concepts of set theory and Boolean algebra.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Explore different types of bracketing methods.	P01	Cognitive(C3)	15	Please refer to Section 8
C02	Understand about open method and some algorithms.	P02	Cognitive(C4)	15	
C03	Know about how to use polynomial method for solving real life problems.	P02 P03	Affective(A3)	20	
C04	Know about different types of numerical integration and differentiation.	P04	Cognitive(C4)	20	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Bracketing Method: Algorithm and flow chart of Bisection method and Regula Falsi Method, Bisection and Regula Falsi Method using C/C++/Python/Java etc.	
L-(4-9)	Open Method: Algorithm and flow chart of fixed-point iteration method and secant method, fixed point iteration method and secant method using C/C++/Python/Java etc., Algorithm and flow chart of Newton Raphson method and modified Newton Raphson method, Newton Raphson method and modified Newton Raphson method using C/C++/Python/Java etc.	
CT-1	Tutorial Exam	
L-(12-17)	Polynomial Method: Algorithm and flow chart of Gauss elimination method and Jaccobi method, Gauss elimination method and Jaccobi method using C/C++/Python/Java etc.	
CT-2	Tutorial Exam	
L-(20-25)	Numerical Integration & Differentiation: Algorithm and flow chart of Simpson 1/3 rule and Runge Kutta method, Simpson 1/3 rule and Runge Kutta method using C/C++/Python/Java etc.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Book	Writer Name	Publisher Name	Edition
1	Discrete Mathematics and Its Applications	Kenneth H. Rosen	WCB/ McGraw-Hill	
2	Introductory Methods of Numerical Analysis	S S Sastry	.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Discrete Mathematical Structures	Bernard Kolman, Robert C	Busby, Sharon Ross, Prentice Hall of India.	

2	Discrete Mathematical Structures with Applications to Computer Science	J.P.Tremblay, R. Manohar	Tata McGraw Hill Publishing Company Ltd	
3	Numerical Mathematical Analysis	J B Scarborough		
4	Object Oriented Numerical Methods	V Rajaraman		

Course Outline

1. General Information

Geometry and Complex Variables	MATH-1201	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	HSC Level Mathematics.

2. Course Summary

This course is to develop expertise on representing 2D and 3D geometry, complex variable, function, differentiation and integration of complex variables.

3. Course Objectives

To provide knowledge on 2D and 3D geometry and complex variables.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Understand the 2D form of geometry.	P02	Cognitive(C4)	20	
C03	Understand the 3D form of geometry	P03	Affective(A3)	25	
C04	Understand the complex number and variable	P03	Cognitive(C4)	20	
C05	Understand and apply the complex function	P03 P04	Cognitive(C3)	15	
C06	Understand the differentiation of complex function	P04	Cognitive(C4)	10	

C07	Understand the integration of complex functions	P04 P05	Affective(A3)	5	
C08	Understand the concepts of Conformal mapping	P05	Cognitive(C4)	5	
C09	Apply the concepts of Conformal mapping in physical problems	P05	Cognitive(C4)	5	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course Overview: Mission and vision of the Department, General idea about the course Vector Analysis and Linear Algebra, Content and policies for the class	
L-(2-7)	2D Analytical geometry: Cartesian and polar coordinates, Change of axes, Pair of straight lines, The general second degree equation, Circle, System of circles, parabola, ellipse, hyperbola.	
L-(8-12)	3D Analytical geometry: Rectangular coordinates, plane, straight line, sphere, central coincides and general equation of the second degree.	
CT-1	Tutorial Exam	
L-(14-16)	Complex Variables: The complex number system, graphical representation, fundamental operations, absolute value, polar form, De Moivre's theorem, roots of complex number, Euler's formula, polynomial equations, vector interpretation of complex number, Dot and cross product, complex conjugate, point set.	
L-(17-20)	Complex Function Limit and continuity: Complex variable and functions, Single and multiple valued function, inverse function, transformations, curvilinear coordinates, elementary functions, branch points and branch lines, Riemann surfaces, limits, theorems on limits, infinity, continuity, theorems on continuity, uniform continuity, sequences, limit of sequences, theorems on limits of sequences infinite series.	
CT-2	Tutorial Exam	
L-(22-26)	Complex Differentiation and the Cauchy-Riemann Equations: Derivatives, Analytic functions, Cauchy-Riemann equations, Harmonic functions, Geometric interpretation of the derivative, differentials, rule of derivatives, derivatives of elementary functions, higher order derivatives, L'Hospital's rule, singular points, Orthogonal families, curves applications to geometry and mechanics, complex differential operators, gradient, divergence, curl and Laplacian	
L-(27-30)	Complex Integration and Cauchy's theorem: Complex line integrals, real line integrals, connection between real and complex line integrals, properties of integrals, change of variables, Jordan curve theorem, Convention regarding traversal of a closed path, Green's theorem, Complex form of Green's theorem, Cauchy's theorem, Cauchy-Goursat theorem, Morera's theorem, indefinite integrals, integrals of special functions	
CT-3	Tutorial Exam	

L-(32-35)	Conformal Mapping: Transformations, Jacobian of a transformation, Complex mapping function, conformal mapping, Riemann's mapping theorem, fixed or invariant points of a transform, general transform, successive transform, linear transform, bilinear transform, mapping of a half plane on to a circle, Schwarz-Christoffel transformation, transformation of Boundaries in parametric form, some special mapping.	
L-(36-38)	Physical Applications of Conformal Mapping: Boundary value problems, Harmonic and conjugate functions, Dirichlet and Neumann problems, Dirichlet problems for unit circle, Poisson's formula, half plan, solutions by conformal mapping, complex potential, sources and sinks, some special flows, Bernoulli's theorem, Coulomb's law, electric field and potential, line charges, conductance and capacitance	
CT-4	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Analytical Geometry 2D and 3D	P. R. Vittal		
2	Complex Variable	Pearson Murray R. Spiegel etl	Schaum'sOutlone	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Geometry	Barnett Rich and Christopher Thomas	Schaum'sOutlone 4th Ed	
2	Complex Variable: Introduction and Applications	Mark J. Ablowitz and A. S. Fokas	<i>Cambridge Univ Press</i> 2003, 2 nd Ed..	

Course Outline

1. General Information

Sociology	HUM-1201	Semester	2 nd Semester
		Full Marks	100
		Exam. Duration	4 Hours
		Course Credit	2.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Humanities
		Prerequisite Course	Basic Sociology at Higher Secondary Level

2. Course Summary

This course will introduce the students to the fundamental concepts of nature, scope, origin and development of sociology, properties of social perspectives, Basic Concepts of society and cultural norms and values, Social process and type of society, Social structure and Institutions.

3. Course Objectives

To develop knowledge about inequality of sociology.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Analyze the characteristics of culture and socialization	P02	Cognitive(C4)	25	
C03	Explain the characteristics of pre-industrial, industrial and post-industrial society	P03	Affective(A3)	25	
C04	Understand the relation between Environment and Population	P03	Cognitive(C4)	25	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: Mission and vision of the Department, General idea about the course, Content and policies for the course.	

L-(3-6)	Basic Concept of Sociology: Nature and scope, origin and development, relationship with other disciplines and natural sciences, scientific method and techniques for sociological investigation, objectivity in sociology, Sociology and commonsense, sociological imaginations, functionalist, conflict, inter-actionist perspectives.	
L-(7-8)	Society: Hunter gatherer society to capitalist industrial society and late capitalism. The role of Group, society, community, association, institution, organization, culture, material and nonmaterial culture, culture lag, civilization, norms, values, folkways, mores, cultural traits, cultural unity and diversity, acculturation, assimilation, diffusion, enculturation.	
CT-1	Tutorial Exam	
L-(10-11)	Social Process and Institutions: Cooperation, competition and conflict, socialization and its agent, personality development. Family, marriage, kinship, property, religion, economy and political institutions, functionalist and conflict perspectives about institutions.	
L-(12-13)	Social Structure: Components of social structure, theories of social structure, social inequality and stratification, class structure, systems of stratification and social mobility, functionalist and conflict perspectives about social stratification	
CT-2	Tutorial Exam	
L-(15-16)	Population and Environment: Population growth, ecological balance, ecosystem, threats to global environment, environment as a social issue.	
L-(17-19)	Social Change and Development: About Social change, factors of change, progress, evolution, development, theories of social change, planned change, technology and social change, social problems, cause and consequences of social problems, social disorganization and deviance.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Sociology	Anthony Giddens		
2	Sociology: A Guide to Problems and Literature by Bottomore			

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	<i>Human Societies</i>	<i>Lenski et al</i>		
2	<i>Social Change</i>	<i>Moore</i>		
3	<i>Introduction to Sociology</i>	<i>Pascal Gisbert</i>		
4	<i>Social Problems</i>	<i>Scarpitti & Anderson</i>		
5	<i>Lecture Sheet and Presentation Materials</i>			

Course Outline

Viva-voce	ICT-1000	Semester	2 nd Semester
		Full Marks	100
		Course Credit	1.00
		Course Type	Viva-voce
		Prerequisite Course	Based on 2 st Year 1 st and 2 nd Semester

2nd Year 1st Semester-2027 Course Outline

1. General Information

Digital Electronics and Logic Design	ICT-2101	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Physics, Mathematics and ICT at Higher Secondary Level

2. Course Summary

Systems using programmable logic, with specific focus on programmable logic devices. Within this context it introduces the fundamentals of digital logic, digital arithmetic, programmable logic and computer architecture. Research skills and aspects of professional practice are developed through group-based assignments. It emphasizes on techniques to design, analyze, plan, and implement complex digital systems

3. Course Objectives

To provide knowledge on Digital Electronics including digital systems, different number systems, Boolean algebra, different logic gates, different simplification methods of Boolean expressions, designing techniques of combinational and sequential logic circuits and Digital ICs.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Impart the knowledge on digital systems, different number systems and coding, error-checking in digital signals.	PO1	Cognitive(C3)	25	Please refer to Section 8

C02	Define Boolean algebra and provide the knowledge of truth table, logic functions and different logic gates.	P02 P03	Cognitive(C 4)	20	
C03	Provide the concepts of simplifying Boolean expression using K-map techniques and Quin-Mc-Cluskey minimization techniques.	P03 P04	Affective(A 3)	20	
C04	Understand the techniques of designing and analyzing combinational logic circuits.	P03 P04	Cognitive(C 3)	10	
C05	Impart the design methods and analysis of sequential logic circuits.	P04 P05	Cognitive(C 4)	15	
C06	Provide the introductory concepts of digital ICs.	P04 P05	Affective(A 3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Introduction: Digital systems, Advantages of Digital System, Digital Computers, System block structure.	
L-(3-5)	Number systems: The decimal number system, Binary number system, Binary to Decimal Conversion, Decimal to Binary Conversion, Binary Addition and Subtraction, 1's complement and 2's complement Subtraction, Representation of Binary Numbers as Electrical Signals, Octal Number System, Decimal to Octal Conversion, Binary to Octal Conversion, Octal to Binary Conversion, Usefulness of Octal Number System, Hexadecimal Number System, Binary Coded Decimal (BCD) Code, Gray Code.	
CT-1	Tutorial Exam	
L-(7-9)	Boolean algebra and logic gates: Boolean algebra, Truth tables, logic functions, simple logic gates	
L-(10-13)	Simplifying Boolean expressions: Karnaugh map, Quine-McCluskey method.	
CT-2	Tutorial Exam	
L-(15-17)	Combinational logic circuits: Introduction, Threshold logic, Adder, Subtractor, Decoder, Encoder, Multiplexer	
L-(18-20)	Sequential logic circuits: Synchronous and asynchronous operation, memory elements, Abstract model of sequential circuits, representation of sequential machines, analysis of sequential circuits.	
CT-3	Tutorial Exam	
L-(22-24)	Design of sequential logic circuits: Introduction, problem formulation, state minimization, state assignment, circuit implementation, Counter, Register.	
L-(25-26)	Integrated Circuits: IC Technology, Basic monolithic IC, Large and Medium scale integration, Digital ICs.	
CT-4	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Digital Electronics	W Gothmann William	PHI (Pvt.) Ltd.	

		Gothmann		
2	Digital Systems	Tocci Winder		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Digital Electronics	W Gothmann William Gothmann	PHI (Pvt.) Ltd	
2	Switching Theory and Digital Electronics	Dr. V K Jain	Khanna Publishers	

Course Outline

1. General Information

Digital Electronics and Logic Design Laboratory	ICT-2102	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	Basic Physics at Higher Secondary Level

2. Course Summary

Digital Electronics Lab is helpful for the students to acquire the basic knowledge of digital logic levels and its application to construct digital electronics circuits. This course will prepare students to perform the analysis and design of various digital electronic circuits.

3. Course Objectives

To introduce the basic idea about the fundamental digital logic gate design and construction using diode and transistor.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Gain the practical understanding of different logic gates.	PO1	Cognitive(C3)	30	Please refer to Section 8
CO2	Design and implement combinational logic circuits.	PO2	Cognitive(C4)	35	
CO3	Design and implement sequential logic circuits.	PO2 PO3	Affective(A3)	35	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Logic Gates: AND/OR gates using Diode Logic (DL), AND/OR gates using Transistor Logic (TTL), NAND and NOR as a universal gate using ICs.	
L-(4-9)	Boolean Algebra: Transistor acts as NOT gate, of the given Boolean function using logic gates, Operation of half-adder and Full-adder circuits using logic gates, Operation of half-subtractor and Full-subtractor circuits using logic gates.	
CT-1	Tutorial Exam	
L-(11-16)	Combinational Circuit: Implementation and verification of decoder using logic gates. Implementation and verification of encoder using logic gates. Implementation and verification of Multiplexer/De-multiplexer using logic gates.	
CT-2	Tutorial Exam	
L-(18-24)	Sequential Circuit: Verification of state tables of RS, JK, T and D flip-flop using logic gates, Design and verify the 4-bit synchronous counter.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Digital Electronics	Malvino	McGraw Hill	
2	Digital Systems	Tocci Winder		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Digital Electronics	W Gothmann William Gothmann	PHI (Pvt.) Ltd	
2	Switching Theory and Digital Electronics	Dr. V K Jain	Khanna Publishers	
3	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Data Structure and Algorithm	ICT-2103	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	Basic C Programming

2. Course Summary

To provide knowledge on different data structure for computer programming language, complexity of algorithm design, basic operations of linked list, tree, graphs and those algorithms, string processing algorithms, sorting and searching algorithms and their complexity.

3. Course Objectives

Assess how the choice of data structures and algorithm design methods impacts the performance of programs.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Discuss about the fundamental of data structure.	P02	Cognitive(C4)	25	
C03	Analyze the properties of linked list and algorithmic complexity.	P02 P03	Affective(A3)	20	
C04	Understand about STACK and Queue		Cognitive(C3)	15	
C05	Explain and Design process of searching and sorting			15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: The mission and vision of the Department, General idea about the course Fundamental and Data Structure, The content and policies for the class, To discuss Basic Terminology; Elementary Data organization, Data structure, Data Structure operations, Data types, Logical, abstract view of data: Arrays, Records, Pointers, Structure.	
L-(3-5)	Fundamental of Data Structure & Algorithm: Basic Terminology; Elementary Data organization, Data structure, Data Structure operations, Data types, Logical, abstract view of data: Arrays, Records, Pointers, Structure.	

L-(6-9)	Algorithms Complexity & Linked Lists: Definition and properties of algorithm, data flow-chart, pseudo code, Time-Space Trade off, Complexity Notations, and complexity calculations, Introduction, Linked Lists Representation, linear and circular linked list, Traversing, Searching, Insertion and Deletion Algorithms of linked lists, Complexity calculation.	
	Tutorial Exam	
L-(11-16)	Stack Queue and Recursion, Trees & Graph: Introduction to Stacks, Queue and recursion, Traversing, Searching, Insertion and Deletion Algorithms of stack, queue and recursion, Introduction, Representation of different types of trees and graphs, binary search tree, Traversing, Searching, insertion, and Deleting algorithm of trees and graphs, Heap; heap sort, path lengths, Huffman's algorithm.	
CT-2	Tutorial Exam	
L-(18-24)	String Processing, Searching & Sorting Algorithm: Introduction, basic terminology, storing strings, character data type, string operations, word processing, pattern matching algorithms. To explain searching and sorting algorithms: Introduction to searching and sorting, concepts of division and conquer, sorting algorithm: insertion sort, selection sort, quick sort, merge-sort, radix-sort, searching algorithm: binary search, binary search tree, data modification and hashing.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Data Structure and Algorithm	Seymour Lipsuitz	Mc Graw Hill (Schaum's Outline Series).	
2	Data Structures using C and C++	Y Langsam, M J Augenstein, A M Tanenbaum	Prentice Hall India Ltd.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Java Gently	J M Bishop, Addison Wesley	ISBN 0-201-59399-8.	
2	Fundamentals of Data structures	by E.Horowitz and S. Sahni		
3	Introduction to Algorithms	<i>T.H. Cormen, Leiserson</i>		

Course Outline

1. General Information

Data Structure and Algorithm Lab.	ICT-2104	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2103

2. Course Summary

To provide practical knowledge of different data structure for computer programming language, use of linked list, tree and graph in real problems, implementation of searching and sorting techniques.

3. Course Objective

Assess how the choice of data structures and algorithm design methods impacts the performance of programs.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Students can apply Data Structure and Algorithm for solving real life problems	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Analysis the performance and complexity of sorting and searching algorithm	P02	Cognitive(C4)	25	
C03	Implement Array and Linked List for solving real time problems.	P02 P03	Affective(A3)	20	
C04	Understand different types of Stack and queue, trees and graphs.	P04	Cognitive(C3)	30	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Introduction to Data Structure & Algorithm: The algorithm of finding the largest element in array, understand the solutions of quadratic equation, find the avg of three numbers, procedure SWITCH to interchanges the values, pattern matching algorithm.	
L-(4-9)	Searching and Sorting: The algorithm of linear search, Binary Search and implement them using C/C++/Java/Python, The algorithm of selection sort, insertion sort, merge sort, quick sort, heap sort, Bubble sort and implement them using C/C++/Java/Python.	
CT-1	Tutorial Exam	

L-(11-16)	Array and Linked List: The Principle of Recursion, Comparison between Recursion and Iteration, Tail Recursion, Factorial, Fibonacci Sequence, GCD, Tower of Hanoi (TOH) , singly linked list, doubly linked list, circular linked list, basic operation in linked list, node creation, node insertion and deletion from beginning, end and specified position, stack and queue as linked list, Them using C/C++/Java/Python.	
CT-2	Tutorial Exam	
L-(18-24)	Array and Linked List: Introduction to Stacks, Queue and recursion, Traversing, Searching, Insertion and Deletion Algorithms of stake, queue and recursion, Introduction, Representation of different types of trees and graphs, binary search tree, Traversing, Searching, insertion, and Deleting algorithm of trees and graphs, Heap; heap sort, path lengths, Huffman's algorithm and implement above topics using C/C++/Java/Python.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Data Structure and Algorithm	Seymour Lipsuitz	Mc Graw Hill (Schaum's Outline Series).	
2	Data Structures using C and C++	Y Langsam, M J Augenstein, A M Tanenbaum	Prentice Hall India Ltd.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Java Gently	J M Bishop, Addison Wesley	ISBN 0-201-59399-8..	
2	Fundamentals of Data structures	by E.Horowitz and S. Sahni		
3	Introduction to Algorithms	T.H. Cormen, Leiserson		

Course Outline

1. General Information

Object Oriented Programming I	ICT-2105	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

This course investigates object-oriented methods including object-oriented programming, analysis and design. Current methodology is emphasized. The use of object-oriented features such as encapsulation, information hiding, inheritance and polymorphism is reinforced by class assignments and programming exercises.

3. Course Objectives

To provide knowledge Object oriented computer programming language concepts, data encapsulation, class and objects and their uses and scopes, function and operator overloading, virtual function and polymorphisms, C++ streams, I/O operations, and console managements.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the object and classes relevant to the computer programming languages.	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Understand the syntax and uses of function & operator overloading	P02	Cognitive(C4)	25	
C03	Understand the syntax and uses of virtual function and polymorphism	P02 P03	Affective(A3)	20	
C04	Understand the Java programming language & its Methods	P03	Cognitive(C3)	15	
C05	Understand Standard Java Packages, Socket Programming & Java Database Connectivity	P04	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Principles of Objective Oriented Programming: Object Oriented Programming Paradigm, Basic Concepts of Object, Oriented Programming, Benefits of Object Oriented Programming, Object Oriented Languages, Applications of Object Oriented Programming, Beginning with C++.	
L-(4-5)	Token Expressions & Control Structures: Tokens, Keywords, Identifiers and Constants, Data Types, Type Compatibility, Variables, Operators in C++, Implicit Conversions, Operator Overloading, Operator Precedence, Control Structures.	

L-(6-10)	Functions in C++, Classes & Objects: The Main Function, Function Prototyping, Call by Reference, Return by Reference, Inline Functions, Function Overloading, Friend and Virtual Functions. Specifying a class, Member Functions, Arrays within a class, Static Member Functions, Arrays of Objects, Friendly Functions.	
	Tutorial Exam	
L-(11-13)	Constructors & Destructors, Operator Overloading, Inheritance: Constructors, Parameterized Constructors, Copy Constructors, Dynamic constructors, Destructors, Defining Operator Overloading, Overloading Operators, Rules for Overloading Operators, Type Conversions	
L-(14-17)	Pointers, Virtual Functions & Polymorphism, Working with Files, Exception handling: Pointers, Pointers to Objects, this pointer, Pointer to Derived Classes, Virtual Functions, Classes for File Stream Operations, Opening and Closing a File, File Modes, File Pointers, Input Output Operations, Updating a File.	
CT-2	Tutorial Exam	
L-(18-24)	An Object-Oriented Approach in Real Life Problems: Object Orientation O Development O Themes, Modelling, Abstraction Models.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Object-Oriented Programming with C++	E Balagurusamy	Tata McGraw-Hill Publishing Company Ltd Turbo C / C++ The Complete Reference, Herbert Schildt, McGraw-Hill.	
2	Programming with Java	E Balagurusamy	Tata McGraw-Hill Publishing Company Ltd.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	C++ Object-oriented Programming	Mitchell	Macmillan, 1993.5. Mastering Java 2 by John Zukowski	
2	The Apprentice C++ Programmer	Lee, Phillips	Thompson Computer Press, 1997.	
3	Mastering Java 2	John Zukowski		

Course Outline

1. General Information

Object Oriented Programming Lab. I	ICT-2106	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

This course investigates object-oriented methods including object-oriented programming, analysis and design. Current methodology is emphasized. The use of object-oriented features such as encapsulation, information hiding, inheritance and polymorphism is reinforced by class assignments and programming exercises.

3. Course Objectives

To provide knowledge Object oriented computer programming language concepts, data encapsulation, class and objects and their uses and scopes, function and operator overloading, virtual function and polymorphisms, C++ streams, I/O operations, and console managements.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Design and Implementation of C++ codes with beginning with C++, Token, expression, and Function in C++.	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Design and Implement of C++ codes with class and objects.	P02	Cognitive(C4)	25	
C03	Design and implementation of C++ codes with Constructor, Destructor, Operator overloading and inheritance.	P02 P03	Affective(A3)	20	
C04	Design and Implementation of C++ codes with polymorphism and Virtual Function	P04	Cognitive(C3)	15	
C05	Design and Implement of Java codes with private and public objects and classes, function overloading, virtual functions and function polymorphisms	P05	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Beginning with C++: A program that reflects scope resolution operator, manipulators, reference variable, type cast operator, different control structure, swapping function, pyramid program, sinx and cosx function, different mathematical function, Function prototyping, call by reference, return by reference, inline function, default arguments, function overloading, friend and virtual function.	
L-(4-9)	Class and Objects: A program that reflects member function, nesting of member function, private member function, Arrays within a class, static data members, static member function, arrays of objects, returning objects, objects as function arguments, pointers to members.	
CT-1	Tutorial Exam	
L-(11-16)	Constructor, Inheritance and Polymorphism: Parameterize, copy and multiple constructors, Destructor, Overloading binary and unary operator, Single inheritance, multiple inheritance, multilevel inheritance and Hybrid Inheritance, Pointers to objects, Virtual function and Pure Virtual Function.	
CT-2	Tutorial Exam	
L-(18-24)	Java Programming: Java codes with private and public objects and classes, function overloading, virtual functions and function polymorphisms, Java program that reads a file name from the user, and then displays information about whether the file exists, whether the file is readable, whether the file is writable, the type of file and the length of the file in bytes, Program that reads a file and displays the file on the screen, with a line number before each line. Write a Java program that displays the number of characters, lines and words in a text file.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Object-Oriented Programming with C++	E Balagurusamy	, Tata McGraw-Hill Publishing Company Ltd Turbo C / C++ The Complete Reference, Herbert Schildt, McGraw-Hill.	
2	Programming with Java	E Balagurusamy	Tata McGraw-Hill Publishing Company Ltd.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	C++ Object-oriented Programming	Mitchell, Macmillan, 1993		
2	The Apprentice C++ Programmer	Lee, Phillips,	Thompson Computer Press, 1997	
3	Mastering Java 2	<i>John Zukowski</i>	<i>Complete Reference of Java 2 by Herbert Schildt</i>	

Course Outline

1. General Information

Signals and Systems	ICT-2107	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1101, MATH-1101, and MATH-1201

2. Course Summary

This course is designed to provide the knowledge on signals and systems. The course covers characterization of signals and its classification, LTI systems, Fourier series and Fourier transform representation of both continuous and discrete-time signals, application of Fourier representation, Laplace transform, z-transform and digital processing of continuous-time signal.

3. Course Objectives

To provide exposure on signals and systems concepts to the students, which is highly significant for communication engineering. Besides, the students will acquire sound knowledge for the modeling of signals to design the real systems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire knowledge about the signals and systems with their applications.	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Know about the LTI systems and its behavior and properties.	P02	Cognitive(C4)	25	
C03	Understand the representation and analysis of signals employing Fourier series and transformations.	P02 P03	Affective(A3)	20	

C04	Know about the Laplace and Z-transform of signals.	P04	Cognitive(C3)	15	
C05	Attain the knowledge about the application of Fourier representation and digital processing of Continuous Time Signals in the real system design.	P05	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the ICT Department, General idea about the course objectives and fundamentals of signals and system, The content and learning policies	
L-(4-6)	Introduction to Signals and Systems: The characterization and classification of signals, The transformations of the independent variable, The representation of signal, The systems and its basic properties, Discrete and continuous-time LTI systems LTI systems, Casual LTI systems described by differential and difference equations.	
L-(7-9)	Linear Time-Invariant (LTI) System: The discrete and continuous-time LTI systems, The properties of LTI systems, Casual LTI systems described by differential and difference equations.	
CT-1	Tutorial Exam	
L-(11-14)	Fourier Series (FS) Representation of Periodic Signals: FS representation of continuous and discrete-time periodic signal, The convergence of the FS, The properties of continuous and discrete-time FS, Fourier series and LTI system.	
L-(15-17)	Fourier Transform (FT) Representation of Signals: Continuous and discrete-time aperiodic signals, FT representation of continuous and discrete-time aperiodic signals, FT representation of continuous and discrete-time periodic signals, continuous and discrete-time FT, convolution properties of continuous and discrete-time FT.	
CT-2	Tutorial Exam	
L-(19-20)	Time and Frequency Characterization of Signals and Systems: The magnitude-phase representation of FT, The first order and second order continuous and discrete-time systems.	
L-(21-22)	Laplace Transform (LT): Laplace transform and its classification, The solving of differential equations with initial conditions, LT of systems.	
L-(23-24)	z-Transform: Z-transform properties of z-transform and ROC, and inversion of z-transform, LTI system in terms of z-transform, computational structures for implementing DT systems, and unilateral z-transform.	
L-(25-26)	Digital Processing of Continuous Time Signals: The sampling process, sampling of continuous time and band pass signals, Analog low pass, high pass, band pass band stop filter, anti-aliasing filter design and signal	

	reconstruction filter.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Signals and Systems	Alan V. Oppenheim and Alan S. Willsky		
2	Digital Signal Processing	Sanjit K Mitra	.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Signals and Systems	Simon Haykin & Barry Van Veen		
2	Digital Signal Processing	J G Proakis & D G Manolakis		
3	Lecture Sheet and Presentation Materials			

Course Outline

1.General Information

Signals and Systems Lab.	ICT-2108	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2107

2. Course Summary

This practical course is designed to develop expertise on signals and systems modeling. The practical knowledge on signals and systems modeling is highly significant in the communication system design. This course covers characterization of signals and its classification, LTI systems, Fourier series and Fourier transform representation of both continuous and discrete-time signals, application of Fourier representation, Laplace transform, z-transform and digital processing of continuous-time signal.

3. Course Objectives

To provide practical knowledge about signals and systems modeling. Moreover, the students will know how to design transceiver model in terms of physical layer baseband signaling for a communication system.

4.Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire knowledge about the signals and systems with their applications	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Know about the modeling of LTI systems	P02	Cognitive(C4)	25	
C03	Understand the representation and analysis of signals employing Fourier series and transformations	P02 P03	Affective(A3)	20	
C04	Know about the Laplace and Z-transform of signals.	P04	Cognitive(C3)	15	
C05	Attain the practical knowledge about the application of Fourier representation and digital processing of continuous time signals in the real system design.	P05	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course Overview: General idea about the signals and systems Laboratory, The experiment list for this Laboratory, The required instruments and software tools.	
L-(2-3)	Signals Generation: Continuous and discrete-time signals using MATLAB. The laboratory reports.	
L-(4-5)	Signal Processing Operations and System Properties Verifications: Basic signal processing operations on continuous and discrete-domain signals using MATLAB, Properties of a system in both continuous and discrete-domain, The laboratory report.	
CT-1	Tutorial Exam	
L-(7-8)	Convolution of Signals: Convolution of signals in continuous and discrete-time using MATLAB, The result of convolution by analytical calculation, The laboratory report.	
L-(9-10)	Fourier Series (FS) Representation of Signal: The trigonometric and exponential FS coefficients of a periodic signal, The discrete spectrum of the signal, The signal by combining the FS coefficients, The laboratory report.	
CT-2	Tutorial Exam	
L-(11-12)	Fourier, Laplace and z-Transformations of Signals: FT and IFT operations on continuous and discrete-time signals using MATLAB, The amplitude and phase spectrum, LT and z-transforms on signals, The laboratory report.	

L-(13-15)	Signal Sampling Process: Discrete time sequence by sampling a continuous time signal, The signal with the generated discrete time sequence considering different Nyquist rate, The laboratory report.	
CT-3	Tutorial Exam	
L-(17-22)	Design of Analog Filters: First order low pass and high pass filters, The response of the filters in logarithmic scale, The laboratory report.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Signals and Systems	Alan V. Oppenheim and Alan S. Willsky		
2	Digital Signal Processing	Sanjit K Mitra	.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Signals and Systems	Simon Haykin & Barry Van Veen		
2	Digital Signal Processing	J G Proakis & D G Manolakis		
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Vector Analysis and Linear Algebra	MATH-2101	Semester	3 rd Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic Science
		Prerequisite Course	HSC Level Mathematics

2. Course Summary

This course to develop expertise on representing various situational data in vector and matrix form.

Linear relationship among various domain data. Different types of modeling, manipulation and analysis.

3. Course Objectives

To provide knowledge on vector analysis Linear Algebra:

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Acquire general idea about the course	PO1	Cognitive(C3)	25	Please refer to Section 8
CO2	Define and experience with the vector, matrix, vector space and functions.	PO2	Cognitive(C4)	25	
CO3	c relations.	PO3	Affective(A3)	20	
CO4	Analysis of vector relations	PO4	Cognitive(C3)	10	
CO5	Understand the mapping functions.	PO5	Affective(A3)	10	
CO6	Apply for different data domain	PO6	Cognitive(C3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course Vector Analysis and Linear Algebra, The content and policies for the class.	
L-(4-5)	Vector Analysis: Definition and Theorems on vector and scalar product of vectors, vector differentiation, vector differential operator, vector integration.	
L-(6-8)	Linear Algebra: Vector space, subspace, sum and direct sum, Linear dependence and independence, basis and dimension, Linear transformation: Range, kernel, nullity, rank, singular and non-singular transformations	
CT-1	Tutorial Exam	
L-(10-13)	Matrix: Matrix representation of a linear operator. Change of basis, similarity, Matrices and linear mappings, Characteristic roots and vectors	
L-(14-15)	Mapping: Matrices and linear mappings, Characteristic roots and vectors	
CT-2	Tutorial Exam	
L-(17-20)	Linear Transform: Linear transformations, Theorems and problems Characteristic and Minimum Polynomials of square matrices	
L-(21-23)	Linear function: Linear functions and dual vector spaces, Annihilator.	
CT-2	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Elementary Linear Algebra	Larson & Falvo	6 th Ed. Huston Pub, Boston, New York 2009	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Vector Analysis and Tensor Calculus	Spigel M R		
2	Linear Algebra	Lipschutz, S		
3	Topics in Algebra	<i>Herstein, L.N</i>		

2nd Year 2nd Semester-2027 Course Outline

1. General Information

Database Management Systems	ICT-2201	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1102

2. Course Summary

This course is introduced about database management systems. This course covers Data Models, SQL, Data Storage & Indexing, Query Processing & Optimization, Transactions & Concurrency, Databases Recovery System, and Database System Architecture.

3. Course Objectives

This course focuses on the fundamentals relational database management systems, and the current developments in database theory and their practice.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the different issues involved in the design and implementation of a database system.	P01	Cognitive(C3)	10	
C02	Study the physical and logical	P01	Cognitive(C4)	20	

	database designs, database modeling, relational, hierarchical, and network models	P02			
C03	Understand and use data manipulation language to query, update, and manage a database	P02 P03	Affective(A3)	20	
C04	Develop an understanding of essential DBMS concepts such as: storage, database security, integrity, concurrency, distributed database, and Data Warehousing.	P03 P04 P05	Cognitive(C3)	15	
C05	Understand query processing and database recovery techniques.	P04 P05	Affective(A3)	15	
C06	Understand different database architectures	P03 P04	Cognitive(C3)	20	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Introduction: database applications, database vs file systems, view of data, data models, database languages, database users and administrators, transaction management, database system architecture.	
L-(4-7)	Data Models: E-R Model-Basic concepts, constraints, keys, E-R diagram, Relational model – structure of, Relational database, relational algebra, modification of database and views.	
CT-1	Tutorial Exam	
L-(9-11)	SQL: Background, basic structure, set operations, aggregate functions, null values, nested sub-queries, derived relations, views, modification of the database, joined relations, data-definition language, embedded SQL, other SQL features.	
L-(12-13)	Data Storage & Indexing: Overview of physical storage media, tertiary media, file organization, indexing concepts, ordered indices, B ⁺ tree index files, static hashing, dynamic hashing.	
L-(14-15)	Query Processing & Optimization: Overview, measures of query cost, selection operation, sorting, join, query optimization, choice of evaluation plans.	
L-(16-17)	Transactions & Concurrency: Basic concepts, transaction states, implementation of atomicity and durability, concurrent execution and serializability, concurrency control protocols-lock based, time-stamp based, validation based, multi-version scheme, deadlock handling.	
CT-2	Tutorial Exam	

L-(19-21)	Databases Recovery System: Failure classification, storage structure, Recovery and Atomicity, Log-based Recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer management, Advanced Recovery Techniques.	
L-(22-24)	Database System Architecture: Introduction, Centralized and decentralized, Client-server architecture, server system architecture, distributed systems, distributed data storage; distributed transactions commit protocol, parallel systems, I/O parallelism, inter query and intra query parallelism.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Database System Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw Hill	
2	Database Systems – Management and Design	Pratt and Adamski	Boyd and Fraser	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	An Introduction to Database System	C J Date	Adison-Wesley	
2	Data Analysis for Database Design	D R Howe	Arnold.	
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Database Management Systems Lab.	ICT-2202	Semester	4 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2201

2. Course Summary

The practical knowledge on Database Management Systems.

3. Course Objectives

This course focuses on designing and implementing a database application, which will include a web-based user interface as its front-end and a supporting SQL Server database as its back end.

4. Course Outcomes

CO	CO Description	P0	Domain (LoBT)	Weight	Assessment Methods
C01	Have a real hands-on experience by using a full-fledged database management system.	P01	Cognitive(C3)	20	
C02	Describe fundamental elements of a relational database management systems and data models	P01	Cognitive(C4)	15	
C03	Populate a relational database and formulate SQL queries on the data	P02 P03	Affective(A3)	20	
C04	Learn practical knowledge on data storage, indexing and query processing	P04 P05	Cognitive(C3)	15	
C05	Learn practical knowledge on database recovery and security	P03 P05	Affective(A3)	15	
C06	Observe practical knowledge on database system architecture	P02 P03	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course overview: General idea about the ICT Laboratory and DBMS laboratory, The experimental list for this Laboratory.	
L-(3-4)	Data Models: Observe characteristics of various data models, Draw E-R diagram, Design Relational model using constraints, keys, relational algebra, modification of database and views.	
L-(5-6)	SQL: Observe the basic structure of SQL, handling SQL queries specially in the case of set operations, aggregate functions, null values, nested sub-queries, derived relations, views, modification of the database	
L-(7-8)	Data Storage & Indexing: Observe the characteristics of physical storage media, tertiary media, file organization, database indexing	

L-(9-10)	Query Processing & Optimization: Observe the characteristics of query processing and optimization, practical knowledge on query cost measurement, selection operation, sorting, join, query optimization, choice of evaluation plans.	
L-(11-12)	Transactions & Concurrency: Basic concepts, transaction states, implementation of atomicity and durability, concurrent execution and serializability, concurrency control protocols-lock based, time-stamp based, validation based, multi-version scheme, deadlock handling.	
L-(13-14)	Databases Recovery System: Understand practical knowledge on database recovery system, Failure classification, Log-based Recovery, Shadow Paging, Recovery with concurrent Transactions, Buffer management, Advanced Recovery Techniques.	
L-(15-16)	Database System Architecture: Observe the basic characteristics of database system architecture like Centralized and decentralized, Client-server architecture, server system architecture, distributed systems, distributed data storage; parallel systems, I/O parallelism	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Database System Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw Hill	
2	Database Systems – Management and Design	Pratt and Adamski	Boyd and Fraser	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	An Introduction to Database System	C J Date	Adison-Wesley	
2	Data Analysis for Database Design	D R Howe	Arnold.	
3	Lab. Manual			

Course Outline

1. General Information

Web Engineering	ICT-2203	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering

	Prerequisite Course	Basic ICT at Higher Secondary Level
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2. Course Summary

This course is an introduction to a broad range of topics in Web Technologies. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Web technology classes. The course covers HTML and HTML5, CSS and CSS3, DOM, JavaScript, PHP and MySQL, Mobile Apps Development, Web Development Tools and Environments, Server-Side Programming, Web Security and Performance Optimization, and Emerging Trends in Web Engineering

3. Course Objectives

The course content enables students to: understand best technologies for solving web client/server problems, analyze and design real time web applications, use HTML5, Java script and CSS3 for dynamic effects and to validate form input entry, analyze to Use appropriate Php applications, understand the use of mobile apps development platform and android studios.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	To acquire general idea about the course	P01	Cognitive(C3)	10	Please refer to Section 8
C02	To Discuss about HTML and HTML5	P02 P03	Cognitive(C4)	25	
C03	Analyze the properties of JavaScript and CSS3	P03	Affective(A3)	25	
C04	Understand about PHP and MySQL	P02	Cognitive(C3)	25	
C05	Explain and design process of Mobile apps	P03	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course Overview: The mission and vision of the Department, General idea about the course Fundamental and Web Technology and Engineering, The content and policies for the class	
L-2	HTML and HTML5: About Introduction, Editors, Basic Elements, Attributes of HTML, Formatting, Links, Tables, Lists, Forms, Colors of HTML, HTML graphics, HTML Elements, Forms, Graphics, Media and APIs.	
L- (3-4)	CSS, JavaScript, and DOM manipulation: Introduction, Syntax, ID and Class, Texts, Fonts, Links, Lists, Tables, Selectors, Attributes Selectors, CSS3: Gradients, 2D Transform 3D Transform, Transition, Animations, and Media. Introduction, Why JavaScript, Output, Statements, Comments, Variables, Data Types, Objectives, Functions, Operators, Comparisons, Conditions, Switch, Loops, Breaks, Regular Expressions, Ajax, JS HTML, DOM manipulation and events, ES6+ features, JavaScript frameworks (jQuery,	

	React, Vue)	
L- (5-6)	Web Development Tools and Environments: Development environments and tools, Version control with Git and GitHub, Task runners and module bundlers (Gulp, Webpack), Debugging and testing tools	
CT-1	Tutorial Exam	
L-(7-8)	Server-Side Programming: Introduction to server-side scripting, Node.js and Express.js, Working with databases (SQL, NoSQL), RESTful API design	
L- (9-10)	Advanced Front-End Development: Single-page applications (SPA), Front-end frameworks (Angular, React, Vue), State management (Redux, Vuex), Component-based architecture	
CT-2	Tutorial Exam	
L- (11-12)	Web Security and Performance Optimization: Common web vulnerabilities (XSS, CSRF, SQL Injection), Security best practices, Authentication and authorization, HTTPS and SSL/TLS, Performance measurement and analysis, Techniques for optimizing web performance, Caching strategies, Content Delivery Networks (CDN)	
L-(13-15)	PhpMySQL and Mobile Apps: Basic Syntax, Types, Variables, Constants, Expressions, Operators, Control Structures, Functions, Classes and Objects, Exceptions of Php language, HTTP Authentication with PHP, Cookies, Sessions, Database, MySQL, Database Connections, The Introduction of Mobile apps development environments, android studio, Web Services and APIs, and Progressive Web Apps (PWA)	
L-(16)	Emerging Trends in Web Engineering: Web Assembly, Microservices architecture, Serverless computing, AI and machine learning in web development	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Web Technologies	Uttam Roy	OXFORD University press	
2	Web programming with HTML, XHTML and CSS	Jon Duckett	Wiley India	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Web programming Bai	Michael Ekedahl	CENAGE Learning, India edition	
2	An Introduction to Web Design + Programming	Paul S.Wang	India Edition	
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Web Engineering Laboratory	ICT-2204	Semester	4 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

This course is an introduction to a broad range of topics in Web Technologies. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Web technology classes. The course covers HTML and HTML5, CSS and CSS3, JavaScript, PHP and MySQL, Mobile Apps Development.

3. Course Objectives

Understand the web technologies to create adaptive web pages for web application.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Integrate frontend and backend web technologies in distributed systems.	P01	Cognitive(C3)	25	Please refer to Section 8
CO2	Facilitate interface between frontend and backend of a web application.	P02 P03	Cognitive(C4)	25	
CO3	Debug, Test and Deploy web applications in different web servers.	P03	Affective(A3)	20	
CO4	Migrate the web applications to the other platforms like .Net	P02	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
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L-(1-3)	Experiment 1: Design the following static web pages required for a Training and placement cell web site. • Home Page • Login Page • Registration Page Experiment 2: • Company Details Page • Alumni Details Page • Placement Staff Details Page Experiment 3: • Student personal Info Page • Student Academic Page Semester Wise Percentage & their Aggregate page	
L-(4-7)	Experiment 4: Validate login page and registration page using regular expressions. Experiment 5: Apply different font styles, font families, font colors and other formatting styles to the above static web pages. Experiment 6: Install WAMPP sever and tomcat server, access above developed static web pages using these servers.	
L-(8-11)	Experiment7: Write a servlet/PHP to connect to the database, Insert the details of the users who register with the web site, whenever a new user clicks the submit button in the registration. Experiment8: Write a JSP/PHP to connect to the database, Insert the details of the student academic information with student academic info page. Experiment9: User Authentication: Assume four users user1, user2, user3 and user4 having the passwords pwd1, pwd2, pwd3 and pwd4 respectively. Write a servlet for doing the following. 1. Create a Cookie and add these four-user id's and passwords to this Cookie. 2. Read the user id and passwords entered in the Login form (week1) and authenticate with the values (user id and passwords) available in the cookies. If he is a valid user (i.e., user-name and password match) you should welcome him by name (username) else you should display "You are not an authenticated user ". Use init-parameters to do this. Store the user-names and passwords in the webinf.xml and access them in the servlet by using the get Init Parameters () method.	
L-(12-15)	Experiment10: Write a JSP which does the following job: Authenticate the user when he submits the login form using the user's name and password from the database. Experiment11: write a JSP to insert the student's semester wise percentages and calculate aggregate and insert into database. Experiment12: write a JSP to search the students according to their aggregate and produce sorted list or according to their Enroll number.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Web Technologies	Uttam Roy	OXFORD University press	

2	Web programming with HTML, XHTML and CSS	Jon Duckett	Wiley India	
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S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Web programming Bai	Michael Ekedahl	CENAGE Learning, India edition	
2	An Introduction to Web Design + Programming	Paul S.Wang	India Edition	
3	Lab. Manual			

Course Outline

1. General Information

Communication Systems	ICT-2205	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2107

2. Course Summary

This course provides a comprehensive introduction to basic principles and techniques of communication systems. Lecture topics include: Analog to digital conversion, PCM, baseband transmission, power spectrum density analysis, inter-symbol interference, matched filters, noise analysis, different modulation techniques, coherent and non-coherent detections. Laboratory work is based on simulations in MATLAB.

3. Course Objectives

To provide knowledge on communication systems, different types of modulation techniques, noise signals, transmitter system, and receiver system models.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
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C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Use communication engineering knowledge to understand and design communication systems understand	P01 P02 P03	Cognitive(C4)	25	
C03	Derive mathematical equations for analog and digital signal	P03	Affective(A3)	20	
C04	Use modulation technique's knowledge to understand analog and digital modulation techniques	P02 P03	Cognitive(C3)	15	
C05	Explain the transmitter and receiver circuits.	P03 P06	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Digital Modulation Techniques: The mission and vision of the Department, General idea about the course communication systems, The content and policies for the class.	
L-(4-9)	Analog Modulation Demodulation Techniques: Communication process, Communication Resources, Sources of information, Communication networks, Communication Channels, Modulation Process, Multiplexing, Basic signal processing operation in digital communication, Channels for digital communication, Theory of AM, Mathematical Analysis of AM, Power Relations in AM Wave, Different Forms of AM, AM Modulators, AM Demodulators.	
CT-1	Tutorial Exam	
L-(10-15)	Digital Modulation Techniques: The Digital modulation, Factors that influence the choice of digital modulation, Phase modulation, Pulse modulation: Types, PWM, PPM, Linear modulation: BPSK, DPSK, QPSK, $\pi/4$ QPSK, Offset QPSK, QAM; M-ary modulation techniques, Power spectrum, Bandwidth efficiency, The angle modulation, pulse modulation and spread spectrum	
CT-2	Tutorial Exam	
L-(16-19)	Transmitter: The transmitters, AM Transmitters, Carrier Frequency Requirement, Broadcast AM Transmitters, FM Transmitters, Comparison of Transmitters.	
L-(20-23)	Receiver: The receivers, Salient Features and Basic Functions of receiver, TRF Receiver, Principle of Super heterodyne Receiver, AM Receivers, FM Receivers, Comparison of receivers.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Communication Systems	S. Haykin		

2	Analog Communication	V. Chandra Sekar		
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S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Principle of Communication Engineering	Anokh Singh		
2	Fundamentals of Communication Systems	J. G. Proakis, M. Salehi		
3	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Communication Systems Lab.	ICT-2206	Semester	4 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2205

2. Course Summary

This course gives students deep knowledge in communication systems at the practical level. This lab focuses on the design and constructs transmitter circuit, to verify different analog and digital modulation techniques, to calculate bandwidth and power saving for different modulation techniques.

3. Course Objectives

This course will introduce the students to hands on knowledge on modeling and implementation of modulation techniques, analysis and evaluation of modulation techniques, antenna design and implementation.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Verify the different analog and digital modulation techniques	P01 P02 P03	Cognitive(C4)	25	
C03	Able to design and implement different demodulation techniques.	P03 P04	Affective(A3)	20	

C04	Calculate Bandwidth and power saving of different modulation techniques by using MATLAB tools	P02 P03	Cognitive(C3)	15	
C05	Design and construct transmitter and receiver circuit	P03 P06	Affective(A3)	15	

5.Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: General idea about the Communication Systems Laboratory, The experimental list for this Laboratory, About the simulator tools	
L-(4-6)	Analog Modulation /Demodulation Techniques Analog modulation circuit and observe its properties, Analog demodulation circuit and observe its properties, Modulation index for different modulation techniques.	
L-(7-9)	Digital Modulation Techniques: Digital modulation circuit and observe its properties, Digital demodulation circuit and observe its properties, Bandwidth and power saving for different modulation techniques	
L-(10-12)	Transmitter: Design and construct transmitter circuit.	
L-(13-15)	Receiver: Design and construct receiver circuit.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Communication Systems	S. Haykin		
2	Analog Communication	V. Chandra Sekar		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Principle of Communication Engineering	Anokh Singh		
2	Fundamentals of Communication Systems	J. G. Proakis, M. Salehi		
3	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Object Oriented Programming II	ICT-2207	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, ICT-2105

2. Course Summary

This course explores advanced topics of contemporary object-oriented programming including programming paradigms, design patterns, generics, collection framework, threads, errors and exceptions handling, synchronization, networking programming.

3. Course Objectives

Students will have the opportunity to learn the object-oriented techniques used to develop programs and to attain software reliability. The goal of the course is to develop skills such program design, code reuse, collections, threads, error and exception handling, synchronize threads, and networking. All programs will be practiced in any contemporary programming languages (Java, Python, C++).

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	To understand and design problems using various techniques	P01	Cognitive(C3)	15	Please refer to Section 8
C02	To understand and create classes and collection of classes that work with different data types and support various ways to store and manage objects of any kind in memory.	P01 P02 P03	Cognitive(C4)	20	
C03	To grasp, learn, and design simultaneous execution of multiple processes.	P03 P04	Affective(A3)	20	
C04	To understand and handle errors and exceptions.	P02 P03	Cognitive(C3)	15	
C05	To learn synchronization to manage dead locks.	P03 P06	Affective(A3)	15	
C06	To understand, design, and develop socket programs.		Cognitive(C4)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview and Programming paradigms: Overall basics of this course, Programming paradigms, imperative programming paradigm, procedural programming paradigm, object-oriented programming, declarative programming paradigm, functional programming paradigms, database/data driven programming approach and design problems on those concepts.	
L-(4-8)	Design Patterns: Problems based on creational pattern, structural pattern, behavioral pattern, intercepting pattern, front controller pattern.	
L-(9-12)	Generics: The concepts of generic, generic types: generic methods and generic classes, type parameters in generics, generic interfaces, and design problems using the above concepts.	
CT-1	TUTORIAL EXAM	
L-(13-15)	Collection Framework: The concepts of iterators, abstract class, collection classes and interfaces, using vectors and apply these to design and develop problems.	
L-(16-17)	Threads and Multithreads: Threads and multithreads and life cycle of a thread, threads priorities, To create and manage threads.	
CT-2	TUTORIAL EXAM	
L-(18-20)	Errors and Exceptions: To grasp the types of exceptions, managing exceptions, exception objects, and exception chaining, To raise and handle multiple unrelated exceptions.	
L-(21-22)	To understand synchronization methods, synchronization block, static synchronization, deadlock, inter-thread communication, interrupting threads, reentrant monitors and design the problems.	
L-(23-25)	Synchronization: To learn networking concepts, common networking protocol networking interfaces, socket programming, socket class, inet Address class, URL class, datagram socket class, To design networking problems.	
CT-3	TUTORIAL EXAM	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Ivor Horton's Beginning Java 2 JDK 5 Edition	Ivor Horton		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	http://www.cs.umd.edu/class/fall2022/cm-sc132-030X/			

2	https://docs.python.org/3/tutorial/			
3	https://sites.google.com/site/oopunyt/syllabus			

Course Outline

1. General Information

Object Oriented Programming II Lab.	ICT-2208	Semester	4 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	1.5/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, ICT-2105, ICT-2207

2. Course Summary

This course explores advanced topics of contemporary object-oriented programming including programming paradigms, design patterns, generics, collection framework, threads, errors and exceptions handling, synchronization, networking programming.

3. Course Objectives

Students will have the opportunity to learn the object-oriented techniques used to develop programs and to attain software reliability. The goal of the course is to develop skills such program design, code reuse, collections, threads, error and exception handling, synchronize threads, and networking. All programs will be practiced in any contemporary programming languages (Java, Python, C++).

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Attain competence on the use of Java/Python/C++ to develop programming problems.	P01	Cognitive(C3)	25	Please refer to Section 8
CO2	To design and develops problems using programming paradigms and designs patterns and grasp basic concepts of object-oriented programming.	P01 P02 P03	Cognitive(C4)	25	
CO3	To create classes and collection of classes that work with different data types and support various ways to store and manage objects of any kind in memory.	P03 P04	Affective(A3)	20	

C04	To design and solve simultaneous execution of multiple processes.	P02 P03	Cognitive(C3)	15	
C05	To handle errors and exceptions.	P03 P06	Affective(A3)	15	
C06	To learn and design synchronization to manage dead locks.	P06	Cognitive(C4)		
C07	To design and develop socket programs.	P07	Cognitive(C3)		

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Exp #1: Fundamentals of Java/Python/C++ and Installation: Java/Python/C++ installation, General idea about Java/Python/C++ programming.	
L-(4-8)	Exp 2#: Creational Patterns Exp 3#: Structural pattern Exp 4#: Behavioral patterns Creational pattern, structural pattern, and behavioral pattern, Creational pattern, structural pattern, and behavioral pattern.	
L-(9-12)	Exp 5#: Generic Methods Exp 6#: Generic Classes Exp 7#: Generic Interfaces Generic methods, generic classes, and generic interfaces, Problems using generic methods, generic classes, and generic interfaces.	
CT-1	TUTORIAL EXAM	
L-(13-15)	Exp 8#: Iterators Exp 9#: Interfaces Exp 10#: Vectors Iterators, interfaces, and vectors, Problems based on iterators, interfaces, and vectors.	
L-(16-17)	Exp 11#: Threads Exp 12#: Multithreads Threads and multithreads, and threads priorities, Programming problems based on threads and multithreads, and threads priorities.	
CT-2	TUTORIAL EXAM	
L-(18-20)	Exp 13#: Catching and throwing exceptions Exceptions, managing exceptions, and exception objects, Multiple unrelated exceptions.	
L-(21-22)	Exp 14#: Detect deadlock Exp 15#: Synchronize processes Synchronization methods, deadlock, and inter-thread communication, and develop problem ensuring synchronization.	
L-(23-25)	Exp 16#: Client server algorithm Exp 17#: Socket programming	

	Networking concepts, common networking protocol networking interfaces, client server algorithm, and socket programming, Socket programming.	
CT-3	TUTORIAL EXAM	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Ivor Horton's Beginning Java 2 JDK 5 Edition	Ivor Horton		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	http://www.cs.umd.edu/class/fall2022/cmsc132-030X/			
2	https://docs.python.org/3/tutorial/			
3	https://sites.google.com/site/oopunyt/syllabus			

Course Outline

1. General Information

Statistics for Communication Engineering	STAT-2201	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Basic science
		Prerequisite Course	HSC Level Mathematics

2. Course Summary

This course to develop expertise on representing data, data uncertainty i.e. probability measurement, properties of random variable, probability models, hypothesis testing and parameter estimation

3. Course Objectives

To provide knowledge on probability, probability distribution, modeling of data and parameter estimation.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	15	Please refer to Section 8
C02	Understand the role of statistics in engineering	P01 P02 P03	Cognitive(C4)	20	
C03	Organize and representation of Data	P03 P04	Affective(A3)	15	
C04	Handle the uncertainty of model using probability	P02 P03	Cognitive(C3)	15	
C05	Model the random system using relevant probability distribution	P03 P06	Affective(A3)	15	
C06	Understand Hypothesis and conclusion	P04	Cognitive(C4)	10	
C07	Estimate model parameters	P03 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: The mission and vision of the Department, General idea about the course Statistics for Communication Engineering, The content and policies for the class.	
L-(4-8)	Data Collection, and Representation: Meaning and Scope, Variables and Attributes, statistical data collection methods, sample space, Population, event, statistical data organization and presentations table and charts: Charts and Pareto Charts, Pie Charts, Histograms Outliers, Box-and-Whisker Plot.	
L-(9-12)	Random Variable: Random Variables, Continuous Random Variables, The Expectation of a Random Variable, The Variance of a Random Variable, Jointly Distributed Random Variables, Combinations and Functions of Random Variables	
CT-1	TUTORIAL EXAM	
L-(13-15)	Probability Distribution: Discrete Probability Distributions: The Binomial Distribution, Geometric and Negative Binomial Distributions, Poisson distribution, The Multinomial Distribution	
L-(16-18)	Probability Distribution: Continuous Probability Distributions: The Uniform Distribution, The Exponential Distribution, The Gamma Distribution, The Beta Distribution, Normal Distribution: Probability Calculations Using the Normal Distribution, Linear Combinations of Normal Random Variables, Approximating Distributions with the Normal Distribution, Distributions Related to the Normal Distribution: Log-normal Distribution, Chi-square Distribution, T-Distribution and F-Distribution.	
CT-2	TUTORIAL EXAM	
L-(19-21)	Statistical Estimation: Statistical Estimation and Sampling Distributions: Point Estimates, unbiased and biased Point Estimates, Point Estimates of a population mean, Point Estimates of a population variance, Relative Efficiency, Sample Proportion, sample mean, sample variance, Constructing	

	Parameter Estimates: The Method of Moments, Maximum Likelihood Estimates.	
L-(22-24)	Inferences on a Population Mean: Confidence Interval Construction, Effect of the Sample Size on Confidence Intervals, One-Sided Confidence Intervals, z-Intervals, Hypothesis Testing: Rejection and Acceptance of the Null Hypothesis, Interpretation of p-Values, Calculation of p-Values, Significance Levels, Relationship between Confidence Intervals and Hypothesis Tests, One-side and two-side z-Tests	
L-(25-27)	Regression: Simple Linear regression and correlations: model and parameter estimation	
CT-3	TUTORIAL EXAM	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Probability and Statistics for Engineers and Scientists	Anthony Hayter	Fourth Ed. Brooks/Cole, Cengage Learning, USA	
2	Beginning Statistics	Schaum's Outline Series		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Theory and problems of beginning statistics Engineering	McGraw Hill		
2	Applied statistics and probability for engineers	<i>Douglas C. Montgomery, George C. Runger,</i>		
3	Fundamentals of Probability and Statistics for Engineers	T.T. Soong		

Course Outline

1. General Information

Economics	HUM-2201	Semester	4 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.0
		Course Type	Theory
		Contact Hours	1.5/week
		Course Status	Humanities
		Prerequisite Course	Physics and Mathematics at Higher Secondary Level

2. Course Summary

This course provides a comprehensive introduction to the basic idea about economics. This course focuses on Theory of Demand, Supply and Consumer Behavior, Production and Cost, Theory of the Firm, Input-Output analysis, National income accounting and determination, Budgets of Bangladesh and Development Planning in Bangladesh.

3. Course Objectives

To provide knowledge on basic concepts of Economics, Microeconomics and Macroeconomics.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Understand the basic concepts of Economics, Microeconomics and Macroeconomics.	P01 P02 P03	Cognitive(C4)	25	
C03	Understand the Theory of Demand, Supply and Consumer Behavior.	P03 P04	Affective(A3)	20	
C04	Understand the basis operations of Theory of the Firm, Input-Output analysis	P02 P03	Cognitive(C3)	15	
C05	Understand the Solution of National income accounting and determination.	P03 P06	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	The mission and vision of the Department, General idea about the course communication systems, The content and policies for the class.	
L-(4-8)	The subject matter of Economics; Microeconomics Vs Macroeconomics; Law of Economics; Central economic problems of every society; Different economic systems; Economics and Engineering.	
L-(9-12)	Production and Cost and Theory of the Firm, Theory of the Firm.	
CT-1	TUTORIAL EXAM	
L-(13-15)	Meaning of input-output, Input-output analysis model; balance equation; coefficient matrix; determination of final demand vector.	
L-(16-17)	Growth; Unemployment; Inflation; Philips Curve, Business cycle; Circular flow of economics; two, three and four sector economics.	
CT-2	TUTORIALEXAM	
L-(18-20)	National income accounting and determination, Budgets of Bangladesh, Development Planning in Bangladesh	
CT-3	TUTORIALEXAM	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Economics	Samuelson and Nordhaus.		
2	Economics	Byrns and Stone		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Modern Economic Theory	Dewett, K.K		
2	Advanced Economic Theory	Ahuja H.L		

Course Outline

1. General Information

Viva-voce	ICT-2000	Semester	4 th Semester
		Full Marks	100
		Course Credit	1.00
		Course Type	Viva-voce
		Prerequisite Course	Based on 2 st Year 1 st and 2 nd Semester

3rd Year 1st Semester-2028

Course Outline

1. General Information

Data Communication	ICT-3101	Semester	5 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite	Computer Fundamentals

2. Course Summary

This Course gives a general overview of data communications and networking. This course introduces students to evolution trend of Data communication. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

3. Course Objectives

This is an introductory course in Data Communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models, digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus to develop engineering skills in troubleshooting and designing data networks.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Describe the concepts of data communication, and the general principles of network design and compare the different network topologies.	PO1 PO2	Cognitive(C4)	40	

C02	Analyze digital and analog representations of data and channels, mechanisms and techniques of encoding and different technologies regarding guided and unguided media, their constructions and applications in real life.	P02 P03	Affective(A3)	35	Please refer to Section 8
C03	Critique error detection, correction and flow control techniques; multiple access control techniques.	P03 P04	Cognitive(C3)	25	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Course overview: Socialization and Introduction to the course.	
L-(2-4)	Introduction: Over view, Introduction to data communication, categories of network, Protocol and standards	
L-(5-7)	Transmission Layers: Layered communication architecture, The OSI Model, TCP/IP Model, Addressing. Data and Signals, Periodic Analog Signals, Digital Signals, Transmission Impairment, Data rate limits and performance.	
CT-1	Tutorial Exam	
L-9	Transmission Modes: Guided Media, Unguided Media	
L-(10-12)	Transmission media: Digital to digital conversion, Analog to digital conversion, Transmission Mode	
L-13	Data conversion: Digital to Analog conversion, Analog to Analog conversion	
CT-2	Tutorial Exam	
L-(15-16)	Multiplexing: Multiplexing, Spread Spectrum	
L-(16-19)	Network switching: Circuit-switched Network, Datagram Networks, Virtual-circuit Networks, Switch	
L-(20-22)	Data encoding: Types of error in data communication, Block Coding, Cyclic Codes, Checksum	
L-(23-25)	Modulation Techniques: Framing, Flow and Error Control, Noisy and noiseless channel, Multiple Access: CSMA/CD, CSMA/CD, Controlled Access, FDMA, CDMA, TDMA	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
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1	Data communication and Networking	Foruzan, B. A. (2013)		
2	Introduction to Networking and Data Communications	Blanchard, E. (2000)		
3	Computer networks	Tanenbaum, A. S., & Wetherall, D. J. (2011).		
4	Video Tutorials on Data communication for beginners			

Course Outline

1. General Information

Data Communication Laboratory	ICT-3102	Semester	5 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite	ICT-3105

2. Course Summary

This Course gives a general overview of data communications laboratory. This course introduces students to evolution trend of Data communication. It also helps students in understanding the procedure of transmitting data over the network and how to resolve the conflicting issues arising in the course of transmission. This course provides with practical knowledge and hands-on experience in transmitting data over the network.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

3. Course Objectives

This is an introductory course in data communications and networking. It familiarizes the students with the basics of data communications, OSI model and techniques, applications and control of modern data communications networks. Topics included are network models, digital and analog transmission, multiplexing, circuit and packet switching. This course will mainly focus to develop engineering skills in troubleshooting and designing data networks.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Bit stuffing, de-stuffing, channel encoding	P01 P02 P03	Cognitive(C4)	25	Please refer to Section 8
C02	Error detection, correction and flow control techniques; multiple access control techniques.	P02 P03	Affective(A3)	25	
C03	Analyze digital and analog representations of data and channels, mechanisms and techniques of encoding and different technologies regarding guided and unguided media, their constructions and applications in real life.	P03 P04	Cognitive(C3)	20	
C04	Describe the concepts of data communication, and the general principles of network design and compare the different network topologies.	P04 P05	Affective(A3)	15	
C05	Analog to digital conversion and pulse code transmission	P04 P05	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Character Stuffing and De-stuffing: To acquire general idea about the data communication laboratory To supply the experimental list for this laboratory. Implementing character stuffing and de-stuffing	
L-3	Bit Stuffing and De-stuffing: Implementation bit stuffing and de-stuffing	
L-4	Channel Encoding: Implementation cyclic redundancy check and parity checker.	
L-5	Error detection and correction: Implementation of error detection and correction mechanism using Hamming code	
L-6	Encoding and decoding scheme: Implementation of encoding and decoding scheme using NRZ-I	
L-7	IPv4 Implementation: IPv4 implementation of decimal to binary and vice versa	

L-8	Encoding and decoding using Manchester: Implementation of encoding and decoding scheme using Manchester	
L-9	Encoding and decoding using Manchester: Implementation of encoding and decoding scheme using AMI and Pseudo ternary	
L-10	Network Topologies: Study of network topologies using packet tracer software	
L-(11-12)	LAN transmission, standard, cross-wired and straight cable: Study of LAN transmission media's, topologies, interconnection devices & LAN standards and practically implement the cross-wired cable and straight through cable using clamping tool.	
L-13	Analog to digital conversion and pulse code modulation: Implementation of analog to digital conversion and pulse coded transmission	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Data communication and Networking	Foruzan, B. A. (2013)	Science Engineering & Math Publications.	
2	Introduction to Networking and Data Communications	Blanchard, E. (2000)		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Computer networks	Tanenbaum, A. S & Wetherall, D. J. (2011)		
2	Video Tutorials on Data communication for beginners.			

Course Outline

1. General Information

Wave Propagation and Antenna	ICT-3103	Semester	5 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1101 and MATH-2101

2. Course Summary

The Topic will be discussed in detail in class by the course teacher.

3. Course Objectives

This course will introduce the students to the fundamental concepts underlying Electromagnetic theories and antenna, properties of EM wave, transmission and reflection of EM wave, transmission line theory and its characteristics, propagation theory of Radio waves, characteristics of antenna, types of antennae its application area etc. The emphasis is on studying and analyzing fundamental issues in antenna design and their impact on performance.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Learn theory and properties of Electromagnetic waves.	P01 P02	Cognitive(C3)	20	Please refer to Section 8
C02	Emphasize understanding of Maxwell's equations in differential and integral forms in solving electromagnetic problems.	P02 P03	Cognitive(C4)	15	
C03	Understand the concept of transmission and reflection of plane waves at boundaries.	P02	Affective(A3)	10	
C04	Learn the basics of transmission lines (TL), propagation of harmonic signals on TL, TL parameters and equations. Be able to apply the knowledge in basic analysis and design problems. Learn the basics of the Smith Chart as a tool for transmission line calculations, and be able to use it for basic parameter calculation and analysis of transmission lines.	P02 P03	Cognitive(C3)	20	
C05	Predict propagation effects of electromagnetic waves in the surface, space, sky, troposphere, ionosphere including MUF and Fading.	P04	Affective(A3)	10	
C06	Classify the Guided Wave solutions -TE, TM, and TEM. Analyze and design rectangular waveguides and understand the propagation of electromagnetic waves.	P05	Cognitive(C4)	15	
C07	Learn antenna fundamentals types of antennas. Characterize the radiation of an antenna in terms of its radiation pattern, directivity, gain, bandwidth and radiation resistance.	P02 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Theory & Properties of Electromagnetic Waves: Potential in an electric field, potential in a changing magnetic field, displacement current.	
L-(3-4)	Equations of the Electromagnetic Fields, Radiation: Potential in an electric field, Potential in a changing magnetic field, Faraday's law, The first electromagnetic field equation, The second electromagnetic field equation, Maxwell's equation rewritten, The plane wave in space-I, The plane wave in space-II, Energy of the radiated wave, Poynting's theorem.	
L-(5-9)	Transmission and Reflection of Plane Waves at Boundaries : Conditions of field continuity at boundary surfaces, The analogous transmission line for plane wave propagation, Reflection from a plane conductor at normal incidence, Power flow in the reflected and transmitted waves, Current flow in the conductor, Depth of penetration, Skin effect, The perfect conductor concepts, Wave incident on a perfect conductor at an arbitrary angle, Wave incident at an arbitrary angle on a boundary between dielectrics, Index of reflection, Snell's law, Total reflection, Phase and group velocities, Elimination of reflections.	
CT-1	Tutorial Exam	
L-(11-12)	Transmission Lines: Introduction, Propagation through lines, Determination of secondary line constants, Underground cables, Wave velocity, Distortion of low frequency lines, General line equations, High frequency lines, Reflection, Line impedance, Impedance matching in high frequency lines, Smith chart.	
L-(13-15)	Propagation of Radio Wave: Surface wave, space wave and sky wave, Tropospheric propagation, Ionospheric propagation, skip distance and MUF, fading.	
L-(16-17)	Wave Guides: Rectangular Wave guides, Circular and other Wave guides, Cavity resonators.	
CT-2	Tutorial Exam	
L-(19-21)	Antenna Fundamentals: The radiation mechanism, Elementary doublet, Current and Voltage distribution, Resonant & Non-resonant antennas, Antenna gain, Bandwidth, beam width and polarization, Effects of ground on antennas, Antenna coupling.	
L-(22-24)	Different Types of Antennas: Directional high-frequency antennas, Microwave antennas, Wideband and special -purpose antennas, Cell-Site Antennas and Mobile Antennas.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
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1	Networks, Lines and Fields	John D Ryder	Prentice-Hall of India Private Ltd.	
2	Electronic Communications	Dennis Roddy and John Coolen	Prentice-Hall of India Private	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Hand Book of Electronics	Gupta and Kumar	PragatiPrakasan	
2	Radio Engineering	J K Mithal	Khanna Publishers	
3	Electrical Technology	B.L Theraja and A.K Theraja.		
4	Lecture Sheets and Presentation Materials.			

Course Outline

1. General Information

Wave Propagation and Antenna Laboratory	ICT-3104	Semester	5 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-3103

2. Course Summary

The Topic will be discussed in detail in class by the course teacher.

3. Course Objectives

This course will introduce the students to hands on knowledge on Electromagnetic theories and antenna, properties of EM wave, transmission and reflection of EM wave, transmission line theory, propagation theory of Radio waves, characteristics of antenna, types of antennae.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Realize Electromagnetic theories and antenna	P02 P03	Cognitive(C4)	25	

C02	Understand properties of EM wave	P03 P04	Affective(A3)	25	Please refer to Section 8
C03	Comprehend transmission line theory, propagation theory of Radio waves	P03 P04	Cognitive(C4)	25	
C04	Know the characteristics of antenna	P03 P04	Affective(A3)	25	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Electromagnetic Wave: Generation of Electromagnetic wave using MATLAB. , Visualizing Maxwell's equations using MATLAB.	
L-(3-4)	Electromagnetic Theory: To study and analysis propagation of wave in Rectangular Waveguide using MATLAB. Impedance Matching using Smith Chart using MATLAB	
L-(5-8)	Propagation of Radio Wave: Calculate phase & group velocity using MATLAB. , To study and analysis of Electromagnetic waves propagation characteristics using MATLAB.	
L-(9-12)	Antenna: Plot radiation pattern of dipole antenna using MATLAB. Plot the radiation pattern of Half wave dipole antenna using MATLAB.	
L-(13-15)	Antenna: Plot radiation pattern of monopole antenna using MATLAB. , Plot of Radiation pattern of Uniform Linear Array using MATLAB.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Networks, Lines and Fields	John D Ryder	Prentice-Hall of India Private Ltd.	
2	Electronic Communications	Dennis Roddy and John Coolen	Prentice-Hall of India Private	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Hand Book of Electronics	Gupta and Kumar	PragatiPrakasan	
2	Radio Engineering	J K Mithal	Khanna Publishers	
3	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Operating Systems	ICT-3105	Semester	6 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1204, ICT-2104, ICT-2106

2. Course Summary

Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity.

3. Course Objectives

To provide knowledge on operating systems of computer and mobile phone systems, structure of operating systems, CPU scheduling, deadlocks, and memory management of digital systems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the goals of OS concepts, design of operating systems, and extrapolate the interactions among the various components of computing systems.	P01	Affective(A3)	25	Please refer to Section 8
C02	understand the structure and organization of the file system.	P02	Cognitive(C3)	25	
C03	understand what a process is and how processes are synchronized and scheduled.	P03	Affective(A3)	20	
C04	understand different approaches to deadlock handling, dead lock prevention, avoidance, detection, and recovery and memory management.	P04	Cognitive(C4)	15	
C05	use system calls for managing processes, memory and the file system.	P05	Cognitive(C3)	15	
C05	Understand the goals of OS concepts, design of operating systems, and extrapolate the interactions among the various components of computing systems.	P05	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	To acquire knowledge of OS, its design, and different operating system. To understand parallel, real-time, and distributed systems. To understand structures and design of operating systems.	
L-(4-8)	To understand process, its state, threads, and inter-process communication. To acquire knowledge of CPU scheduling. To learn CPU various scheduling algorithms.	
CT-1	Tutorial Exam	
L-(10-15)	To understand process synchronization, and semaphores. To understand the algorithms used to synchronize hardware.	
CT-2	Tutorial Exam	
L-(17-20)	Microprocessor operations, 8085/8086 MPU, Example of an 8085/8086-based microcomputer, Memory interfacing, Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Testing and troubleshooting I/O interfacing circuits.	
L-(20-24)	To discuss and explain dead lock and deadlock handling, dead lock prevention, avoidance, detection, and recovery. To understand logical and physical memory address space. To learn different approach Chex memory management. To understand file access methods and protection strategy.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Operating system concepts essentials.	Silberschatz, A., Galvin, P. B., & Gagne, G.	John Wiley & Sons, Inc	8th Edition. (2014)
2	Operating Systems: Design and Implementation.	Andrew S. Tanenbaum and Albert S. Woodhull.	Prentice-Hall	2nd Ed.

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Operating Systems: Internals and Design Principles	Stallings, W.	Pearson	Edition: 5(2005)
2	https://www.geeksforgeeks.org/operating-systems/			
3	https://www.tutorialspoint.com/operating_system/			
4	https://www.studytonight.com/operating-system/			
5	https://www.cs.uic.edu/~jbell/CourseNotes/OperatingSystems			

Course Outline

1. General Information

Operating Systems Laboratory	ICT-3106	Semester	6 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, ICT-2104, ICT-2106, and ICT-3201

2. Course Summary

Covers the classical internal algorithms and structures of operating systems, including CPU scheduling, memory management, and device management. Considers the unifying concept of the operating system as a collection of cooperating sequential processes. Covers topics including file systems, virtual memory, disk request scheduling, concurrent processes, deadlocks, security, and integrity

3. Course Objectives

This course will provide hand-on training on operating systems of computer and mobile phone systems, structure of operating systems, CPU scheduling, deadlocks, and memory management of digital systems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Apply fundamental programming concepts, algorithms, theorems and methods in operating system to solve substantial problems (e.g. CPU scheduling algorithm, page replacement algorithms, process and file system management using system calls) on Ubuntu platforms.	P01	Affective(A3)	25	Please refer to Section 8
C02	Experiment with Ubuntu commands and shell programming on Linux platforms.	P02	Cognitive(C3)	25	
C03	Understand what a process is and how processes are synchronized and scheduled.	P03	Affective(A3)	20	
C04	Understand different approaches to deadlock handling, dead lock prevention, avoidance, detection, and recovery and memory management.	P04	Cognitive(C4)	15	
C05	Use system calls for managing processes, memory and the file system.	P05	Cognitive(C3)	15	
C05	Apply fundamental programming concepts, algorithms, theorems and methods in operating system to solve substantial problems (e.g. CPU scheduling algorithm, page replacement algorithms, process and file system management using system calls) on Ubuntu	P05	Affective(A3)	15	

	platforms.				
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5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Calculating computational cost of various CPU scheduling algorithms, various CPU scheduling algorithms.	
L-(3-5)	The interactions among the various components of file systems, memory management techniques.	
L-(6-10)	Memory allocation techniques, basic Linux command, how to organize files.	
L-(11-13)	Deadlock avoidance algorithms. Philosopher's problem, disc scheduling algorithms.	
L-(14-16)	page replacement algorithms, shell scripting in Ubuntu OS.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Operating system concepts essentials.	Silberschatz, A., Galvin, P. B., & Gagne, G.	John Wiley & Sons, Inc	8th Edition. (2014)
2	Operating Systems: Internals and Design Principles	Stallings, W.	Pearson	Edition: 5 (2005)

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Operating Systems: Design and Implementation.	Andrew S. Tanenbaum and Albert S. Woodhull.	Prentice-Hall	2nd Ed.
2	https://www.geeksforgeeks.org/operating-systems/			
3	https://www.tutorialspoint.com/operating_system/			
4	https://www.studytonight.com/operating-system/			
5	https://www.cs.uic.edu/~jbell/CourseNotes/Operating Systems/			

Course Outline

1. General Information

Computer Architecture and Organization	ICT-3107	Semester	5 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	None

2. Course Summary

This course aims to provide a strong foundation to understand modern computer system architecture and to apply these insights and principles to future computer designs. The course is structured around the three primary building blocks of general-purpose computing systems: Microprocessors, memories, and parallel processing.

3. Course Objectives

Course will introduce the students to the fundamental concepts underlying modern computer organization and architecture. Main objective of the course is to familiarize students about hardware design including logic design, basic structure and behavior of the various functional modules of the computer and how they interact to provide the processing needs of the user. It will also provide knowledge on microprocessor and interfacing devices, 8085/8086 microprocessor architecture, assembly language, and interfaces.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the basics of computer hardware and Register Transfer Logic	P01	Affective(A3)	25	Please refer to Section 8
C02	Understand the basics of processors organization and logic design of processors	P02	Cognitive(C3)	25	
C03	Understand the basics of control logic design of microcomputer	P03	Affective(A3)	20	
C04	Understand the fundamental knowledge on system organization of computer system	P04	Cognitive(C4)	15	
C05	Understand the basic concept on assembly language programming	P05	Cognitive(C3)	15	
C05	Understand the basic concepts on 8085/8086 Instructions	P05	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Register Transfer Logic: Inter-register transfer, arithmetic, logic and shift micro-operations, conditional control statements, fixed point binary data, overflow, arithmetic shifts, floating point data, and instruction codes.	

L-(4-8)	Processor Logic Design, Control Logic Design: Processor organization, design of arithmetic and logic unit, status register, design of shifter, processor unit, design of accumulator. Control organization, hardware control, micro-program control, control of processor unit, PLA control.	
CT-1	Tutorial Exam	
L-(10-15)	System Organization, Introduction to 8085/8086 assembly language programming: Communication methods, IO and system control, parallel processing- processor level parallelism, multiprocessors, fault tolerance. The 8085/8086 programming model, Instruction classification, Instruction, Data formats, Storage, how to write assemble and execute a simple program, overview of the instruction set.	
CT-2	Tutorial Exam	
L-(17-20)	8085/8086 Microprocessor Architecture and Memory I/O Interfacing: Microprocessor operations, 8085/8086 MPU, Example of an 8085/8086-based microcomputer, Memory interfacing, Basic interfacing concepts, Interfacing output displays, Interfacing input devices, Memory mapped I/O, Testing and troubleshooting I/O interfacing circuits.	
L-(20-24)	Introduction to 8085/8086 Instructions: Data transfer (copy) operations, Arithmetic Operations, Logic operations, Branch operations, writing assembly language program, debugging a program, stack and subroutines.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Computer Architecture and Logic Design.	T C Bartee	McGraw Hill	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Digital Logic and Computer Design.	M. Morris Mano	Prentice-Hall, New Delhi	
2	Computer Architecture & Organization,	J P Hayes	McGraw-Hill	
3	Architecture of Computer Hardware and Software.	I Englander	Wiley Eastern	
4	Microprocessor Architecture, Programming and Applications with 8085.	Ramesh S. Goankar		
5	The Intel Microprocessors 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium, and Pentium pro Processors			

Course Outline

1. General Information

Ethics and Cyber Law	HUM-3101	Semester	5 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Humanities
		Prerequisite Course	None

2. Course Summary

This course to develop an understanding on basic concepts ICT policy in Bangladesh, cyber-crime, ICT acts, Intellectual property law, patent, trademarks.

3. Course Objectives

To provide knowledge on cyber law, ICT policy in Bangladesh, Different types of cyber-crime, Human rights, ICT act, Intellectual property law, patent, trademarks.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Affective(A3)	25	
C02	Understand cyber law	P02	Cognitive(C3)	25	
C03	Understand ICT policy in Bangladesh	P03	Affective(A3)	20	
C04	Understand Cybercrime and its penalty	P04	Cognitive(C4)	15	
C05	Understand ICT act and Human rights	P05	Cognitive(C3)	15	
C05	Understand Intellectual property law, patents and trademarks	P05	Affective(A3)	15	
C06	Acquire general idea about the course		Cognitive(C3)		

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview: Comprehend the mission and vision of the Department, acquire general idea about the course Statistics for Communication Engineering, grasp the content and policies for the class.	
L-(4-8)	Cyber Law: Definition Nature, Nature, Scope, Utility of Cyber Law, origin and	

	Development of Cyber Law and Internet.	
CT-1	Tutorial Exam	
L-(10-15)	ICT Policy in Bangladesh: Internet Service Providers (ISP)- Domain Name, Present Legal Basis of (ISP)- Domain Name, Present Legal Basis of ISP in Bangladesh; e-Readiness in Bangladesh-e-Commerce in Bangladesh, e-Governance in Bangladesh, e-Learning/Education in Bangladesh, e-Journal in Bangladesh, e-Voting in Bangladesh; Electronic Evidence- Digital signature, The Evidence Act of 1872 Vs. ICT act-2006, Electronic Evidence in Bangladesh, Legal Effects of electronic evidence, UNCITRAL Model Law on Electronic Evidence.	
L-(10-15)	Cybercrime: Jurisdiction and Cybercrime, Criminal Justice in Bangladesh and Implications on Cyber Crime; cyber vandalism, Hacking, Malicious spreading in Viruses, Password fraud, cheating, Cyber Pornography, Child Pornography, Protection of Copyrights and Intellectual Property right. Invasion of Privacy, Constitutional basis of Privacy, Unsolicited E-Mail, Defamation, Harassment and e-Mail Abuse, Present Legal Protection	
CT-2	Tutorial Exam	
L-(17-20)	Human Rights, International Cyber Law, Electronic Commerce: Human Rights violation and Internet; the Information and Communication Technology Act, 2006- Objectives, Strengths & weaknesses of the ICT Law, Regulation of Cryptography. India, Sri Lanka, Japan Malaysia, Australia and the USA, International Conventions on Cyber Law & Crime. Electronic Money, Online credit card Payments and Electronic bills of Lading, UNCITRAL Model Law on Electronic Commerce.	
L-(20-24)	Intellectual Property Law, Patent and Trademarks: Basic Concepts of IP Law, Nature of IPR, Computer-related Intellectual property rights: Copyright- Original and development of Copyright Law, subject matter of copyright protection, Rights protected by copyright, Neighboring rights, Limitations of Copyright Protecting, Piracy and infringement, Remedies Computer Program, New technology and copyright, Software Patents Vs. Copyright, International Convention copyright. Patents and technological development, Requirements for patentability and ownership of patents, Scope of exclusive rights and duration of protection, patents infringement, defenses and remedies, Legal arrangement for the transfer of technology. Types of intellectual property licenses Reasons for the protection of trademarks, Acquisition of trademark right, Registration procedure, Duration of protection and renewal, termination. Trademarks in Cyberspace, Domain name and Meta- tag Controversies.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Cryptography and Network Security: Principles and Practice	William Stallings		
2	Cryptography and Network Security	AtulKahate		
3	Applied Cryptograph	Bruce Schneier		

3rd Year 2nd Semester-2028

Course Outline

1. General Information

Microwave Engineering	ICT-3201	Semester	5 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2205, 3103

2. Course Summary

Electronics and Communications Engineering (ECE) involves researching, designing, developing and testing of electronic equipment used in various systems. Electronics and Communications engineers also conceptualize and oversee the manufacturing of communications and broadcast systems.

This stream of engineering deals with analogue transmission, basic electronics, microprocessors, solid-state devices, digital and analogue communication, analogue integrated circuits, microwave engineering, satellite communication, antennae and wave progression. It also deals with the manufacturing of microwave engineering, microwave tubes and resonators.

3. Course Objectives

To provide knowledge on television system, satellite communication, radar system and microwave engineering.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C4)	25	Please refer to Section 8
C02	Understand the television system.	P01	Affective(A3)	25	
C03	Understand the satellite system	P05	Cognitive(C4)	20	
C04	Understand the Radar system	P02 P03	Affective(A3)	15	
C05	Analysis microwave communication networks	P04 P06	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
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L-(1-2)	Course Overview: Comprehend the mission and vision of the Department To acquire general idea about the course Fundamental, To grasp the content and policies for the class	
L-(3-5)	Television System: To discuss Image Capturing, Image Continuity, Flicker, Interlaced Scanning, Composite Video Signal, Video Modulation, Sound Modulation, Channel bandwidth, TV Camera, TV Transmitter, Monochrome TV Receiver, Principle of Color TV.	
L-(6-9)	Satellite Communication: To understand General Structure, Merits & Demerits of Satellite Communication, Satellite Orbits, Linkages, Equipment's on Satellite, Propagation of Signal, Ground Station, Digital Satellite Communication.	
CT-1	Tutorial Exam	
L-(11-14)	Radar: To discuss the Radar Performance Factors, Basic Pulsed Radar System, Antennas & Scanning, Display Methods, Pulsed Radar Systems, Moving Target Indication, CW Doppler Radar, and Frequency Modulated CW Radar, Phased Array Radars.	
CT-2	Tutorial Exam	
L-(16-20)	Microwave Engineering: To discuss Short history of microwave engineering, Microwave frequencies, Microwave systems, Microwave applications, Microwave circuit Elements and analysis, Micro strip and Strip line, Smith Chart.	
L-(21-24)	Microwave Components: To analyze Waveguide tees, E-plane tee, H-plane tee, Hybrid junctions, Cavity wave-meter, Hybrid ring, directional couplers, Isolators and circulators. To discuss about microwave resonators and tubes	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Electronic Communication	Roddy and Coolen,	Prentice Hall of India	4th Ed.
2	Radio Engineering	G K Mithal	Khanna Publishers	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Integrated Electronics	Millman and Halkias, McGraw-Hill		
2	Microwave Engineering	David M. Pozar		
3	Microwave Devices and Circuits	Samuel Y Laio		

Course Outline

1. General Information

Microwave Engineering Laboratory	ICT-3202	Semester	5 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-3105

2. Course Summary

This course gives students deep knowledge in electronic communication and microwave engineering at the practical level. This lab focuses on the fundamental concepts on TDM, Pulse modulations, digital modulation techniques, source coding techniques and Error-control coding techniques.

3. Course Objectives

This course will introduce the students to hands on knowledge on image, Camera, principle of color TV and satellite communication, analysis and evaluation of microwave components and microwave resonators and tubes.

4. Course Outcomes

C0	C0 Description	P0	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01 P02	Cognitive(C4)	25	Please refer to Section 8
C02	Able to understand Basics of conversions from analog signals into digital signals.	P02 P03	Affective(A3)	25	
C03	Able to verify of microwave tube characteristics and gunn characteristics.	P02	Cognitive(C3)	20	
C04	Able to verify of microwave tube characteristics and gunn characteristics	P02 P03	Cognitive(C4)	15	
C05	Able to analyze the frequency and wavelength of the different wave guides	P04	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: Acquire general idea about the ECMW Laboratory, Supply the experimental list for this Laboratory, Discuss about the simulator tools	
L-(3-5)	Frequency Spectrum: Frequency spectrum of AM and FM waves, Fidelity response of AM receiver.	
L-(6-8)	Analog Modulation/Demodulation Techniques: Amplitude, frequency and phase modulation signal, Extract modulating signal using Diode Detector.	

L-(9-12)	Digital Modulation/Demodulation Techniques: Generate and detect PCM, generate DPCM, generate Delta Modulation, Generate and Detect PSK, DPSK, FSK	
L-(13-16)	Microwave Engineering: Characterize Reflex Klystron, characterize Gunn Diode, measurement of scattering parameters of magic tee., Measurement of Scattering Parameters of Circulator, Attenuation measurement, Measurement of microwave Frequency.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	<i>Electronic Communication</i>	<i>Roddy and Coolen</i>	Prentice-Hall of India Private Ltd.	<i>4th Ed</i>
2	<i>Radio Engineering</i>	<i>G K Mithal</i>	<i>Khanna Publishers</i>	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	<i>Microwave Engineering-</i>	<i>David M. Pozar</i>		
2	<i>Microwave Devices and Circuits</i>	<i>Samuel Y Laio</i>		
3	<i>Lab. Guide and Lab. Manuals</i>			

Course Outline

1. General Information

Computer Networking	ICT-3203	Semester	6 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic ICT at Higher Secondary Level

2. Course Summary

This course is an introduction to a broad range of topics in Computer Networking. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Computer Network classes. The course covers Network introduction and Network Models, Data and Signals, Digital and Analog Transmission, Multiplexing, Error Detection, Data Link Control, Media Access Control and Ethernet, Data Link and Network Layer Protocols, Unicast and Multicast Routing, Wireless Networks, Network Management and Firewalls.

3. Course Objectives

The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations, and discuss the following topics: Open Systems Interconnection (OSI) communication model; error detection and recovery; local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students should be able, in part to design, implement and maintain a typical computer network (LAN).

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	To acquire general idea about the course	P01	Affective(A3)	25	Please refer to Section 8
C02	To Discuss about Computer Network, OSI Model and Physical Layer	P01 P02 P03	Cognitive(C3)	25	
C03	Analyze the properties of Data Link Layer and Medium Access Layer	P02	Affective(A3)	20	
C04	Understand about Network Layer and Transport Layer	P03	Cognitive(C4)	15	
C05	Explain and design process of Application Layer	P03	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: Comprehend the mission and vision of the Department, general idea about the course Fundamental and Computer Networking, the content and policies for the class.	
L-(3-10)	Introduction and The Physical Layer: Types of Computer Networks, Network Topologies, Circuit and Packet Switching and Protocol Hierarchies, OSI Model, The TCP/IP Model and Uses of Computer Networks. Transmission Media, Communication Channel and Wireless Transmission), Telephone System, Narrowband ISDN Cellular Radio and Communication Satellite.	
CT-1	Tutorial Exam	
L-(12-17)	The Physical Layer and Data Link Layer: Telephone System, Narrowband ISDN Cellular Radio and Communication Satellite, Design Issues, Error Detection and Correction, Data Communication Interface, Elementary Data Link Protocols, Example Data Link Protocols, The channel allocation problem, Multiple access protocols, IEEE standard for LANs and MANs, Bridges, High speed LANs.	

CT-2	Tutorial Exam	
L-(19-25)	The Network, Transport and Application Layer: Design issues, Routing algorithms, Congestion control algorithms, Internetworking, The network layer in the internet, The transport service, Element of transport protocols, TCP and UDP, Performance issues, Network security, DNS, SNMP, E-Mail, Usenet News, WWW, Multimedia.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Computer Networks	Andrew. S. Tanenbum.		
2	Data Communications and Networking	Behrouz. A Forouzan.		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Understanding Data Communications	William A Shay	An International Thompson Publishing Company.	
2	Introduction to Data Communications	A practical approach, Larry Hughes	Narosa Publishing House,	

Course Outline

1. General Information

Computer Networking Laboratory	ICT-3204	Semester	6 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Basic Networking knowledge at Higher Secondary Level

2. Course Summary

This course is an introduction to a broad range of topics in Practical Computer Networking. It is meant to introduce the basic concepts of a range of topics, with the full details left to upper-level Computer Network classes. The course covers basic network topologies and network models, pair to pair network, Dynamic Host Configuration Protocol, DNS Server, Active directory, Cabling and packet sniffing, Basic Network Operation and Troubleshooting, IP Addressing Subnetting.

3. Course Objectives

The main emphasis of this course is on the organization and management of local area networks (LANs). The course objectives include learning about computer network organization and implementation, obtaining a theoretical understanding of data communication and computer networks, and gaining practical experience in installation, monitoring, and troubleshooting of current LAN systems. Students are introduced to computer communication network design and its operations, and discuss the following topics: local area networks; bridges, routers and gateways; network naming and addressing; and local and remote procedures. On completion of the course, students should be able, in part to design, implement and maintain a typical computer network (LAN).

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	To acquire general idea about the LAN, Cabling and Different network devices	P01	Affective(A3)	25	Please refer to Section 8
C02	To Discuss about Topologies, Printer and output device sharing	P03	Cognitive(C3)	25	
C03	Analyze the properties of DHCP, DNS and Directory Services	P02 P03	Affective(A3)	20	
C04	Understand about Basic Network Operation and Troubleshooting	P03	Cognitive(C4)	15	
C05	Explain and testing basic Linux command	P03	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Basic Idea About Network Devices: General idea about cabling, cross and straight through cabling, CAT 6 and CAT 7 cable identification, basic networking such as LAN, MAN and WAN, characteristics of different network devices such as Hub, Switch, Router, Mikrotik Router other network devices.	
L-(3-5)	Different Topologies and Sharing: Types of Networks Topologies and analysis their performance based on PDR, E2E and other parameters, printer and scanner and MODEM through multiple PC, Hybrid Topologies and implement them in real time.	
L-(6-8)	Network Protocols: DHCP and implement how DHCP work and understand it logically, domain name Server, how DNS work, explain Subnetting and super netting, basic directory services, active directory and passive directory services. To configure basic router and Mikrotik Router.	
L-(9-12)	Troubleshooting: set up windows using disk or bootable pen-drive, Setting NIC driver for basic networking, several network related errors such as NIC adapter missing, IP address missing and other driver related problem findings and their solutions, network security related issues and try to solve these problems practically., several Linux commands to test the security of the network.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Computer Networks	Andrew. S. Tanenbum		
2	Data Communications and Networking	Behrouz. A Forouzan		
3	Lab. Manual			

Course Outline

1. General Information

Artificial Intelligence	ICT 3205	Semester	7 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	Discrete Mathematics, Data Structures

2. Course Summary

Artificial intelligence is an extremely broad field with applications to many disciplines and many subfields. This course gives a broad survey of artificial intelligence, as opposed to focusing on any particular subfield of AI. The course offered by the department of CSE, will cover methods from search, optimization, probabilistic reasoning, and learning, among other topics. Of course, these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition.

3. Course Objectives

To provide knowledge on Artificial intelligence, behavior of intelligent agents, problem solving by search algorithm, knowledge representation approaches, PROLOG programming, machine learning, data driven and statistical approaches of machine learning, expert system models and expert system shells

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Define the terms Artificial Intelligence, rationality, autonomy & different types of AI agents.	PO1 PO2	Cognitive(C3)	25	

C02	Analyze various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) in relation to the benefit and behavior of the human society.	P02 P03	Cognitive(C4)	25	Please refer to Section 8
C03	Implement the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving and building procedure of simple knowledge-based systems, concerning strong morality issues	P03 P04	Affective(A3)	20	
C04	Apply fundamental knowledge of machine learning algorithms to solve analytical problems within the fields related to machine learning.	P03 P04	Cognitive(C4)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Introduction: Introduction to AI definition, Foundations of Artificial Intelligence, History of Artificial Intelligence, and The State of the Art.	
L-(4-6)	Intelligent Agents: Intelligent agents, How Agents Should Act, Structure of Intelligent Agents, and Environments.	
L-(7-9)	Problem Solving: Problem-Solving Agents, Formulating Problems, Data structures for search trees Uninformed Search Strategies: BFS, DFS, DLS, Uniform cost search, Iterative deepening search, Bidirectional search and Comparing search strategies. Informed Search: Best-First Search, Heuristic functions, Iterative deepening A* search (IDA*) Hill-climbing search and Simulated annealing.	
CT-1	Tutorial Exam	
L-(11-14)	Knowledge and Reasoning: Building a Knowledge Base Agent, Types of Knowledge, Knowledge representations, Reasoning, Propositional logic, First order logic, Inference in First order Logic, Logical Reasoning Systems (Languages for AI Problem Solving: PROLOG, LISP)	
L-(15-18)	Constraint Satisfaction Problems (CSP): Constraint Satisfaction Problems, Constraint Propagation Backtracking Search Local Search, Optimization Problem	
CT-2	Tutorial Exam	
L-(20-22)	Natural Language Processing (NLP) and Game Playing: Natural Language Processing Introduction, Syntactic Processing, Semantic Analysis, Discourse & Pragmatic Processing, Game Playing Overviews, The Minimax search procedure, Adding Alpha-Beta Cut-offs, Iterative Deepening	
L-(22-24)	Probabilistic Reasoning and Learning: Uncertainty, Probabilistic Reasoning Systems, Inference in Belief Networks, Clustering methods, Fuzzy sets and fuzzy logic, and Decision Networks, Dempster Shafer, Fuzzy Logic, Linear Regression, Perceptron, Neural Networks, Reinforcement Learning, and	

	generative adversarial network	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norving	Prentice Hall	
2	Introduction to Artificial Intelligence and Expert Systems	Patterson	D. W, Prentice Hall	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Artificial Intelligence	E. et al	McGraw Hill	
2	Machine Learning for Absolute Beginners	A Plain English Introduction (Second Edition)" by Oliver Theobal	John Wiley & Sons Inc	

Course Outline

1. General Information

Artificial Intelligence Laboratory	ICT 3206	Semester	7 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	ICT-4201

2. Course Summary

Artificial intelligence is an extremely broad field with applications to many disciplines and many

subfields. This course gives a broad survey of artificial intelligence, as opposed to focusing on any particular subfield of AI. The course offered by the department of CSE, will cover methods from search, optimization, probabilistic reasoning, and learning, among other topics. Of course, these topics are closely related with each other. For example, the knowledge acquired through learning can be used both for problem solving and for reasoning. In fact, the skill for problem solving itself should be acquired through learning. Also, methods for problem solving are useful both for reasoning and planning. Further, both natural language understanding and computer vision can be solved using methods developed in the field of pattern recognition.

3. Course Objectives

To provide knowledge on Artificial intelligence, behavior of intelligent agents, problem solving by search algorithm, knowledge representation approaches, PROLOG programming, machine learning, data driven and statistical approaches of machine learning, expert system models and expert system shells.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Define the terms Artificial Intelligence, rationality, autonomy & different types of AI agents.	P01 P02	Cognitive(C3)	25	Please refer to Section 8
C02	Analyze various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction, genetic algorithms) in relation to the benefit and behavior of the human society.	P02	Cognitive(C4)	25	
C03	Implement the fundamentals of knowledge representation (logic-based, frame-based, semantic nets), inference and theorem proving and building procedure of simple knowledge-based systems, concerning strong morality issues	P03	Affective(A3)	20	
C04	Apply fundamental knowledge of machine learning algorithms to solve analytical problems within the fields related to machine learning.	P04	Cognitive(C4)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-1	Intelligent agents: Lab task on what Artificial Intelligence is about and different types of AI agents, Knowledge-based agents and logical problem solving: introduction to, knowledge representation and propositional logic.	

L-2	First-order logic: as a basis for building intelligent agents capable of acting and reacting in a complex environment.	
L-3	Searching as a problem-solving technique: a review of "conventional" searching methods including breadth-first, depth-first, bi-directional and best-first search, Searching as a problem-solving technique: depth limited search and iterative depth limited search.	
L-4	Searching as a problem-solving technique: Heuristic functions and their effect on performance of search algorithms.	
L-(5-6)	Introduction to WEKA: Supervised learning: regression - Attributes and target variable, Linear regression by Maximum Likelihood.	
L-(7-9)	Supervised learning: classification - Nearest neighbors (kNNs), Decision trees, Unsupervised learning: Introduction to clustering, K-means.	
L-(10-15)	Project Presentation	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell and Peter Norving	Prentice Hall	
2	Introduction to Artificial Intelligence and Expert Systems	Patterson	D. W, Prentice Hall	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Artificial Intelligence	E. et al	McGraw Hill	
2	Machine Learning For Absolute Beginners	A Plain English Introduction (Second Edition)" by Oliver Theobal		

Course Outline

1. General Information

Computer Graphics and Visualizations	ICT-3207	Semester	6 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Vector and Geometry, C/C++

2. Course Summary

Computer graphics are an intrinsic component of many modern software applications and are often essential to the success of these applications. The objective of this course is to familiarize the student with fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers. The principles and practice of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualization, virtual reality, computer games and film animation. The course will include some practical experience of graphical software environments such as Java Graphics 2D and OpenGL.

3. Course Objectives

The course introduces the basic concepts of computer graphics. It provides the necessary theoretical background and demonstrates the application of computer science to graphics. The course further allows students to develop programming skills in computer graphics through programming assignments.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Explain the application areas, graphic pipeline, and different display technologies.	P01	Cognitive(C3)	30	Please refer to Section 8
C02	Demonstrate the concepts of color models, lighting and shading models, textures, ray tracking, hidden surface elimination, anti-aliasing and rendering.	P01 P02	Cognitive(C4)	35	
C03	Design various algorithms for scan conversion and filling of basic objects and their comparative analysis.	P02 P04	Affective(A3)	35	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Introduction: Introduction to Computer Graphics, Graphics hardware, Display devices and Input devices.	
L-(3-6)	Image Representation: Scan Conversion, Basic raster graphics algorithms for drawing 2D, Line Drawing Algorithms, Circle Drawing Algorithms, Recursively Define Drawing: C Curve, Koch Curve, Aliasing and Anti-Aliasing Technique, Super-sampling.	
CT-1	Tutorial Exam	
L-(6-9)	2D Viewing and Clipping: Introduction to two-dimensional viewing, clipping and transformations, Line clipping and polygon clipping algorithms.	
L-(10-13)	3D Viewing, Clipping, and Geometric Representation: Three-dimensional viewing, 3D object representation, B-spline curves and surfaces, BSP trees, Octrees.	
CT-2	Tutorial Exam	
L-(14-18)	Hidden Surface: Visualization of 2D/3D scalar fields: color mapping, iso	

	surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of: Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional,	
L-(14-18)	Hidden Surface: Fractal geometry methods, Visible surface detection methods	
L-(18-24)	Visualization: Visualization of 2D/3D scalar fields: color mapping, iso surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of: Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional, key framing.	
CT-3	Tutorial	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Schaum's Outlines Computer Graphics	Zhigang Xiang	McGracHill	
2	Computer Graphics C Version	D Hearn and M P Baker	Prentice-Hall	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Computer Graphics Principles and Practice	Foley and co-authors	Addison Wesley	
2	From Pixels to Pictures	Sun Microsystems Inc	Addison Wesley	

Course Outline

1. General Information

Computer Graphics and Visualization Laboratory	ICT-3208	Semester	6 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Practical/Laboratory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	Vector and Geometry, C/C++

2. Course Summary

Computer graphics are an intrinsic component of many modern software applications and are often essential to the success of these applications. The objective of this course is to familiarize the student with fundamental algorithms and data structures that are used in today's interactive graphics systems as well as programming and architecture of high-resolution graphics computers. The principles and practice of computer graphics are described from their mathematical foundations to the modern applications domains of scientific visualization, virtual reality, computer games and film animation. The course will include some practical experience of graphical software environments such as Java Graphics 2D and OpenGL.

3. Course Objectives

The course introduces the basic concepts of computer graphics. It provides the necessary theoretical background and demonstrates the application of computer science to graphics. The course further allows students to develop programming skills in computer graphics through programming assignments

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Explain the application areas, graphic pipeline, and different display technologies.	P01	Cognitive(C3)	30	Please refer to Section 8
C02	Demonstrate the concepts of color models, lighting and shading models, textures, ray tracking, hidden surface elimination, anti-aliasing and rendering.	P01 P02	Cognitive(C4)	35	
C03	Design various algorithms for scan conversion and filling of basic objects and their comparative analysis.	P02 P04	Affective(A3)	35	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Introduction: Introduction to Computer Graphics, Graphics hardware, Display devices and Input devices.	
L-(3-6)	Image Representation: Scan Conversion, Basic raster graphics algorithms for drawing 2D, Line Drawing Algorithms, Circle Drawing Algorithms, Recursively Define Drawing: C Curve, Koch Curve, Aliasing and Anti-Aliasing Technique, Super-sampling.	
CT-1	Tutorial Exam	
L-(6-9)	2D Viewing and Clipping: Introduction to two-dimensional viewing, clipping and transformations, Line clipping and polygon clipping algorithms.	
L-(10-13)	3D Viewing, Clipping, and Geometric Representation: Three-dimensional viewing, 3D object representation, B-spline curves and surfaces, BSP trees,	

	Octrees.	
CT-2	Tutorial Exam	
L-(14-18)	Hidden Surface: Visualization of 2D/3D scalar fields: color mapping, iso surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of: Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional,	
L-(14-18)	Hidden Surface: Fractal geometry methods, Visible surface detection methods	
L-(18-24)	Visualization: Visualization of 2D/3D scalar fields: color mapping, iso surfaces. Direct volume data rendering: ray-casting, transfer functions, segmentation. Visualization of: Vector fields and flow data, Time-varying data, High-dimensional data: dimension reduction, parallel coordinates, Non-spatial data: multi-variate, tree/graph structured, text Perceptual and cognitive foundations, Evaluation of visualization methods, Applications of visualization, Basic Animation Techniques like traditional, key framing.	
CT-3	Tutorial	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Schaum's Outlines Computer Graphics	Zhigang Xiang	McGracHill	
2	Computer Graphics C Version	D Hearn and M P Baker	<i>Prentice-Hall</i>	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	<i>Computer Graphics Principles and Practice</i>	<i>Foley and co-authors</i>	<i>Addison Wesley</i>	
2	<i>From Pixels to Pictures</i>	<i>Sun Microsystem Inc</i>	<i>Addison Wesley</i>	

Course Outline

1. General Information

System Analysis and Software	ICT-3209	Semester	6 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory

	Contact Hours	3/week
	Course Status	Major Engineering
	Prerequisite Course	ICT-1203, ICT-2105, ICT-2207

2. Course Summary

In this course students will learn system analysis and software engineering including basic idea about system and system environment, role of system analyst, system design and testing. This course also focuses on software engineering and CASE study

3. Course Objectives

To provide knowledge on information system, system life-cycle, role of system analyst, system design, system testing and quality, software engineering, CASE, and re-engineering.

4. Course Outcomes

C0	C0 Description	P0	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the system life-cycle	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Understand the challenges and issues to develop a system	P01 P02	Cognitive(C4)	25	
C03	Test and analysis the quality of a system	P02 P04	Affective(A3)	20	
C04	Understand the roll of a system analyst	P04 P05	Cognitive(C4)	10	
C05	Understand the planning and decision-making level of organization	P04 P05	Cognitive(C4)	10	
C06	Understand the CASE and software reuse.	P02 P03 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	System Concepts and the Information Systems Environment: Introduction, Definition, Characteristics of a system, Elements of a system, Types of Systems.	
L-(4-5)	Role of System Analyst: Historical perspective, Skills and Qualifications of a system analyst, Multifaceted role of an analyst, The analyst/user interface.	
L-(6-8)	The process and Stages of System Design: Explain Logical and Physical design, Design methodologies, Major development activities.	
CT-1	Tutorial Exam	
L-(10-12)	System Testing and Quality Assurance: System testing, Nature of test data, Test	

	plan, Quality assurance, Trends in testing.	
L-(13-16)	Introduction to Software Engineering: Definition of software Engineering, Why engineering software is different? Characteristics of software product, Software life cycle.	
L-(16-18)	CASE: Computer-aided Software Engineering, CASE workbenches, Software Engineering Environments.	
CT-2	Tutorial Exam	
L-(20-22)	Software Management: Managing People, Software Cost Estimation, Process Improvement	
L-(23-24)	Software Evolution: Software Reuse, Software Maintenance, Configuration Management, Software Re engineering.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Modern Structured Analysis	E Yourdon,	Prentice-Hall	
2	SSADM Version 4 a Practical Approach	M Goodland and C Slater	Mc Graw-Hill	
3	System Analysis and Development	P J Layzell and P Loucopolus	Chartwell-Bratt.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	System Analysis and Design	S Y Wu and M S Wu	<i>West.</i>	
2	System Analysis and Design	Elias M Awad	Galgotia Publications	
3	Galgotia Publications	R S Pressman	McGraw-Hill.	
4	CASE Using Software Development Tools	A S Fisher		

Course Outline

Viva-Voce	ICT-3000	Semester	6 th Semester
		Full Marks	100
		Exam Duration	
		Course Credit	1.00
		Course Type	
		Contact Hours	
		Course Status	
		Prerequisite Course	Based on 3 rd Year 1 st and 2 nd Semester

4th Year 1st Semester-2029

Course Outline

1. General Information

Machine Learning	ICT 4101	Semester	8 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	Linear Algebra, Probability and Statistics, Artificial Intelligence

2. Course Summary

The comprehensive Machine Learning course is designed to provide students with a solid foundation in the principles, techniques, and applications of machine learning. The course covers both theoretical foundations, algorithms to advanced application, and practical implementations, aiming to equip students with the skills necessary to apply machine learning to real-world problems.

3. Course Objectives

To understand the basic theory underlying machine learning. To be able to formulate machine learning problems

corresponding to different applications. To understand a range of machine learning algorithms along with their strengths and weaknesses. To be able to apply machine learning algorithms to solve problems of moderate complexity. To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Understanding popular ML algorithms with their associated mathematical foundations for appreciating these algorithms.	P01	Affective (A5)	15	Please refer to Section 8
CO2	Make aware of the role of data in the future of computing, and also in solving real-world problems using machine learning algorithms.	P02	Cognitive (C5)	20	
CO3	Help connect real-world problems to appropriate ML algorithm(s) for solving them. Enable formulating real world problems as machine learning tasks.	P03 P04	Cognitive (C6)	20	
CO4	Appreciate the mathematical background behind popular ML algorithms.	P02 P05	Cognitive (C4)	20	

C05	Ensure awareness about importance of core CS principles such as algorithmic thinking and systems design in ML	P03	Psychomotor (P7)	25	
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5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Introduction: Expose broad canvas of machine learning; brief history and importance, Problem formulations (classification and regression), Appreciate the probability distributions in the context of data, Prior probabilities and Bayes Rule, Introduce paradigms of learning (primarily supervised and unsupervised	
L-(4-6)	Fundamentals of ML: PCA and Dimensionality Reduction, Nearest Neighbours and KNN, Linear Regression, Decision Tree Classifiers, Notion of Generalization and concern of Overfitting, Notion of Training, Validation and Testing; Connect to generalisation and overfitting	
L-(7-9)	Selected Algorithms: Ensembling and RF, Linear SVM, K Means, Logistic Regression, Naive Bayes	
CT-1	Tutorial Exam	
L-(11-14)	Neural Network Learning: Role of Loss Functions and Optimization, Gradient Descent and Perceptron/Delta Learning, MLP, Backpropagation, MLP for Classification and Regression, Regularizations, Early Stopping, Introduction to Deep Learning, CNNs	
L-(15-18)	Key Concepts from ML: Kernels (with SVM), Bayesian Methods, Generative Methods, HMM, EM, PAC learning, hidden Markov model	
CT-2	Tutorial Exam	
L-(20-22)	Deep Learning Architectures: Popular CNN Architectures, RNNs, GANS and Generative Models	
L-(22-24)	Training Today's Neural Networks: Advances in Backpropagation and Optimization for Neural Networks, Adversarial Learning	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Machine Learning	Tom M. Mitchell	McGraw Hill Education	International Edition
2	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong	Cambridge University Press	23 April 2020

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Deep Learning	Ian Goodfellow, YoshouaBengio, and Aaron Courville	MIT Press Ltd	Illustrated edition
2	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	2nd edition

Course Outline

1.General Information

Machine Learning Laboratory	ICT 4102	Semester	8 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	ICT-4201

2.Course Summary

The comprehensive Machine Learning course is designed to provide students with a solid foundation in the principles, techniques, and applications of machine learning. The course covers both theoretical foundations, algorithms to advanced application, and practical implementations, aiming to equip students with the skills necessary to apply machine learning to real-world problems.

3.Course Objectives

To understand the basic theory underlying machine learning. To be able to formulate machine learning problems corresponding to different applications. To understand a range of machine learning algorithms along with their strengths and weaknesses. To be able to apply machine learning algorithms to solve problems of moderate complexity. To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

4.Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weig ht	Assessment Methods
CO1	Understanding popular ML algorithms with	P01		15	

	their associated mathematical foundations for appreciating these algorithms.		Affective (A5)		Please refer to Section 8
C02	Make aware of the role of data in the future of computing, and also in solving real-world problems using machine learning algorithms.	P02	Cognitive (C5)	15	
C03	Capability to implement basic algorithms using basic machine learning libraries mostly in python. Gain hands-on experience in applying ML to problems encountered in various domains. In addition, obtain exposure to high-level ML libraries or frameworks such as TensorFlow, PyTorch.	P02	Affective (A5)	15	
C04	Help connect real-world problems to appropriate ML algorithm(s) for solving them. Enable formulating real world problems as machine learning tasks.	P03 P04	Cognitive (C6)	20	
C05	Analyze and compare models and algorithms with respect to their complexity, performance and applicability	P02 P04	Cognitive (C4)	15	
C06	Develop models/algorithms with small modifications of existing standard techniques for a modification of known task	P03	Cognitive (C5)	20	

5.Topic Outline

Lecture	Selected Topic	Index
L-1	(i) Experiments/notebooks/code that refresh Python, programming frameworks used for the course (ii) Experiments/Code that allows students to appreciate mathematics and data manipulation. Appreciate (a) Features, Representation of the data/real-world phenomena (b) mathematical operations or transformations that manipulate the data (c) plot/visualise the data distributions (say in 2D) (d) eigen values, eigen vectors, rank of matrices.(iii)Lab/Experiments that appreciate the problem of Classification and problem of Regression (iv)Lab/Experiments that appreciates the notions related to "Training" and "Testing" by considering algorithms like decision trees, nearest neighbour as black boxes.	
L-2	(i) Dimensionality Reduction using PCA and its applications in (a) removing irrelevant features (b) compression /compaction (c) efficient ML pipeline(ii)Experiment related to Nearest neighbour classifier, (a)visualize the decision boundaries (b) appreciate the role of hyperparameter K. Role of validation data in choice of hyper parameters (iii) Decision Tree as a classifier and see the overfitting with "deep" trees. How the overfitting can be controlled by seeing validation performance during the training.	
L-3	(i)Experiments related to K-Means, by varying in "K", "initialization". How the "analysis of the algorithm" can be seen in the lab (eg. change of objective across iterations). Try multiple datasets. Appreciate that "unsupervised discovery" makes sense in the problem under consideration. (ii)An experiment that demonstrates how SVM can yield a solution better than a simple linear separating solution. Appreciate the role of support vectors. Appreciate how	

	SVMs extend to problems even if data is not linearly separable. (iii)An experiment that makes students appreciate the utility of naive Bayes classifier in practice (say designing a text classifier).	
L-4	(i)Experiment that exposes the GD and BP in simple neural networks. Show the learning process (graphs) and performances. (ii)Experiment that use a modern library and implementation of a deep neural network, expose computational graphs, expose the generalized way of appreciating BP as a learning algorithm in Deep Neural Networks (iii)Experiment that uses a popular CNN architecture for practical application (say image classification). (iv)Experiments that strengthen the empirical skills in training with (a) initializations (b) update strategies (c) regularization (d) multi fold validation on a small/medium size deep neural network that can be trained in 5 minutes.	
L-(5-6)	Python notebooks that demonstrate the use of these algorithms on public datasets, Use of popular architectures for pretrained features and transfer learning, Use of RNNs in learning “language models” in large text corpus (charRNN), Capability and practical challenged in working with GANS	
L-(7-9)	See how (i) initialization (ii) momentum (iii) update rules have helped in getting better minima/soln. Experience how regularisation helps in avoiding overfitting and getting better solutions	
L-(10-15)	Project Presentation	

Notes on Exercises/Labs/Homeworks

1. Use iPython/Jupyter notebooks to hand out assignments; such notebooks allow embedding instructions/videos/etc, making it easy for instructors, students as well as TAs
2. It may be good to have both theory and programming components in the assignment/homework component, to allow students to appreciate and learn both aspects of machine learning
3. Based on target audience, have a healthy mix of using an off-the-shelf machine learning library (e.g. using sklearn's decision tree function) and writing an algorithm from scratch (e.g. coding up decision tree from scratch)
4. Consider having a Kaggle-style hackathon in the course, where students get used to competitive machine learning

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow	AurélienGéron	O'Reilly Media, Inc.	2nd Edition
2	Machine Learning	Tom M. Mitchell	McGraw Hill Education	International Edition
3	Mathematics for Machine Learning	Marc Peter Deisenroth, A. Aldo Faisal, Cheng Soon Ong	Cambridge University Press	23 April 2020

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Deep Learning	Ian Goodfellow, YoshouaBengio, and	MIT Press Ltd	Illustrated

		Aaron Courville		edition
2	Pattern Recognition and Machine Learning	Christopher M. Bishop	Springer	2nd edition

Course Outline

1. General Information

Digital Image Processing	ICT-4103	Semester	7 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, ICT-2107, MATH-2101, and STAT-2201

2. Course Summary

In this course students will learn digital image processing techniques including representation, sampling and quantization, image acquisition, image transforms, image enhancement, and image smoothing and sharpening. More advanced topics include image filtering, color image processing, and image segmentation.

3. Course Objectives

Interpret image storage, sampling, and frequency domain processing operations.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Achieve knowledge of a broad range of fundamental image processing and image analysis techniques and concepts.	P01	Cognitive(C3)	25	Please refer to Section 8
CO2	Learn different techniques employed for the enhancement of images.	P02	Cognitive(C4)	25	
CO3	Understand the need for image transforms different types of image transforms and their properties.	P02 P03	Affective(A3)	20	
CO4	Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.	P02 P03	Cognitive(C4)	10	

C05	Learn different post-processing operations.	P02 P03	Cognitive(C4)	10	
C06	Develop any image processing application.	P03 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Image Fundamentals: Human vision system, Image capturing, digital image generating, image sampling, quantization techniques, General idea of pixel relationships, image region, image boundary, and some linear operations.	
L-(4-5)	Image Enhancement in Spatial Domain: Intensity (gray level) transformation and spatial filtering, Image enhancement techniques and pixel-level arithmetic operations.	
L-(6-9)	Color Image Processing: Color different model for color image processing, Addition color generation and transformation.	
CT-1	Tutorial Exam	
L-(11-16)	Image Compression: Image compression, image compression standards, and benefits of image compression, JPEG and JPEG 2000 image compression standards.	
CT-2	Tutorial Exam	
L-(18-24)	Morphological Image Processing: Mathematical morphological tools to represent and describe region's shape such as boundaries, skeletons, and the convex hull, several theoretic operations and discuss binary sets and logical operations, intensity discontinuities, such as points, lines, and edges, image segmentation	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Digital Image Processing	Rafael C. Gonzalez		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Digital Image Processing	William K. Pratt, Wiley		
2	https://www.tutorialspoint.com/dip			
3	https://www.geeksforgeeks.org/digital-image-processing-basics			

4	https://homepages.inf.ed.ac.uk/rbf/HIPR2/glossary.htm			
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Course Outline

1. General Information

Digital Image Processing Lab.	ICT-4104	Semester	7 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, MATH-2101, STAT-2201, ICT-4103

2. Course Summary

In this course students will learn digital image processing techniques including representation, sampling and quantization, image acquisition, image transforms, image enhancement, and image smoothing and sharpening. More advanced topics include image filtering, color image processing, and image segmentation.

3. Course Objectives

Interpret image storage, sampling, and frequency domain processing operations, Evaluate current technologies and issues that are specific to image processing systems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Achieve knowledge of a broad range of fundamental image processing and image analysis techniques and concepts.	P01	Cognitive(C3)	15	Please refer to Section 8
CO2	Learn different techniques employed for the enhancement of images.	P02	Cognitive(C4)	25	
CO3	Understand the need for image transforms different types of image transforms and their properties.	P02 P03	Affective(A3)	20	
CO4	Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.	P02 P03	Cognitive(C4)	15	

C05	Learn different post-processing operations.	P02 P03	Cognitive(C4)	15	
C06	Develop any image processing application.	P03 P04	Affective(A3)	10	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Exp #1: Fundamentals of Python and OpenCV with python. Anaconda and Open CV with Python installation. General idea about OpenCV and Python programming.	
L-(4-6)	Exp #2: Point Processing and Pixel Operations. Exp #3: Image Arithmetic, Histogram calculation and Equalization. Exp #4: Linear transformation of an image. Point processing, arithmetic operations. Image enhancement techniques.	
CT-1	Tutorial Exam	
L-(7-10)	Exp #5: Spatial filtering operations. Exp #6: Edge, corner, and boundary detection. Image filtering techniques. Edge, corner, boundary detection operation. Color transformation. Post-processing operations.	
CT-2	Tutorial Exam	
L-(11-16)	Exp #5: Spatial filtering operations. Exp #6: Edge, corner, and boundary detection. Image compression techniques. Video segmentation. Wavelet transformation.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Digital Image Processing	Rafael C. Gonzalez		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	https://docs.opencv.org/4.x/d6/d00/tutorial_py_root.html			
2	https://www.tutorialspoint.com/dip			

3	https://www.geeksforgeeks.org/digital-image-processing-basics			
4	https://homepages.inf.ed.ac.uk/rbf/HIPR2/glossary.htm			
5	Digital Image Processing: PIKS Scientific Inside	William K. Pratt		

Course Outline

1. General Information

Information Theory and Coding	ICT-4105	Semester	7 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-2205 and STAT-2201

2. Course Objectives

To provide the knowledge of different information sources.

3. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the notion of information and information sources in the quantitative sense	P01	Cognitive(C3)	15	Please refer to Section 8
C02	Know entropy, relative entropy and mutual information.	P02	Cognitive(C4)	15	
C03	Understand the notion of entropy rates of stochastic process.	P02 P03	Affective(A3)	10	
C04	Understand information rates.	P02 P03	Cognitive(C4)	15	
C05	Know the different data compression techniques as it applied to information.	P02 P03	Cognitive(C3)	15	
C06	Understand the notion on channels and codes.	P03 P04	Cognitive(C4)	10	
C07	Understand different source coding theorems.	P03 P04	Affective(A3)	10	
C08	Understand channel coding for noisy channels.	P03 P04	Cognitive(C4)	10	

4. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Information Sources: Introduction, Probability Spaces and Random Variables, Random Processes and Dynamical Systems, Distributions, Standard Alphabets, Expectation, Asymptotic Mean Stationarity, Ergodic Properties.	
L- (4-7)	Entropy, Relative Entropy and Mutual Information: Entropy and Entropy Rate, Basic Properties of Entropy, Joint Entropy and Conditional Entropy, Relative Entropy and Mutual Information, Relationship between Entropy and Mutual Information, Chain Rules for Entropy, Relative Entropy and Mutual Information.	
CT-1	Tutorial Exam	
L-(8-10)	Entropy Rates of a Stochastic Process: Markov Chains, Entropy Rate, Example: Entropy Rate of a Random Walk on a Weighted Graph, Second Law of Thermodynamics Functions of Markov Chains.	
L-(11-13)	Information Rates: Introduction, Stationary Codes and Approximation, Information Rate of Finite Alphabet Processes, Conditional Relative Entropy, Limiting Entropy Densities, Information for General Alphabets, Some Convergence Results. Information Rates for General Alphabets, A Mean Ergodic, Theorem for Densities, Information Rates of Stationary Processes.	
CT-2	Tutorial Exam	
L-(12-15)	Data Compression: Examples of Codes, Kraft Inequality, Optimal Codes, Bounds on the Optimal Code Length, Kraft Inequality for Uniquely Decodable Codes, Huffman Codes, Some Comments on Huffman Codes, Optimality of Huffman Codes, Shannon–Fano–Elias Coding, Competitive Optimality of the Shannon Code, Generation of Discrete Distributions from Fair Coins.	
L-(16-18)	Channels and Codes: Introduction, Channels, Stationarity Properties of Channels, Examples of Channels, The Rohlin-Kakutani Theorem, Distortion and Fidelity Criteria, Performance, The ρ -bar distortion, d -bar Continuous Channels, The Distortion-Rate Function.	
L-(19-21)	Source Coding Theorems: Source Coding and Channel Coding, Block Source Codes for AMS Sources, Block Coding Stationary Sources, Block Coding AMS Ergodic Sources, Subadditive Fidelity Criteria, Asynchronous Block Codes, Sliding Block Source Codes, A Geometric Interpretation of OPTA's.	
L-(22-25)	Coding for noisy channels: Noisy Channels, Feinstein's Lemma, Feinstein's Theorem, Channel Capacity, Robust Block Codes, Block Coding Theorems for Noisy Channels, Joint Source and, Channel Block Codes, Synchronizing Block Channel Codes, Sliding Block Source and Channel Coding.	
CT-3	Tutorial Exam	

5. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Communication Systems	Simon Haykin		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Communication system.	Carlson		
2	Information Theory and Coding	N Abramson		
3	Error Control Coding	Shu Lin and D J Costello		
4	Fundamentals in Information Theory and Coding	Borda		
5	Information theory and Coding Basics and Practices	Veluswamy S		
6	Lecture Sheet and Presentation Materials			

Course Outline

1. General Information

Information Theory and Coding Laboratory	ICT-4106	Semester	7 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-4105

2. Course Objectives

This course will introduce the students to the practical concepts underlying information theory, mutual information, information gain, design and Analyze channel capacity, noise control coding techniques.

3.

Course Outcomes

C

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
CO1	Understand the Entropy and its types	P01	Cognitive(C3)	25	Please refer to Section 8
CO2	Know different source coding techniques	P02	Cognitive(C4)	25	
CO3	Understand different channel coding techniques in noiseless and noisy environments	P03	Affective(A3)	25	
CO4	Understand Channel coding with different codes	P04	Cognitive(C4)	25	

4. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	*Find Entropy, Joint Entropy, Conditional Entropy, Relative Entropy (KL divergence), Mutual Information, Normalized Mutual Information, and Normalized Variation Information (using MATLAB). *Compute the entropy of an entered text string (using MATLAB).	
L-(4-9)	*Huffman Coding, Run Length Encoding, Shanon-Fano Encoding (using MATLAB)	
L-(10-12)	Find Entropy and Mutual Information of Noiseless Channel (using MATLAB). Channel Coding for Noisy Channel (using MATLAB).	
L-(13-14)	Channel Coding using Hamming (7,4) Block Code (using MATLAB).	
L-(15-17)	Channel Coding (Forward error correction codes and Convolutional Codes both are used for Error correction and which will perform better in AWGN environment) using MATLAB.	

5. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Communication Systems	Simon Haykin		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Communication system.	Carlson		
2	Elements of Information Theory	TM Cover and J. M Tomas		

Course Outline

1. General Information

Microprocessor and Microcontroller	ICT-4107	Semester	7 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1201

2. Course Summary

Microprocessor: microcontroller and microcomputer, evaluation of microprocessor and application, introduction to 8-bit, 16-bit, and 32-bit microprocessors; addressing modes: absolute addressing, 8086 internal architecture, PIN diagram of 8086, Max-Min mode, register structure; memory read write cycle; Instruction set; pipeline concept: interrupts, programmed I/O, memory mapped I/O, interrupt driven I/O, direct memory access; block transfer; cycle stealing; interleaved; multi-tasking and virtual memory; memory interface; bus interface; arithmetic co-processor; assembly language programming of 8086 microprocessors.

3. Course Objectives

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation. Microprocessor is the course used to provide an understanding of microprocessor hardware and software. Students completing this course will work with microprocessor-based equipment, and be capable of distinguishing hardware from software faults. The superior students will also be capable of participating in product development efforts, including support and development of assembly language code.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Compare accepted standards and guidelines to select appropriate Microprocessor and Microcontroller to meet specified performance requirements.	P01	Affective(A3)	25	Please refer to Section 8
C02	Assess and solve basic binary math operations using the microprocessor and explain the microprocessors and Microcontroller's internal architecture and its operation within the area of manufacturing and performance.	P02	Cognitive(C3)	25	
C03	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.	P03	Affective(A3)	20	

C04	Design electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.	P04	Cognitive(C4)	15	
C05	Formulate appropriate computing solution for processor or controller-based application.	P05	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	microprocessors and microcontroller, the evolution of microprocessor and its application, microcomputer system consists of CPU, RAM and ROM memories, input /output interfaces and peripheral units.	
L-(3-8)	the different instruction bits 8086 microprocessor, the different addressing modes of 8086 microprocessor, 8086 internal architecture and its PIN diagram, max and min mode and register's structure, how to read and write into memory and different instruction sets.	
CT-1	Tutorial Exam	
L-(10-15)	pipelining concepts, interrupts, electrical circuitry to the Microprocessor I/O ports in order to interface the processor to external devices.	
CT-2	Tutorial Exam	
L-(16-19)	data transfer in microprocessor, concurrency and virtual memory.	
L-(20-24)	knowledge to interface peripherals with the microprocessor, knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor and microcontroller.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Microprocessors and Interfacing	Douglas V Hall	Tata Mcgraw Hill	3rd Edition 2019-2020

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	The Intel Microprocessors	Barry B. Brey	Prentice Hall	Eighth Edition 2009
2	Microprocessor and Microcontroller System	Godse	Technical Publications.	First Edition

Course Outline

1. General Information

Microprocessor and Microcontroller Lab.	ICT-4108	Semester	7 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Practical/Laboratory work
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1201

2. Course Summary

This course introduces the programming, architecture and interfacing of the Intel 80x86 microprocessors for the students who had previous knowledge in both computer architecture: hardware and software. This course helps students to understand how the microcomputer system works and how to build a microcomputer system using a microprocessor or microcontroller using assembly language. This course focuses on programming language for machine code, rules, syntax and how to write programs to perform any task with microprocessor.

3. Course Objectives

This course is intended for students who have some prior programming experience. The course will introduce the basics of the microprocessor instructions, assembly language and writing different programs in assembly language using EMU 8086.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Discuss different concepts of Microprocessors.	P01	Affective(A3)	25	Please refer to Section 8
C02	Analyze and identify the major component of a computer system and steps involving in assembling, linking, and executing a program to run the system.	P02	Cognitive(C3)	25	
C03	Create programs for microcontroller using assembly language and programming knowledge.	P03	Affective(A3)	20	
C04	Assess and solve basic binary math operations using the microprocessor.	P04	Cognitive(C4)	15	
C05	Apply knowledge and demonstrate programming proficiency.	P05	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1)	Introduction to Assembly Language and EMU 8086: the assembly programming language and the 8086 microprocessors.	
L-(2-3)	Program structure and familiarization with different instructions: identify program structure, understand different program structure.	
L-(4-7)	Arithmetic operations: learn arithmetic operations, practice some examples of arithmetic operations.	
L-(8-12)	Understanding Advanced 8086 I/O Instructions: understand how to read and write into memory and different instruction sets.	
L-(13--15)	Use of Loop: apply knowledge and demonstrate different loops of assembly language.	
L-(16--18)	Use of Array: knowledge and demonstrate array of assembly language.	
L-(19--20)	Logic operations in assembly language: learn logic of assembly language, write a program in assembly language to illustrate logic.	
L-(20--22)	Familiarizing with MDA 8086 trainer Kit Commands in Serial Monitor Mode: apply with the MDA 8086 microprocessor kit and its operations.	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	The AVR Microcontroller and Embedded Systems.	Mazidi, M. A., Naimi., S. &Naimi, S.	Prentice-Hall of India Private Ltd.	August (2011)
2	Microprocessors and interfacing: programming and hardware (pp. 442-487).	Hall, D. V., & Rood, A. L.	McGraw-Hill.	(1986)
3	Assembly Language Programming and Organization IBM PC.	Yu, Y. Y., & Marut, C.	McGraw-Hill Higher Education	(1992)

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Assembly Language for the IBM-PC.	Irvine, K. R.	Prentice Hall PTR	(1990)
2	https://kader05cuets.wordpress.com/lecture-materials-2/microprocessor-and-interfacing-sessional/			

4th Year 2nd Semester-2029

Course Outline

1. General Information

Wireless Communications	ICT 4201	Semester	8 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	ICT-2205, 3101

2. Course Summary

To provide knowledge on mobile and cellular system, design of cellular systems, cell coverage of signal and traffics, cell frequency management, operational techniques and techniques, switching techniques, intelligent cell concepts and applications

3. Course Objectives

To understand the theory of wireless propagation environment and wireless communication systems, to be able to design and analyze optimum receivers for various wireless communication in fading channel, to understand the theories and practice of diversity, multiple input multiple output (MIMO) system, space time coding, spread spectrum modulation, orthogonal frequency division multiple access, to be able to simulate and design wireless communication systems.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01		25	Please refer to Section 8
C02	Differentiate the mobile and cellular system,	P02 P03		25	
C03	Calculate coverage area and traffics of a cell	P02 P03		20	
C04	Understand frequency management techniques under a cell	P05		15	
C05	Discuss the switching techniques, Intelligent cells and its applications	P0(6-7)		15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: Comprehend the mission and vision of the Department, General idea about the Wireless Communication Systems, The content and policies for the class.	
L-(3-6)	Introduction to Cellular Mobile Systems: To discuss Basic Cellular System, Operation of Cellular Systems, Planning a Cellular Systems, Analog and Digital Cellular Systems.	
L-(6-8)	Elements of Cellular Radio System Design: General description, Frequency reuse channels, Co-channel Interference, Handoff Mechanism, Cell splitting, and Components of Cellular Systems.	
CT-1	Tutorial Exam	
L-(10-12)	Cell Coverage for Signal and Traffic: Obtaining the Mobile Point-to-Point Model Propagation over Water or Flat Open Area, Foliage Loss, Propagation in Near in Distance, Long Distance Propagation, Obtain Path Loss from a Point-to-Point Prediction Model, Form of a Point-to Point Model, Computer Generation of a Point-to-Point Prediction, Cell-Site Antenna Heights and Signal Coverage Cells, Mobile-to Mobile Propagation.	
L-(13-15)	Frequency Management and Channel Assignment: Frequency management, Frequency spectrum utilization, Setup channels, Definition of Channel assignment, Fixed channel assignment, Non-fixed channel assignment.	
CT-2	Tutorial Exam	
L-(17-19)	Operational Techniques and Technologies: Adjusting the Parameters of a System, Coverage-Hole Filler, Leaky Feeder, Cell Splitting, Small Cells (Microcells), Narrow-beam Concept, Separation between Highway Cell Sites, Low-Density Small-Market Design.	
L-(20-22)	Switching and Traffic: To Analyze General Description, Cellular Analog Switching Equipment, Cellular Digital Switching Equipment, Special Features for Handling Traffic, MTSO Interconnection, Small Switching Systems, System Enhancement.	
L-(22-25)	Intelligent Cell Concept and Applications: Intelligent Cell Concept, Applications of Intelligent Microcell Systems, In-building Communication, CDMA Cellular Radio Network.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Mobile Cellular Telecommunications, Analog and Digital Systems	William C. Y. Lee, McGraw Hill	McGraw Hill	
2	Mobile Radio Communications	Raymond Steele	IICE Press, New York	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Telecommunication System Engineering	Roger L Freeman	John Wiley & Sons	

Course Outline

1. General Information

Wireless Communications Laboratory	ICT 4202	Semester	8 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	39
		Course Status	Major Engineering
		Prerequisite Course	ICT-4203

2. Course Summary

This course gives students deep knowledge in wireless communication systems at the practical level. This lab focuses on the propagation path-loss, mobile velocity, transmitting and receiving power, distance between cell site and mobile unit.

3. Course Objectives

This course will introduce the students to the practical concepts of mobile and cellular system, cell coverage and traffics, frequency management, quality of services, operation techniques, switching techniques, intelligent cell design.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	25	Please refer to Section 8
C02	Simulate and analyze cell's coverage area and traffics	P02	Cognitive(C4)	25	
C03	Calculate different lossesby using MATLAB tools	P03	Affective(A3)	20	
C04	Estimate transmitting powerby using MATLAB tools	P05 P05	Cognitive(C4)	15	
C05	Simulate and configure switches	P07	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Course Overview: General idea about the Wireless Communication Laboratory, The experimental list for this Laboratory, About simulator software.	

L-(3-4)	Elements of Cellular Radio System Design: Maximum velocity of Mobile unit using MATLAB tools, Coherence bandwidth using MATLAB tools, The distance between transmitter and receiver using MATLAB tools.	
L-(5-7)	Study of wireless Communications using Communication Trainer Kits: Adaptive Linear Equalize, Code Division Multiple Access (CDMA) – Multipath, Code Division Multiple Access (CDMA) – Multiuser, Global System for Mobile Communication (GSM) (Using WiCOMM-T – Wireless Digital Communication Training system – SDR Platform), Spread Spectrum – DSSS Modulation & Demodulation (Using Emona 101 Trainer Kit)	
CT-1	Tutorial Exam	
L-(9-11)	Study of Propagation Path loss Models: Indoor & Outdoor (Using MATLAB Programming): Free Space Propagation – Path Loss Model, Link Budget Equation for Satellite Communication, Carrier to Noise Ratio in Satellite Communication, Outdoor Propagation – Okumura Model.	
CT-2	Tutorial Exam	
L-(13-15)	Antenna Design Concept (using 4NEC2): Dipole Antennas, Yagi – Uda Antenna – 3 element, Yagi – Uda Antenna – 5 element, Yagi – Uda Antenna – 7 elements.	
L-(16-20)	Switching and Traffic: The Cellular Switching System	
CT-3	Tutorial Exam	

6.Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Mobile Cellular Telecommunications, Analog and Digital Systems	William C. Y. Lee	McGraw Hill	
2	Mobile Radio Communications	Raymond Steele	IIICE Press, New York	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
3	Telecommunication System Engineering	Roger L Freeman	John Wiley & Sons	
4	Lab. Guide and Lab. Manuals			

Course Outline

1. General Information

Optical Communication	ICT-4203	Semester	6 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week

	Course Status	Major Engineering
	Prerequisite Course	ICT-2205

2. Course Summary

The topic will be discussed in class by the course teacher

3. Course Objectives

To realize the significance of optical fiber communications.

4. Course Outcomes

C0	C0 Description	P0	Domain (LoBT)	Weight	Assessment Methods
C01	Understand and analyze the constructional parameters of optical fibers including the reason Light is used Instead of Electricity.	P01	Affective(A3)	25	Please refer to Section 8
C02	Understand Ray theory transmission and different modes fiber	P02	Cognitive(C3)	25	
C03	Estimate the losses due to attenuation, absorption, scattering and bending.	P03	Affective(A3)	20	
C04	Be aware of how optical fiber cable is made in Industry.	P04	Cognitive(C4)	15	
C05	Compare various optical detectors and choose suitable one for different applications.	P05	Cognitive(C3)	15	
C06	Be able to design the optical system.	P06	Affective(A3)	15	
C07	Gaining practical knowledge on how to measure optical fiber.	P07	Cognitive(C3)	20	
C08	Be able to know the real applications of optical fiber and future development of it.	P08	Affective(A3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	Introduction: Historical development, The general system, Advantages of optical fiber communication.	
L-(3-5)	Fundamentals of Optics: Light, Electromagnetic spectrum, Propagation of light, Geometric and physical optics, Snell's law of reflection and refraction, Total internal reflection, Optical energy losses, Specular and diffuse reflection, Diffraction and polarization, Optical components.	
CT-1	Tutorial Exam	

L-(7-9)	Optical fiber wave guides: Introduction, Ray theory transmission, cylindrical fiber, Single-mode fibers. Introduction, Attenuation, Losses, Dispersion, Polarization, Nonlinear phenomena.	
L-(10-12)	Transmission characteristics of optical fiber: Introduction, Preparation of optical fiber, Optical fiber cables, Stability of the fiber transmission characteristics, Cable design. Fiber connections.	
CT-2	Tutorial Exam	
L-(14-20)	Optical cables and connection, Optical sources and detectors, Optical fiber measurements: Introduction, Optical sources- LASER and Light Emitting Diode, Optical detectors. Introduction, Fiber attenuation measurements, Fiber dispersion measurements, Fiber refractive index profile measurements, Fiber cutoff wavelength measurements, Fiber numerical aperture measurements, Fiber diameter measurements, Mode-field diameter for single mode fiber, Reflectance and optical return loss, Field measurements.	
L-(20-25)	Applications and future developments: Introduction, Public network applications, Military applications, Civil, consumer and industrial applications. Optical sensor systems, Computer applications, Local area networks.	
CT-3	Tutorial Exam	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Optical Fiber Communications.	John M Senior	Prentice Hall of India.	
2	Optical Communication Systems	John Gower.	Prentice Hall of India	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Fiber Optic Communication	D.C.Agarwal	S CHAND & Company Ltd.	
2	Fiber Optic Theory	Heathkit Educational System		
3	Fiber Optic Communications	Joseph C. Palais		

Course Outline

1. General Information

Optical Communications Laboratory	ICT-3204	Semester	6 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.50
		Course Type	Practical/Laboratory work.
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-3205

2. Course Summary

The topic will be discussed in class by the course teacher

3. Course Objectives

To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.

4. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Understand the properties of Step index fibers and Graded index fibers.	P01	Affective(A3)	25	Please refer to Section 8
C02	Know the mode field diameter of Step index fibers.	P02	Cognitive(C3)	25	
C03	Achieve the knowledge on Material dispersion and waveguide dispersion.	P03	Affective(A3)	20	
C04	Understand Rayleigh Scattering Loss, Infrared Absorption Loss, Ultraviolet Loss.	P04	Cognitive(C4)	15	
C05	Gain the knowledge on WDM.	P05	Cognitive(C3)	15	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-2)	*Calculate for Step Index Fibers (using MATLAB/Optical ETB): (i) Numerical aperture (ii) Acceptance angle (iii) Solid acceptance angle (iv) Propagation constant *Calculate for Step Index Fibers (using MATLAB/ Optical ETB): (i) Propagation constant (ii) Normalized propagation constant (iii) V number (iv) Check	

	whether the fiber is SM or MM (v) Graph between normalized propagation constant and V number (vi) Cut off wavelength (vii) Number of modes traveling in fibers.	
L-(3-5)	*Calculate for Graded Index Fibers (using MATLAB/ Optical ETB): (i) Graphical representation of core refractive index w.r.t. radius of core for different profile parameters. (ii) Graphical representation of NA w.r.t. radius of core for different profile parameters (iii) Acceptance angle for given value of radius.	
L-(6-8)	* Calculate for Graded Index Fibers (using MATLAB/ Optical ETB): (i) NA, (ii) V number (iii) Check whether the fiber is SM or MM (iv) Graph between V number and wavelength (v) Cut off wavelength (vi) Number of modes traveling in fiber. * Calculate for Step Index Fiber (using MATLAB/ Optical ETB) of Mode Field Diameter. * Calculate for Step Index Fiber (using MATLAB/ Optical ETB) of Mode Field Diameter.	
L-(9-12)	*Calculate for pure Silica fibers (using MATLAB Optical ETB): (i) Graph for refractive index with wavelength (ii) Graph for $dn/ddn/d\lambda$ with wavelength λ (iii)Graph for $d^2n/d\lambda^2$ with wavelength λ (iv) Graph for material dispersion (Dm) with wavelength (v) Calculate material dispersion (Dm) at given wavelength (vi) Find zero material dispersion wavelength.	
L-(13-16)	*Calculate for Step Index Fibers (using MATLAB/ Optical ETB): (i) V number (ii) Cut off wavelength (iii) Waveguide dispersion at given wavelength (iv) Plot of waveguide dispersion with wavelength *Calculate (using MATLAB/ Optical ETB): (i) The Rayleigh Scattering Loss for Silica Fibers (ii) Plot a graph for Loss with wavelength. *Calculate the Infrared absorption loss for silica fibers and plot a graph with wavelength (using MATLAB/ Optical ETB). *Wavelength Division Multiplexing and De-multiplexing (using MATLAB/ Optical ETB).	

6. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Optical Fiber Communications.	John M Senior	Prentice Hall of India.	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	Optical Communication Systems	John Gowar.	Prentice Hall of India	
2	Fiber Optic Communication	D.C.Agarwal	S CHAND & Company Ltd.	
3	Fiber Optic Theory	Heathkit Educational System		
4	Fiber Optic Communications	Jeseoph C. Palais		

Course Outline

1. General Information

Cryptography and Network Security	ICT-4205	Semester	8 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	3.00
		Course Type	Theory
		Contact Hours	3/week
		Course Status	Major Engineering
		Prerequisite Course	ICT-1203, MATH-2101

2. Course Objectives

To provide knowledge on what network management is all about, functions and applications of network management, architecture and organization of it, exchange of management information, fundamental issues of network security, different ciphering techniques.

3. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Define network management and understand the necessity & the functions of network management system.	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Learn about the elements of network management system and architectural organization of it.	P01 P02	Cognitive(C4)	20	
C03	Understand the structure of management information and the exchange of information between management entities.	P02 P04	Affective(A3)	20	
C04	Distinguish between information & network security and know about information security architecture.	P04 P06	Cognitive(C3)	10	
C05	Analyze different symmetric and asymmetric encryption techniques.	P04	Cognitive(C4)	10	
C06	Learn about different data integrity and authentication mechanism.	P05	Affective(A3)	10	
C07	Understand the behavior of intruders & viruses and learn about different measures of network security.	P06	Cognitive(C4)	10	

4. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Network Management Basics: Challenges of IT Managers, Need for Network Management System, Network Management; Definition, Goals and Functions, Different Functional Groups, Management Applications, Need for Standard Management System.	
L-(4-6)	Network Management System Organization: Architecture of NMS, Network Management Organization Model, Distributed Network Management System, Comparison of OSI & Internet Management Model.	
CT-1	Tutorial Exam	
L-(7-9)	Security Fundamentals: Information Security, Threats & Attacks, OSI security architecture, Security Services & Mechanisms, Placement of Encryption Function, A Model for Network Security, Stream Cipher & Block Cipher, Key Distribution.	
L-(10-16)	Modern Encryption Techniques: Symmetric & Asymmetric Encryption, Substitution Cipher, Transposition Cipher, Modern Block Cipher, Block Chain Ciphering	
CT-2	Tutorial Exam	
L-(17-20)	Data Integrity& Authentication: Hash Function, MAC, Digital Signature, Entity Authentication, Mutual & One-way Authentication.	
L-(21-24)	Network & System Security: General Model of Network Access Control, Elements of Network Access Control System, Network Access Control Enforcement Methods, Intrusion Detection, Viruses & Related Threats, Virus Countermeasures.	
CT-3	Tutorial	

5. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Cryptography & Network Security	William Stalling		
2	Cryptography & Network Security	Behrouz Forouzan		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	SNMP, SNMPV2, RMON	<i>Foley and co-authors</i>		
2	Network Management Standards	Subramanian		

Course Outline

1. General Information

Cryptography and Network Security Laboratory	ICT-4206	Semester	8 th Semester
		Full Marks	100
		Exam Duration	6 Hours
		Course Credit	1.5
		Course Type	Laboratory
		Contact Hours	3/week

		Course Status	Major Engineering
		Prerequisite Course	ICT-4109

2. Course Objectives

To provide knowledge on what network management is all about, functions and applications of network management, architecture and organization of it, exchange of management information, fundamental issues of network security, different ciphering techniques.

3. Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Define network management and understand the necessity & the functions of network management system.	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Learn about the elements of network management system and architectural organization of it.	P01 P02	Cognitive(C4)	20	
C03	Understand the structure of management information and the exchange of information between management entities.	P02 P04	Affective(A3)	20	
C04	Distinguish between information & network security and know about information security architecture.	P04 P06	Cognitive(C3)	10	
C05	Analyze different symmetric and asymmetric encryption techniques.	P04	Cognitive(C4)	10	
C06	Learn about different data integrity and authentication mechanism.	P05	Affective(A3)	10	
C07	Understand the behavior of intruders & viruses and learn about different measures of network security.	P06	Affective(A3)	10	

4. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Beginning with Encryption Technique: Write and understand a program that Encrypt a message with Caesar cipher and other basic Encipherment algorithm using python, To understand a program having concept of basic encryption techniques with Python and MATLAB programming Language. Analyzing the pros and cons of the techniques and improvement of the code to upgrade the application of fundamental and practical technique as well.	
L-(4-9)	Advanced Encryption Algorithm and Analysis: Write and understand a program that Encrypt a message with Reverse cipher algorithm using python. Additionally, Practice of Parity Bit checking technique to analyze message with Python and MATLAB, To understand a program having concept of basic encryption techniques with Python and MATLAB programming Language. Analyzing the pros and cons of the techniques and improvement of the code to upgrade the application of fundamental and practical technique as well.	
CT-1	TUTORIAL EXAM	

L-(11-16)	Brute Force Attack: Write and understand a program to analyze Cryptanalysis of Caesar Cipher and other basic technique with brute force attack using python and MATLAB, To understand a program having concept of basic encryption techniques with Python and MATLAB programming Language. Analyzing the pros and cons of the techniques and improvement of the code to upgrade the application of fundamental and practical technique as well.	
CT-2	TUTORIAL EXAM	
	Transposition Technique and CRC method: Write and understand a program to implement Transposition Cipher Encryption Technique using python and MATLAB. Moreover, implementation of CRC (cyclic Redundancy Checking) using python and MATLAB for advanced analysis of Message.To understand a program having concept of basic encryption techniques with Python and MATLAB programming Language. Analyzing the pros and cons of the techniques and improvement of the code to upgrade the application of fundamental and practical technique as well.	
CT-3	TUTORIAL EXAM	

5. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Cryptography & Network Security	William Stalling		
2	Cryptography & Network Security	Behrouz Forouzan		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
1	SNMP, SNMPV2, RMON	Foley and co-authors		
2	Network Management Standards	Subramanian		
3	MATLAB and Python			

Course Outline

1.General Information

Software Project Management and Quality Assurance	ICT-4207	Semester	8 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.00
		Course Type	Theory
		Contact Hours	26
		Course Status	Humanities
		Prerequisite Course	System Analysis and Software Engineering, Computer Fundamentals, Programming concepts

2. Course Summary

An introduction to the concept and techniques of project management for a broad range

of systems, including Web-based application development. Topics include resource management, organizational factors, project manager responsibilities, team building, and risk management. Tools and techniques for project estimating and scheduling will be presented. Case study and group projects.

3. Course Objectives

This course will introduce the students with software project management, motivation in project management, client management, risk management, software quality assurance, software testing, software upgradation and maintenance, international project management.

4. Course Outcome

CO	CO Description	CO	Domain (LoBT)	Weight	Assessment Methods
CO1	Apply project management concepts and techniques to an IT project through working in a group as team leader or active team member.	CO1 CO2	Cognitive(C3)	25	Please refer to Section 8
CO2	Identify issues that could lead to IT project success or failure and the responsibilities of IT project managers.		Cognitive(C4)	25	
CO3	Explain project management in terms of the software development process.	CO3 CO4	Cognitive(C4)	20	

5. Topic Outline

Lecture	Selected Topic	Index
L-(1-3)	Course Overview Chapter 1: Introduction to Project Management.	
L-(4-6)	Chapter 2, 3: Project Management and IT Context, Project Management Process Groups.	
L-(7-9)	Chapter 4,5: Project Integration Management, Project Scope Management.	
CT-1	Tutorial Exam	
L-(11-14)	Chapter 6,7: Project Time Management, Project Cost Management.	
L-(15-18)	Chapter 8,9: Project Quality Management, Project Human Resource Management	
CT-2	Tutorial Exam	
L-(20-22)	Chapter 10, 11: Project Communications Management, Project Risk Management	
L-(22-24)	Project Procurement Management Chapter, Project Stakeholder Management	
L-(25-26)	Software Testing: Functional Testing, Performance Testing and Security Testing, Risk Management, Standards Compliance, Process Improvement, Defect Prevention and Detection, Configuration Management, and Documentation and Reporting	
CT-3	Tutorial Exam	

1. Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Information Technology Project Management	Schwalbe	Kathy	8 th
2	System Analysis and Development	P J Layzell and P Loucopolus	Chartwell-Bratt	

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
3	System Analysis and Design	S Y Wu and M S Wu	Galgotia Publications	
4	Software Engineering, A Practitioner's Approach	R S Pressman	McGraw-Hill.	
5	Software Engineering ISommerville	Addisi-Wesley		4th Edition

Course Outline

1. General Information

Field Work/Industrial Attachment	ICT 4208	Semester	8 th Semester
		Full Marks	100
		Exam Duration	
		Course Credit	2.00
		Course Type	
		Contact Hours	
		Course Status	Major Engineering
		Prerequisite Course	

Course Outline

1.General Information

Industrial Management And Accountancy	HUM 4201	Semester	8 th Semester
		Full Marks	100
		Exam Duration	4 Hours
		Course Credit	2.00
		Course Type	Theory

	Contact Hours	26
	Course Status	Humanities
	Prerequisite Course	

2.Course Summary

This course to develop an understanding on basic concepts of management, accounting, business planning and integration with Information systems

3.Course Objectives

To provide knowledge on the role of Information system in Business, MIS for organization, business strategies, Information system planning, decision making concepts, decision support systems, enterprise resource Planning Systems

4.Course Outcomes

CO	CO Description	PO	Domain (LoBT)	Weight	Assessment Methods
C01	Acquire general idea about the course	P01	Cognitive(C3)	20	Please refer to Section 8
C02	Understand the concepts of information system in business	P01 P02	Cognitive(C4)	20	
C03	Understand the concepts of MIS for organizations	P02 P03	Affective(A3)	15	
C04	Understand business strategies	P03 P04	Cognitive(C4)	15	
C05	Understand the concepts of IS planning	P03 P04	Affective(A3)	10	
C06	Evaluate decision support systems	P04	Cognitive(C4)	10	
C07	Understand enterprise resource planning	P03 P04	Affective(A3)	10	

5.Topic Outline

Lecture	Selected Topic	Index
L-(1)	Course Overview: The mission and vision of the Department, General idea about the course Statistics for Communication Engineering, The content and policies for the class	
L-(2)	Basic Management: Basic Industrial Management: Industry, Type of industry, Types of business, Management, Principles of management, Functions of management, Levels of management, Roles of Management, Scientific management and Core management.	
L-(3-4)	Accounting Basic: Scope, Nature and purpose of accounting, Basic accounting principles, Transactions, Journal, Ledgers and Trial Balance, Cash book, Preparation of financial statement. Cost accounts.	

CT-1	Tutorial Exam	
L-(6-7)	IS in business Org.: Role of IS in Business, Early views & Models of IS, Impact of MIS, The three Era Model, Strategic Uses of Information System, Strategic Information System.	
L-(8-9)	Organizations & Strategic Planning: Organization Structure, MIS for Organization Planning, Strategic Framework, Generic Business Strategies, Planning Tools & Techniques, Supply Chain & Value Chain Analysis.	
CT-2	Tutorial Exam	
L-(11-12)	Development of MIS: Development of Long-Range Plans for MIS, Ascertaining the Class of Information, Determining the Information Requirement, Development and Implementation of MIS, Management of Quality in MIS, Organization for Development of the MIS, Factors of Success and Failures.	
L-(13-14)	Strategic IS Planning: Information system Planning, Purpose & Stimuli Driving IS Planning, Assessment of Current Environment, Scope, Expectations & Objectives, Planning Framework & Approaches, Understanding Current Situation, Analyzing Techniques to Determine IS Strategy, Business Process Re-Engineering.	
L-(15-16)	Strategic Management of IS: Requirements and Sub-functions, Application Portfolio Management, Information Management, Technology Infrastructure Management, Determining IS Strategy.	
L-(17-18)	Decision Making and Information: Decision Making Concepts, Decision Methods, Tools and Procedures, Organizational Decision Makings, MIS and Decision-Making Concepts, Information Concepts, Quality of Information, Classification of Information, Methods of Data and Information Collection, Value of Information.	
CT-3	Tutorial Exam	

6.Text and Reference Materials

S/N	Text Books	Writer Name	Publisher Name	Edition
1	Strategic Planning for Information Systems	John Ward	Pat Griffith	
2	Schaums Easy Outline of Accounting	Joel Lerner		

S/N	Reference Books and Other Materials	Writer Name	Publisher Name	Edition
3	Management Information System	W. S. Jawdekar		
4	Management Information System	D. P. Goyal		
5	Management Information System	Laudon&Laudon		
6	Management Information System	James A.O'Brien		

Course Outline

1. General Information

Viva-Voce	ICT 4000	Semester	8 th Semester
		Full Marks	100
		Exam Duration	
		Course Credit	1.00
		Course Type	
		Contact Hours	
		Course Status	Major Engineering
		Prerequisite Course	

Course Outline

1. General Information

Design Project	ICT 4002	Semester	8 th Semester
		Full Marks	100
		Exam Duration	
		Course Credit	3.00
		Course Type	
		Contact Hours	
		Course Status	Major Engineering
		Prerequisite Course	

Appendix A: Knowledge Profile

Knowledge Profile	Attribute
WK1	A systematic, theory-based understanding of the natural sciences applicable to the discipline
WK2	Conceptually based mathematics, numerical analysis, statistics and the formal aspects of computer and information science to support analysis and modeling applicable to the discipline
WK3	A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline
wk4	Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline
WK5	Knowledge that supports engineering design in a practice area

WK6	Knowledge of engineering practice (technology) in the practice areas in the engineering discipline
WK7	Comprehension of the role of engineering in society and identified issues in engineering practice in the discipline: ethics and the engineer's professional responsibility to public safety; the impacts of engineering activity; economic, social, cultural, environmental and sustainability

Appendix B: Range of Complex Engineering Problem Solving

Attribute	Identity	Complex Engineering Problem Description
Depth of knowledge required	WP1	Cannot be resolved without in-depth engineering knowledge at the level of one or more of K3, K4, K5, K6 or K8 which allows a fundamentals-based, first principles analytical approach
Range of conflicting equipments	WP2	Involve wide-ranging or conflicting technical, engineering and other issues
Depth of analysis required	WP3	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models
Familiarity of issues	WP4	Involve infrequently encountered issues
Extent of applicable codes	WP5	Are outside problems encompassed by standards and codes of practice for professional engineering
Extent of stakeholder involvement and conflicting requirements	WP6	Involve diverse groups of stakeholders with widely varying needs
Interdependence	WP7	Are high-level problems including many component parts or sub-problems

Note: Complex Engineering Problems have identity P1 and some or all of P2 to P7.

Appendix C: Range of Complex Engineering Activities

Attribute	Identity	Activity Description
Range of resources	EA1	Involve the use of diverse resources (and for this purpose re- sources include people, money, equipment, materials, information and technologies)
Level of interaction	EA2	Require resolution of significant problems arising from interactions between wide-ranging or conflicting technical, engineering or other issues
Innovation	EA3	Involve creative use of engineering principles and research-based knowledge in novel ways

Consequences for society and the environment	EA4	Have significant consequences in a range of contexts, characterize by difficulty of prediction and mitigation
Familiarity	EA5	Can extend beyond previous experiences by applying principles- based approaches

Note: Complex activities means (engineering) activities or projects that have some or all of the above activities.

Appendix E: Domain and Level of Bloom's Taxonomy

Cognitive Domain		Psychomotor Domain	Affective Domain
C1	Remembering	P1 Perception	A1 Receive
C2	Understanding	P2 Set	A2 Respond
C3	Applying	P3 Guided Response	A3 Value
C4	Analyzing	P4 Mechanism	A4 Organize
C5	Evaluating	P5 Complex Overt Response	A5 Internalize
C6	Creating/ Designing	P6 Adaption	
		P7 Origination	